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**BEFORE THE NATIONAL GREEN TRIBUNAL
EASTERN ZONE BENCH, KOLKATA
APPEAL. No. 08/2020/EZ**



IN THE MATTER OF:

Mridu Paban Phukon & Anr

...Appellant(s)

-VERSES-

Union of India & Ors.

.....Respondent(s)

-AND-

IN THE MATTER OF:

An Additional-Affidavit on behalf of
the Respondent No. 2 i.e., Oil India
Limited.

I, Sri Saroj Kumar Deka, aged about 59 years, S/o Late. A.C. Deka,
R/o Duliajan, in the District of Dibrugarh, Chief General Manager (Legal) of
Oil India Limited, do hereby solemnly affirms and state as under :-

1. That the deponent is the Chief General Manager (Legal) of Oil India Limited and in course of discharge of his official duties, the deponent is conversant with the facts of the instant case.
2. That the deponent begs to state that by way of this Additional-Affidavit certain factual developments which has a bearing on the adjudication of this proceeding is sought to be brought on record.
3. That the deponent begs to state that the Appellant in paragraph 50 of the Appeal refers to "Biodiversity Impact Assessment and Public Consultation under the Biological Diversity Act, 2002, where the Appellant



quote Section 36(4) of the Biological Diversity Act, 2002, which stipulates as below.

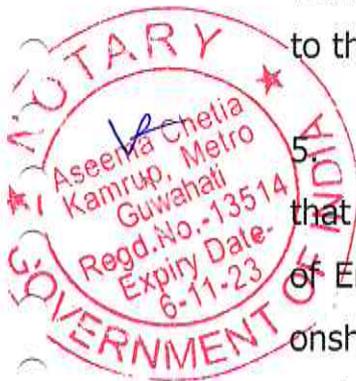
"(4) The Central Government shall undertake measures-

(i) Wherever necessary, for assessment of environmental impact of that project which is likely to have adverse effect on biological diversity, with a view to avoid or minimise such effects and where appropriate provide for public participation in such assessment;"

However, it is not an obligatory requirement that such study have to be conducted through "State Biodiversity Board" and in the present case, through the "Assam State Biodiversity Board".

4. That the deponent begs to state that Para-50 of the Appeal also refers to the Hon'ble Supreme Court order dated 07.09.2017 in the matter of T.N. Godavarman Thirumulpad verses UOI (I.A. No. 3934 in W.P (C) 202 of 1995, wherein the Hon'ble Court had directed for carrying out Biodiversity Impact Assessment Study through State Biodiversity Board in relation to a similar project of the project proponent, i.e Oil India Limited with respect to drilling for exploration of hydrocarbons in close proximity to the Dibru Saikhowa National Park.

5. That the deponent begs to state that it is pertinent to mention herein that the subject matter of this litigation pertains to the issuance of grant of Environmental Clearance dated 09.04.2020 for carrying out additional onshore OIL and gas development drilling and production from 16 wells and setting up of additional production installations and laying of gas pipelines in area of 82 has in Mechaki area in the district of Tinsukia, Assam. The area of operation in this Mechaki block is therefore in and around the boundary of Dibru-Saikhowa National Park itself and certain others adjoining areas which at least around 10 km of land mass is overlapping with the similar project of Oil India Limited known of the



Extended Reach Drilling (ERD) Wells beneath Dibru-Saikhowa National Park, Assam.

6. That the deponent begs to state that as regard the said Extended Reach Drilling (ERD) Project, the Assam State Biodiversity Board has proceeded to carry out a Biodiversity Impact Assessment Study and has submitted a report. That a perusal of the report so submitted provides a very encouraging scenario, as it clearly indicates that even after the Baghjan blow-out and other continued oil drilling activities, there has been a reporting of extensive and varied flora and fauna, which therefore goes to suggest that oil drilling activities had never created any significant impact on the biodiversity. There has been almost no to negligible impact on the biodiversity features in the said area. Further the report has also laid down certain proposal for mitigation of Environment Impact that may be caused while carrying out oil drilling activities of Oil India Limited.

As the area of operation in the present litigation i.e., Mechaki Block is in the same region, sharing similar ecological environment, having similar flora and fauna, the instant Biodiversity Assessment Impact Study will substantially cover the present subject matter area also.

A copy of the Biodiversity Assessment Impact Study is annexed herewith and marked as **ANNEXURE – 1.**

7. That the deponent begs to state that the appellant in para-4 of the Appeal has also raised a controversy alleging that the project proponent i.e., Oil India Limited had concealed information from Form I (one) which was submitted to the Ministry of Environment, Forest and Climate Change in 2017. That in this regard it must be stated that the Appellants have infact suppressed the fact that as per the Office Memorandum dated 20.04.2018 issued by the Ministry of Environment, Forest and Climate



Change, a Form II has been introduced for providing the detailed information and it is the said Form II which is material in the process of granting the Environmental Clearance. The deponent would like to state that as regard the present Environmental Clearance all the information was provided to the competent authority in the said Form – II.

Thus, there is no question of any concealment of materials from the Authority. The stand taken by the Appellant that non providing of all information in Form – I would be a ground for setting aside of the Environmental Clearance, could had been a relevant ground of consideration, prior to the introduction of the Office Memorandum dated 20.04.2018. As prior to the said Office Memorandum, it was only the Form – I which form, the basis for supply of information by a project proponent, based on which the competent Authority would assess the merits of such proposal for grant of Environmental Clearance. However, in the present case in hand, as with the introduction of Form – II, it is this Form – II which forms the basis for the appropriate assessment by the authority and as the project proponent has provided all the relevant information therein and more so when the Appellant has not whispered a single word of demur against the said Form – II submitted by Oil India Limited, the contention of the Appellant viz-a-viz the Form – I holds no relevance in the eye of law.

Copy of the Notification dated 20.04.2018 from the Ministry of Environment, Forest and Climate Change is annexed herewith and marked as **ANNEXURE – 2.**

8. That the deponent begs to state that the project proponent i.e., Oil India Limited had engaged approved consultant ERM India Pvt. Ltd. for preparation of the Environmental Impact Assessment Report and certain objections against the EIA Report has been projected by the Appellant in



this instant lis. In view of the same Oil India Limited had undertaken certain rounds of discussions with ERM India Pvt. Ltd., they being the subject expert. On 23.02.2023 a detailed report has been provided by ERM India Pvt. Limited in response to the allegations pertaining to the EIA Report. The same has been submitted to Oil India Limited vide correspondence dated 23.02.2023. The said report provides point by point clarification to the allegations raised by the appellant in the appeal. A perusal of the said clarifications would indicate that there have been no anomalies in the study conducted by the said ERM India Pvt. Ltd. The Form II i.e., application for prior Environmental Clearance has also been attached therein in the said report as Attachment No. 1. The Form II clearly indicates that all the required parameters and details were being provided.

Copy of the Report of the ERM India Pvt. Ltd. dated 23.02.2023 is annexed herewith and marked as **ANNEXURE-3**

That the statement made in this Additional-Affidavit in paragraph 1, 2, 3 4 & 5 are true to my knowledge and those contended in paragraphs 6, 7 & 8 are true to my information and derived form records maintain in the office which I believe to be true and the rest are humble submissions before the Hon'ble Tribunal.

OATH

I swear that my declaration is true, that it conceals nothing and that no part of it is false, so help me God.

And I sign this Additional-Affidavit on this 10th day of April, 2023 at Guwahati, Assam.

Identified by

Jamiel Mesutai

Advocate

Saroj K. Deba

DEPONENT

Solemnly affirmed before me this day, certify that I read over and explained the contents to the declarant and that the declarant seemed perfectly to understand them

SAROJ KUMAR DEKA
CHIEF GENERAL MANAGER (LEGAL)
&
ATTORNEY
OIL INDIA LIMITED
DULIAJAN, ASSAM



Aseema
NOTARY
ASEEMA CHETIA
Kamrup & Metro Guwahati
Regd. No. - 13514
GOVT OF INDIA



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Annexure - 1



Biodiversity Impact Assessment Study for the Proposed 7 Extended Reach Drilling Wells beneath Dibru-Saikhowa National Park (DSNP), Assam



Report submitted to Assam State Biodiversity Board

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Argo Chuman Sarma
Advocate



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Anghoruman Sarona
Advocate



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 Advocate



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 Advocate



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 Advocate



Acknowledgements

International Union for Conservation of Nature (IUCN) is pleased to acknowledge the support of its technical partners and donor who are supporting in implementation of this project.

We would like to thank:

Dr. Amit Sahai (IFS) Principal Chief Conservator of Forest, Assam

Sri. KSPV Pavan Kumar (IFS) Addl. PCCF (Biodiversity &CC) & Member Secretary, Assam State Biodiversity Board

Dr. Vivek Saxena (IFS), Managing Director HFDC & Ex-Country Head IUCN India

Sri. Prasanta Borkakoty, Resident Chief Executive, Oil India Limited Duliajan

Sri. Sanjay Kuamr Rai, Executive Director, FHQ affairs Oil India Limited Duliajan

Dr. O. Sunanda Devi, Scientific Officer-Assam State Biodiversity Board

Sri K.K. Deori, AFS, Divisional Forest Officer, Tinsukia Wildlife

Dr. PROF SYED AINUL HUSSAIN, Ph.D.; DSc (Wildlife Sciences), Wildlife Institute of India

IUCN Global Business and Biodiversity Unit, Gland, Switzerland

We would also thank the Oil India Limited, Environment and Safety, Duliajan team for the support and on-site coordination.

And finally, we express our sincere appreciation for our on-ground implementing and knowledge partner, Terracon Ecotech Pvt. Ltd. for supporting in the implementation of the study.

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Anghuman Sarma
Advocate



Introduction

The activities associated with Oil and gas exploration, development and production generate diverse range of environmental changes and many times these changes are irreversible. The most common environmental problems associated with industrial activities are conversion of land, deforestation, soil erosion, disturbance to surface and ground water hydrological system of the area, visual intrusion, water, air, and noise pollution and reduction of faunal and floral diversity, health and resource.

This report illuminates, identified and assessed the potential impacts on the environment that could be anticipated from the planned oil & gas exploration drilling activity in ERD Surface Locations in Baghjan Petroleum Mining Lease (PML), Tinsukia District.

Biodiversity Impact Assessments are standard processes of analysing the impacts or potential impacts of projects on the existing environment. Through identifying the type and magnitude of impact, measures can be developed to mitigate impacts.

Project Background

In exercise of powers conferred under sub-section (1) of Section 22 of the Biological Diversity Act, 2002 (Act 18 of 2003), the Government of Assam constituted the 'Assam State Biodiversity Board' on 29th September 2010 to promote biodiversity conservation in the State of Assam, sustainable use of its components, equitable sharing of benefits arising out of the use of biological resources of the state and traditional knowledge associated with these resources, and matters incidental thereto or connected therewith.

Oil India Limited (OIL), a Government of India Navaratna Enterprise, is currently engaged in carrying out exploration activities for hydrocarbon in its operational areas of Upper Assam, Arunachal Pradesh and Mizoram in the North Eastern part of India. OIL has significant presence in pan-India and overseas. Following the discovery of oil and gas in Baghjan area (2003) by OIL, extensive geoscientific works have been carried out through 3D seismic survey. Around 75 sq. km. of Petroleum Exploration License (PEL) area was converted into Baghjan Mining Lease (ML) and OIL has so far drilled 19 wells. Currently, 5000 bbl of oil has been produced from this field per day.

Be that as it may, the Assam State Biodiversity received a copy of the order of the Hon'ble Supreme Court in I.A. No.3934 in W.P. (Civil) No. 202 of 1995, dated 07.09.2017, which directed as follows:

"OIL will carry out Biodiversity Impact Assessment Study through Assam State Biodiversity Board, for which budgetary offer have already been obtained on 12th May 2017."

Earlier, the Assam State Biodiversity Board received a communication on 28.01.2017 from Oil India Limited, calling for a budgetary offer/estimate for undertaking of a 'Biodiversity Impact Assessment

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Advocate



Study' for the 7 nos. Extended Reach Drilling (ERD) wells proposed beneath the Dibru-Saikhowa National Park (DSNP). In response thereto, the Assam State Biodiversity Board sent a budgetary offer for consultancy services, to the Oil India Limited, Duliajan on 12.05.2017 for undertaking the aforesaid study. However, the Assam State Biodiversity Board did not immediately receive any acceptance of this offer from the Oil India Limited.

On the aftermath of the oil-well blowout at Baghjan, that the Assam State Biodiversity Board received an email communication from the General Manager (HSE), S&E Department, Oil India Limited, Duliajan on 21.08.2020, requesting it to submit a fresh budgetary proposal for 'Biodiversity Impact Assessment Study' for drilling of the proposed 7. Nos. Extended Reach drilling wells, beneath the Dibru Saikhowa National Park, Assam. In response to this email, the Assam State Biodiversity Board sent its reply on 29.08.2020 which explained the Board's position as below:

"In the backdrop of the critical and extraordinary situation prevailing around the Baghjan / Dibru-Saikhowa / Maguri-Motapung Beel area on the aftermath of the oil-well blowout, it would not be possible for the Assam State Biodiversity Board to undertake any 'Biodiversity Impact Assessment Study', till the environmental crisis in and around Baghjan / Dibru-Saikhowa / Maguri-Motapung Beel area is fully mitigated by M/s. Oil India Limited."

In response to the Assam State Biodiversity Board's communication dated 29.08.2020, a letter from Oil India Limited was received on 14.12.2020 by email, seeking confirmation from the Assam State Biodiversity Board on undertaking the Biodiversity Impact Assessment Study at the proposed site, now that the Baghjan well No.5 crisis was over.

Accordingly, the Board sent a reply to the Oil India Limited on 30.12.2020, proposing the road-map and modalities for carrying out the 'Biodiversity Impact Assessment Study', and followed it up with another clarification on 28.01.2021. The Board received confirmation from the Oil India Limited for the proposed road-map for undertaking the Biodiversity Impact Assessment vide communications dated 12.01.2021 & 02.02.2021.

After acceptance of the proposal for the 'Biodiversity Impact Assessment Study', by the Oil India Limited, the Assam State Biodiversity Board sought to partner with the International Union for Conservation of Nature (IUCN) for the study, in view of the fact that the said organization is an internationally reputed organization having expertise in the area of conservation of rare, threatened & endangered species of flora and fauna, across the world. Accordingly, a communication was addressed to the IUCN on 03.02.2021, and acceptance by the IUCN was conveyed on 08.02.2021. Thereafter, a draft tripartite MoU along with the budgetary estimate was communicated to the Oil India Limited on 17.02.2021. The Oil India Limited suggested a few modifications to the draft tripartite MoU on 23.02.2021, and again on 03.03.2021, which basically related to the payment terms, taxes, other expenditure to be incurred etc. The said modifications were communicated to the IUCN on 03.03.2021, and the draft tripartite MoU was accordingly revised.

The 'tripartite MoU' was finally signed on 04/05/2021 between the Assam State Biodiversity Board, International Union for conservation of Nature and Natural Resources (IUCN) and the Oil India Limited, after Model Code of Conduct (MCC) pertaining to the Legislative Assembly Elections, 2021 was lifted. The study at this point of time is ongoing.

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Advocate



Under the guidance of Assam State Biodiversity Board, IUCN will go beyond the compliance by conducting biodiversity impact assessment study as well as developing a Comprehensive Biodiversity Management plan with its implementation strategy and framework. IUCN will be using its Global biodiversity mapping tools like IBAT and other guiding and knowledge products to ensure the robust data collection and management.

OIL intends to drill seven (7) extension/appraisal locations in the riverbed areas of Dibru River alongside Dibru-Saikhowa National Park (DSNP). All seven locations will be drilled from three surface well pads viz. PAD 1, PAD 2 and PAD 3 of Baghjan ML located at a minimum distance of 1.3 km outside the boundary of the DSNP. The seven wells will be drilled from the proposed drill pads through Extended Reach Drilling (ERD) Technology. The target depth of each seven wells is planned to be 3950 m (TVD). Once hydrocarbon is established in this area, it is expected to enhance the cumulative oil production of OIL adding to the national economy.

Scope of the study

The major scope of the study is to conduct a Biodiversity Impact Assessment and prepare a Biodiversity Management Plan. This is an exhaustive study that includes on-site as well as desk work. It includes three main components – ecological assessment, biodiversity impact assessment and ecosystem services review. Based on the learning of these components, various strategies and action plans will be suggested to mitigate impact, enhance and conserve biodiversity.

Project Description (Diagrams for construction and photographs of all the proposed 7 sites to be included)

Type of the Project

Oil India Limited (OIL), a Government of India Navaratna Enterprise, is currently engaged in carrying out exploration activities for hydrocarbon in its operational areas of Upper Assam, Arunachal Pradesh and Mizoram in the North Eastern part of India. OIL has significant presence in pan-India and overseas. Following the discovery of oil and gas in Baghjan area (2003) by OIL, extensive geoscientific works have been carried out through 3D seismic survey. Around 75 sq.km. of Petroleum Exploration License (PEL) area was converted into Baghjan Mining Lease (ML) and OIL has so far drilled 19 wells. Currently, 5000 bbl of oil has been produced from this field per day.

Need of the Project

The project will help in achieving the energy requirement of India; thereby reducing the dependency of India on other countries, to an extent. Additionally, the project will help people living in neighbouring villages in relation to direct & indirect employment associated with various project activities and will boost the local economy.

Project Location and Project Details

OIL intends to drill seven (7) extension/appraisal locations in the riverbed areas of Dibru River alongside Dibru-Saikhowa National Park (DSNP). All seven locations will be drilled from three surface well pads viz. PAD 1, PAD 2 and PAD 3 of Baghjan ML located at a minimum distance of 1.3 km outside the boundary of the DSNP. The seven wells will be drilled from the proposed drill pads through

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Advocate



Extended Reach Drilling (ERD) Technology. The target depth of each seven wells is planned to be 3950 m (TVD). Once hydrocarbon is established in this area, it is expected to enhance the cumulative oil production of OIL adding to the national economy.

Typical well site details

For Biodiversity assessment, a combination of an area within a 10 km radius from the boundaries of the PAD 1, PAD 2 and PAD 3 was considered as study area. For the convenience of the survey, the entire study area is divided into grids of 4 x 4 Km. Study plots are laid in each grid to record the present biodiversity and observe ecological conditions. (Refer Figure 2, Pg.30). A total of 29 study plots and 4 transects were laid in the study area. Line Transects was considered to document the diversity in the Ecological Sensitive Areas. Environmental settings of the ERD surface locations, i.e. well pads are as follows:

PAD 1: The well pad is located in Baghjan village, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. The habitat of this well pad is categorised as a cropland/pastureland. Presence of Baghjan settlements is observed in the vicinity of the well pad location.

PAD 2: The well pad is located in Baghjan village, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. An earthen road passing through the village is connecting the approach road to the well pad. The habitat of this well pad is categorised as home backyard. Presence of Dighaltarang and Baghjan settlements is observed in the vicinity of the well pad location.

PAD 3: The well pad is located in Dighaltarang Tea Estate, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. It will pass through nearby tea estates. The habitat of this well pad is categorised as Tea Plantation. Presence of Dighaltarang settlements is observed in the vicinity of the well pad location.

Salient Features of an exploratory Well:

TABLE 1 SALIENT FEATURES OF AN EXPLORATORY WELL

Type of Well	Depth of Well	Water Consumption	Drill Cutting	Drilling Fluid
Exploratory	3900 m	3600-4800m ³	350-400m ³	900-1200m ³

Size or Magnitude of Operation

The study area is situated in Baghjan Village, Doomdooma Tehsil, Tinsukia District of Assam. The seven subsurface locations are located within Dibru-Saikhowa National Park (DSNP). The seven wells will be drilled from three surface well pads within Baghjan Petroleum Mining Lease (PML). The three surface locations are present in Dighaltarang and Baghjan villages in Doomdooma Tehsil of Tinsukia District. The ERD surface locations can be accessed from the NH-37 through Doomdooma-Baghjan Road and is about 22 km from Doomdooma.

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Advocate



Three wells each will be drilled from PAD 1 and PAD 2 surface locations and one well will be drilled from PAD 3. It is estimated that about 3.2 ha. area would be required for each of the well sites. The drilling of the wells is expected to be up to a target depth of 3900 meters below ground level; will take approximately three to four months to complete drilling and testing activity at each well site. Table illustrates site details for the Surface and Subsurface ERD locations.

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Advocate



ERD sites distances from Priority Biodiversity Features

TABLE 2 ERD SITES DISTANCES FROM PRIORITY BIODIVERSITY FEATURES

Plinth Name	Location	Village, Tehsil	Existing Landuse	Accessibility	Ecological Sensitive Zone in Kms				Settlements in surroundings
					Dibru River	Bherjan WLS	Podumoni WLS	Magurl Beel	
PAD 1	27.593769 95.384482	Baghjan, Doomdooma	Cropland/pastureland	An unnamed road is just 0.55 km away, which later meets to Gelapukhuri road.	3.1	6.4	8.3	1.6	Settlement of Baghjan within 0.08 km (NE)
PAD 2	27.599916 95.404428	Baghjan, Doomdooma	Home Backyard	An earthen road is through the village is just beside the site.	2.6	7.6	10.5	2.11	Settlement of Dighaltarang within 0.45 km (NE) & Baghjan Gaon within 0.05 km south
PAD 3	27.612782 95.414843	Dighaltarang, Doomdooma	Tea Plantation	There is a road through tea garden, beside the well location.	2	9.3	12.5	3.6	Settlement of Dighaltarang within 0.15 km (SW) & Dighaltarang T.E. 121/122/118 within 0.07 km south
9Location A	27.603265 95.366276	DNBP	Riverbed	Boat travel from Guijan Ghat	1.3	7.5	8.1	2.7	Settlements of Baghjan Gaon within 1.4 km south
Location B	27.605741 95.374595	DNBP	Riverbed	Boat travel from Guijan Ghat	1.2	7.7	9.1	3	Settlements of Baghjan Gaon within 0.9 km south
Location C	27.612961 95.373864	DNBP	Riverbed	Boat travel from Guijan Ghat	0.4	8.7	9.5	3.5	Settlements of Baghjan Gaon within 1.6 km south
Location D	27.613475 95.383092	DNBP	Riverbed	Boat travel from Guijan Ghat	0.3	8.8	9.9	3.7	Settlements of Baghjan Gaon within 1 km south

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 Advocate



Biodiversity Impact Assessment Study at DSNP, Assam



Location E	27.618875 95.385301	DNSP	Riverbed	Boat travel from Guijan Ghat	0	9.4	10.5	4.2	Settlements of Baghjan Gaon within 1.2 km south
Location F	27.618095 95.391687	DNSP	Riverbed	Boat travel from Guijan Ghat	0.1	9.1	10.9	4.1	Settlements of Baghjan Gaon within 1.1 km south
Location G	27.621662 95.401668	DNSP	Riverbed	Boat travel from Guijan Ghat	0.4	9.8	12	4.5	Settlements of Baghjan Gaon within 1.1 km south

Locations of ERD subsurface wells from ERD surface well:

TABLE 3 LOCATIONS OF ERD SUBSURFACE WELLS FROM ERD SURFACE WELL

ERD Surface locations	PAD 1	PAD 2	PAD 3
ERD sub-surface locations (Below)	Distance in km		
Location A	2	3.8	4.9
Location B	1.6	3	4.1
Location C	2.4	3.4	4
Location D	2.1	2.6	3.1
Location E	2.7	2.8	3
Location F	2.7	2.4	2.3
Location G	3.5	2.4	1.6

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 Advocate



Resource requirement for the Project

Land Requirement

During the site selection process, all legal requirements will be considered and surface location of the exploratory well will be finalized. Three wells each will be drilled from PAD 1 and PAD 2 surface locations and one well will be drilled from PAD 3. It is estimated that about 3.2 ha. area would be required for each of the well sites. Individual sites will be duly fenced to a height of about 2 m using jingle wired fencing or Expanded metal fencing. The drilling of the wells is expected to be up to a target depth of 3900 meters below ground level.

Water Requirement

During the drilling operations, water requirement at a drill site is expected to be 50 m³ per day. The water requirement at the drilling sites during construction and drilling phase will be met groundwater after obtaining necessary permission. Approximately, 5 m³ per day water will be required for construction and 3 m³ per day for workers during construction phase. Potable water requirement at site will be met through packaged drinking water. As mentioned in the Eia for Drilling of ERD Locations in Tinsukia, Assam, in addition, a water storage pit of around 1000 m³ is proposed to store water for fire water supply the likely source being surface water.¹

Power Requirement

The power requirement for each drill site will be met through the 125 KVA DG Sets. Two DG sets, each of 1000 KW capacities, will be simultaneously operated and one will be kept as standby during drilling operation, Lighting and other power requirements at drill sites will be met through 200 KW DG sets. It is estimated that 3.5 KLD of diesel will be required during drilling phase.¹

Manpower requirement

The drilling rig will be operated by approximately 50 persons on the rig at any particular time. The manpower will operate in two shifts with continuous operations on the rig. This will include technical experts (including expats), who will be responsible for various drilling related activities and some local workers who will be hired from nearby villages for the entire duration of the Project.

Drilling Mud

During drilling operations, a fluid known as drilling fluid (or 'mud') is pumped through the drill string down to the drilling bit and returns between the drill pipes. It has been decided that a uniform water-based mud system will be used in all the proposed wells. Mud used during the operation will flush out formation cuttings from the well hole. These cuttings will be separated from the drilling mud using a solids control and waste management package. Each exploratory well will produce 350-400m³ Drill Cuttings and 900-1200m³ of Drilling Fluids (Mud). Waste mud will be tested for hazardous contaminants and disposed according to Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Management Plan will be made in accordance with S No. 72 C.1.a Schedule I Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB as modified in 2005.¹

¹ EIA for Extension Drilling and Testing of hydrocarbons at 7 (seven) locations under Dibru-Saikhowa National Park Area. North - West of Baghjan PML under Tinsukia District, December 2019, Reference#0426932

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Technology and Process description (with drilling Rig sketch)

Drilling of Exploratory well

The exploitation of hydrocarbons requires the construction of a conduit between the surface and the reservoir. This is achieved by the drilling process. The exploration and development wells will be drilled using a standard land rig or a "Mobile Land Rig" with standard water-based drilling fluid treatment system. This rig will be suitable for deep drilling up to the desired depth of 3900 metres as planned for the project.

Well development and production phase

Extended reach technology can be used to develop long-reach wells that can extend horizontally for kilometres underground. By using this technology, previously inaccessible resources lying at the sub-surface of the DSNP can be explored during the current drilling programme.

During drilling operations, a fluid known as drilling fluid (or 'mud') is pumped through the drill string down to the drilling bit and returns between the drill pipe – casing annulus up to surface back into the circulation system after separation of drill cuttings /solids through solids control equipment. Mud used during the operation will flush out formation cuttings from the well hole. The total amount of cuttings produced during the entire drilling period is projected to be about 350-400 m³ per well (approximately 770-880 MT).

Once the cuttings have been separated, the drilling fluid will be reused or processed after further treatment in a Chemically Enhanced Dewatering (CED) system designed to remove suspended solids that are too fine for mechanical separation in solids control package producing inlet particles called 'flocs'. The flocs will be removed in the decanting centrifuges and the resultant sludge disposed of in High Density Polyethylene (HDPE) lined pits (of approximately 800 m³ area) for each well. The cleaned wastewater will also be stored in HDPE lined pits and disposed of, after testing and any necessary treatment, to meet the regulatory requirements. The whole process by which the drilling fluid will be reused during the drilling operation is commonly known as a "closed loop system."

Various components of the drilling mud will be selected carefully to be able to provide desired properties to the mud. Mud chemicals will be added to the uniform mud system to adjust the mud properties and ensure fluid loss control/circulation, lubricity, shale inhibition, pH control and pressure control in the well during drilling.

Development of a Well²

Well Kick Situation

A kick is defined as an intrusion of unwanted fluids into the wellbore. This can happen when the formation pressure exceeds the effective hydrostatic pressure of drilling fluids. When a kick occurs, many warning signs can be noticed at the surface that indicates that the formation fluids have been flowed into the wellbore. These signs have to be analysed properly in order to avoid any uncontrolled situation. The warning signs or indicators are divided into two categories: primary and secondary.

Primary signs of a kick	Secondary Signs of a kick
<ul style="list-style-type: none"> • Pit volume increase 	<ul style="list-style-type: none"> • Drilling Break

² <https://www.drillingcourse.com/2016/01/introduction-to-well-control.html>

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• Flow Rate Increase	• Pump Pressure Changes
• Flowing Well with Shut Off Pumps	
• Improper Filling-up During Tripping	

Blowout Situation

The formation fluids influx or the kick has to be controlled, if no action is taken, then the formation fluids can reach the surface generating what is called as a blowout. Blowout can lead to human life losses, rig and equipment losses, reservoir fluids losses, and cause environment damage. The blowout is an uncontrolled situation which has to be remedied rapidly, carefully and effectively.

Well Control

The formation fluids are basically prevented to flow into the well bore by two types of control:

The primary control: it is the main method of control to prevent formation fluids influx. It is performed by maintaining the hydrostatic pressure applied by a column of drilling fluids greater than the pore pressure. The positive differential pressure is called the overbalance.

The secondary control: when the primary control failed, the secondary control is required. The main purpose of this type of control is stopping the flow of formation fluids into the well bore and circulating them out of the well in a controlled way. The secondary control is started by closing the blowout preventer (BOP), then displacing the formation fluids using heavy drilling fluids which are circulated into the drill string, down to the bottom then up to the surface.

Proposed Hole size/Casing Programme

Spudding-in well is the start of drilling activity. Top-hole section will be drilled to a desired depth based on well design. After drilling top-hole section, it will be cased with a pipe called "Casing". Casing provides support to hole wall and secures hole section. Other than that, it isolates problematic hole sections such as loss zones, shale sections, over pressurized formations, etc. After running casing, space between hole wall and "Casing" will be cemented. This process of drilling and casing the hole section continues until the final well depth (target) is achieved.

Surface testing and Flaring

Testing & Flaring will be undertaken in accordance with the CPCB Guidelines for Discharge of Gaseous Emissions for Oil & Gas Extraction Industry. Flaring of gases primarily during the drilling testing phase will contribute to air pollution. Flaring will involve high temperature oxidation process to burn combustible gases that may be generated from the proposed well sites. Emissions from flaring will include CO₂, carbon particles (soot), unburnt hydrocarbons, CO and other partially burned or altered hydrocarbons, NO_x. Since sour gas¹ and mercaptans are not expected, so SO₂ would not be considered as a priority pollutant. The flaring will only be intermittent and will not last for more than a few days.

Collection and Transportation of Produced Oil and Gas

This is not applicable since it is an exploration project.

Details of Site Utilities

Site Preparation

Site preparation will involve levelling, filling and consolidation of the site for staging equipment and machinery. Individual sites will be duly fenced to a height of about 2 m using jingle wired fencing or

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Expanded metal fencing. Clearance of vegetation is the first activity that will be undertaken during drill site construction. Following this, the preparation and construction of drill site will involve top soil scraping and storage for future use, elevating the drill platform by excavated material from the drill site and authorized quarry area. Reinforced Cement Concrete (RCC) will be used for the construction of foundation system. For making foundations of the main rig structure, cast insitu bored under-reamed piles of specified lengths will also be used.

Approach Roads

The proposed well pads are located adjacent to the existing road; the distance of the proposed well pad will be of 200 m (maximum) from existing road. Construction of site access road will not involve displacement of any household. As far as possible, existing roads will be used. Cutting of trees will be avoided. If necessary, existing road will be developed by widening, etc. Culverts and drainage channel will be maintained during site preparation. In case, roads are not available, approach road will be constructed by contractors appointed by OIL.

Installation of facilities

Earthwork

After clearance of vegetation, top soil from non-paved areas of the drill sites site will be scraped and stored in the top soil storage area for future use. Once the top soil removal process is completed, levelling and compaction will be done with help of graders and mechanical rollers. Quantity of fill material required for each drill sites depends upon the site elevation and HFL. Fill material will be met from excavated material for pit required for drill site and balance amount will be sourced from authorized quarry area.

Reinforced Cement Concrete (RCC) will be used for the construction of foundation system. For making foundations of the main rig structure, cast insitu bored under-reamed piles of specified lengths will also be used. For the construction of a drill site, a total of about 2500 kg of cement, 5000 kg of sand, 500m³ of earth/fill material, 200 kg steel and 1000m³ of aggregate will be required. A backhoe will be used for all excavation and cutting activities (for construction of pits) on site. Subsequently, the proposed well site & campsite will be duly fenced to a height of about 2 m using jingle wired fencing or Expanded metal fencing.

Site preparation will also involve the following:

- Construction of cellar pit 1.85m X 2.15m X 1.5 m for installation of well head and BOP
- Construction of HDPE lined pit of ~800m³ for each well site for temporary storage and disposal of drill cutting
- Construction of HDPE lined pit of 3030 m³ for temporary storage and disposal of drilling wash water & waste mud (800 m³) and rain water (2230 m³)
- Septic tanks and soak pits to dispose the domestic wastewater at the drill site.

Surface drainage

Surface runoff during monsoon season from operating construction site, construction material & waste storage area and spillage area have the potential to degrade soil quality due to deposition of foreign materials, hydrocarbon and other hazardous waste.

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Drainage system at site needs to be provided with sedimentation tank and oily-water separator to prevent contaminants, especially oil and grease, from being carried off by surface runoff. Cross drainage structures should be constructed in approach road for drainage of run-off.

Fuel & Chemical Storage Area

Chemicals required for the preparation of drilling fluid will be centrally stored in Duliajan. Additionally, some chemicals will also be stored in the drill site. The storage area will be paved and bunded and will be provided with a shed. Diesel will also be stored at site within paved and bunded areas.

Waste Oil Collection, Storage and Disposal System

The project design considers construction of a HDPE lined impervious pits for storage of drill cuttings, drilling mud and drilling fluid respectively and their disposal in accordance with "CPCB Oil & Extraction Industry Standard – Guidelines for Disposal of Solid Wastes" in their planning stage.

Spill Containment system

In the event of a chemical spill, spill control materials and protective equipment should be in a readily accessible location within or immediately adjacent to the site. The management needs to provide spill containment bladders and valves that can be retro-fitted to existing drainage systems in short time interval.

Water & Drilling Fluid Storage Pit

Cuttings will then be stored in the High-Density Polyethylene (HDPE) lined pits. Drilling fluid will be reused or processed after further treatment in a Chemically Enhanced Dewatering (CED) system to remove fine suspended solids, producing inlet particles called 'flocs'. The flocs will be removed in the decanting centrifuges and the resultant sludge disposed of in HDPE lined pits (of approximately 800 m3 area) for each well. The cleaned wastewater will also be stored in HDPE lined pits and disposed of, after testing and any necessary treatment, to meet the regulatory requirements.

Closed loop system will be used for reusing the drilling fluid during the drilling operations. This system will cut down immensely on the total water consumption for the formulation of drilling mud and saves on the consumption of chemicals.

Drilling wastewater including drill cuttings wash water shall be collected in HDPE lined disposal pit, evaporated, treated, and shall comply with the S No. 72, Schedule I-Standards for Emission or Discharge of Environmental Pollutants from various industries.

Drill Cuttings Disposal Pit

During the site development construction of HDPE lined pit of ~800m3 for each well site for temporary storage and disposal of drill cutting will take place. The total amount of cuttings produced during the entire drilling period is projected to be about 350-400 m3 per well (approximately 770-880 MT).

Domestic Sewage Treatment & Disposal System

During the site development construction of HDPE lined pit of 3030 m3 for temporary storage and disposal of drilling wash water & waste mud (800 m3) and rain water (2230 m3) and Septic tanks and soak pits to dispose the domestic wastewater at the drill site will take place. Domestic wastewater

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generation of about 8.0 m3 per day for the drilling camp will be treated through a septic pit/soak tank arrangement.

Post Drilling Operations- Abandonment & Restoration

Demobilization & Decommissioning

Well Capping- Removal of Equipment & Materials

After completion of the drilling activity, partial de-mobilization of the drilling rig and associated infrastructure will be initiated if OIL does not strike gas after drilling at the required depth.

The complete demobilization of the facilities at site will happen after well testing has been completed. This will involve the dismantling of the rig, all associated equipment and the residential camp, and transporting it out of the project area. It is expected that demobilization phase will last about 10-15 days and will involve the transportation of materials, equipment and other materials from site to bring it back to original condition.

Restoration of Cutting Containment Area

Following steps will be typically involved to restore and rehabilitate the area:

- The wellhead and all casing string will be cut off to a minimum depth of 3 m (10 ft.) below ground level. Drill cuttings and drill mud will be treated as per G.S.R 546 (E) dated 30th August 2005 to render them harmless.
- Drilling wastewater including drill cuttings wash water shall be collected in HDPE lined disposal pit, evaporated, treated, and shall comply with the S No. 72, Schedule I-Standards for Emission or Discharge of Environmental Pollutants from various industries.
- All fencing and access gates will be removed.
- All pits whose contents will show regulatory compliance for on-site disposal, at the time of site closure, will be backfilled and closed out as per Hazardous and other Waste (Management and Transboundary Movement) Rules, 2016.
- Restoration of unusable portion of the access track, removal of pilings will take place.

Restoration of Well Sites

Decommissioning upon Abandonment

On completion of activities, the exploratory wells will be either plugged and connected with flow lines or suspended. In the event of a decision to suspend the well, it will be filled with a brine solution containing very small quantities of inhibitors to protect the well. The well will be sealed with cement plugs and few wellhead equipment (Blind Flange) left on the surface (Cellar). After the development activities, the well will be sealed with a series of cement plugs, all the wellhead equipment will be removed leaving the surface clear of any debris and site will be restored.

Traffic Volumes

It is estimated that about 60 truckloads will be transported out of site during this period.

Sources of Pollution

General

- Organic kitchen waste produced 10-20 kg per day will be disposed in compost pits on daily basis that will be buried during site closure.

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- About 2 to 3 Acid – lead batteries per drilling of well, will be recycled through the vendors supplying acid – lead batteries as required under the Batteries (Management & Handling) Rules, 2001.
- Used oil & spent Oil will be collected in metal drums kept in secured dyked area & disposed through approved used oil recycling facility.
- Proper segregation and storage of recyclable waste such as packaging wastes, paper, plastic, packaging wastes will be carried out in designated bins onsite. Recyclables will be periodically sold to local waste recyclers.

Wastewater Generation and Disposal

Domestic Wastewater

Domestic wastewater generation of about 8.0 m3 per day for the drilling camp will be treated through a septic pit/soak tank arrangement.

Air Emissions

Point sources emissions are expected from the proposed drilling mainly from sources such as combustion of diesel in the diesel engines of power generators that will be operated to meet power requirement of the drilling rig and the campsite. The principal pollutants will comprise of Particulate Matter (PM), Sulphur Dioxide (SO2) and Oxides of Nitrogen (NOx) and other Hydrocarbons (HC). The quantity of diesel consumption during drilling will be approximately 3.5 KL /day/drilling site. Additionally, the flaring and burning of gas during the testing of well will also lead to the release of some pollutants including un-burnt hydrocarbons to the atmosphere. Some fugitive emissions of dust and air pollutants from vehicular exhaust will also happen during the Project lifecycle, mostly during the construction and decommissioning activities. Additionally, there will be re-entrainment of dust from the approach road leading to the site mainly during the dry season. If hydrogen sulfide is found then appropriate measures will be taken as outlined in the safety protocol and in accordance to Industrial Best Practice.

Solid Waste

Drilling Mud

Drilling mud will be mainly composed of Barite, Bentonite and Traces of Heavy metals. About 900-1200 m3 drilling mud, will be tested for hazardous contaminants and will be disposed as per S No. 72 C.1.a Schedule I Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB as modified in 2005.

The drilling wastewater around 270-360 m3 will be generated during the entire drilling period from rig wash and dewatering of spent drilling mud.

Drill Cuttings

Drill cuttings will be mainly composed of inert material consisting of shales, sands and clay; about 1% of drilling mud. About 350-400 m3 drill cuttings produced per well, will be disposed off in a well-designed pit lined with impervious liner located on site as per S No. 72 C.1.a Schedule I Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB as modified in 2005.

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Waste Pit Details

The rig wash water and drilling wastewater generation is proposed to be collected in a wastewater pit (constructed at the drilling site). Domestic wastewater generation of about 8.0 m3 per day for the drilling camp will be treated through a septic pit/soak tank arrangement.

To ensure that effluent from the project comply with the waste water discharge standards as mentioned in the S No. 72 A (ii) Schedule I Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB, a mobile Effluent Treatment Plant will be installed. The plant would be capable of handling 125m3/day of drilling effluents.

Noise Levels

Noise will be generated from drill site during site preparation, drilling and decommissioning phases. The major noise generating operations from the proposed activity during drilling, testing are operation of rotary drilling equipment as part of rig, diesel engines for power generation, mud pumps and operation of vehicles. Noise during the site preparatory phase will primarily be contributed by heavy construction machinery operating on site and vehicular sources for constructing the facilities for wells. Noise during the drilling phase would be generated from operation of the rig, mud pumps, diesel generators and shale shakers.

The biodiversity baseline and priority biodiversity features

Ecological assessments of Flora and Fauna for forming a Biodiversity baseline

Ecological assessment includes the compilation of baseline data, collected through literature review and field survey, about the biodiversity and ecosystems, of the study area. It involves off-site as well as on-site studies where data collection will be carried out. It comprises of three main sections – Background studies, primary data collection and preparation of a Biodiversity richness map of the study area.

Background Studies

In the preparatory phase of the assessment, desk studies were carried out to move forward to the baseline study. Secondary records were collected regarding the bio-geographical conditions of the study area, from various sources. This involves information such as the geographical location of the site, layout maps of the core, the land-use pattern of the study area (10 km radius), etc. Previous documentation of the biodiversity of the region, documents such as environmental impact assessment and monitoring reports were obtained from the client. After a comprehensive study of the project site, the primary data collection was initiated.

Primary Data Collection

The primary data collection entails all the information on biodiversity at the sites and in the entire project area. It includes the baseline data collection as well as information obtained from the various stakeholders identified in the social interactions. Data on the flora and fauna in the area under 10 km radial distance of the PAD 1, PAD 2, and PAD 3 was collected on the field. Baseline data collection was carried out for two seasons. A stratified random sampling method was used for the selection of the

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study locations. Standard ecological sampling techniques were used for documenting the biodiversity; such as the quadrat method for flora and point count and line transect method for fauna.



Boat Survey in Maguri Motapung Beel

TABLE 4 METHODS FOR PRIMARY DATA COLLECTION

Methodology for biodiversity documentation		
Flora Survey	Trees	10m circular plot (List Count Method)
	Shrubs and Climbers	5m concentric circle (List Count Method)
	Herbs	1m x 1m quadrat
Fauna Survey	Avifauna	50m circular plot (Point Center Count) Aquatic: Total Count
	Herpetofauna	Intensive time constrained
	Mammals	Direct Sighting (Visual Encounter) Indirect sightings (droppings, scat, other tracts and signs)
	Fish	Fish Capture technique/Local fish market surveys
	Phyto and Zooplankton	Sampling and Fixation
	Other insects and Arachnids	Opportunistic sightings

Opportunistic sightings of all taxas were also documented for creating species richness of the study area. The different habitats were noted during the primary data collection.

For navigation and taking GPS readings, 'Samsung A51' device was used. For creating .kmz file of GPS points taken, android software titled 'GPS essentials' was used in 'Samsung A51' android device.

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For making observations of biodiversity, for photo-documentation of flora and fauna, Canon 600D with 55-250mm Canon lens, Canon 80D with 150-600mm Tamron lens and Canon 700D with 100-400mm Tamron lens.

For identification of fauna various field guides were used (Inskipp, 2011) and citizen science portals (Butterflies of India, BirdLife International) were also referred for taking expert help. For latest scientific names of flora, website <https://www.theplantlist.org> was referred.

Besides the baseline data on terrestrial flora and fauna, the aquatic biodiversity was documented. The number of samples was decided based on the background studies of the study area. The samples were collected from various water-bodies within a 10 km distance. The samples were collected using standard ecological techniques using plankton net. These samples were preserved using standard methods and were analyzed in the laboratory to identify the presence of phytoplankton, zooplankton and their diversity. Analysis such as Simpson Diversity index was calculated. Terrestrial flora and fauna were analyzed using statistical tools of relative density and relative frequency.



Terrestrial Survey at PAD 1

Secondary information on the data such as the conservation and protection status (IUCN and Wildlife Protection Act Schedules), distribution status (whether indigenous or exotic, in case of flora and whether resident or migratory, in case of birds), ecological significance, etc. was also collected off-site. This will further help in assessing the impacts of the operations and formulating management actions.

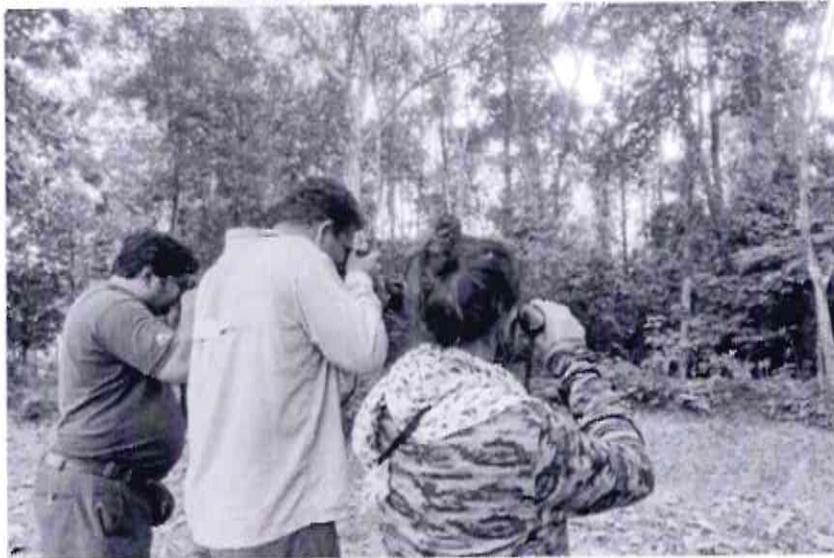
Socio-ecological surveys are best known to reveal information (including traditional) about biodiversity hold by the local communities. Information on the presence of biodiversity management committees, use of biodiversity in day-to-day life, the dependence of local people on biodiversity, etc.

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can be obtained from these surveys. Although tentative baseline data was collected by field surveys, it is sometimes difficult to directly obtain data on taxa such as mammals and reptiles.

To obtain this data, socio-ecological surveys were conducted. These surveys include the knowledge of local communities for information on the biodiversity of the region, the use of biodiversity and their awareness about biodiversity. Community conservation initiatives, reports by Government bodies and other such information were documented.

Also, to devise alien invasive species population control methods, it is important to understand the extent of the population of alien invasive species found in the study area and the magnitude of nuisance caused by them to the local population.



Team photographing ground birds at Podumoni Forest

Species Richness Map

A species richness map depicts the survey habitats of a study along with the number of species of all taxa observed in those habitats. It allows a comparative overview of the biodiversity present in the study area. Key areas such as national parks, wildlife sanctuaries and such protected areas are also depicted in this map. Areas not legally protected but of ecological concern such as roosting sites, breeding sites, migratory pathways, important bird areas, Ramsar sites, etc. are also marked on the map. This integrated biodiversity richness map uses the data collected and analyzed during the primary data collection.

Species Richness is the number of species of trees, shrubs, herbs, butterflies, birds, amphibians, reptiles and mammals recorded at a sampling site. In the given study area, 6 habitats were surveyed for flora and fauna diversity. Number of species recorded in both the monsoon and winter season helped us determine the richness of the habitat.

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Project Area (Description of project site)

The study area is situated in Baghjan Village, Doomdooma Tehsil, Tinsukia District of Assam. The seven subsurface locations are located within Dibru-Saikhowa National Park (DSNP). The seven wells will be drilled from three surface well pads within Baghjan Petroleum Mining Lease (PML). The three surface locations are present in Dighaltarang and Baghjan villages in Doomdooma Tehsil of Tinsukia District. The ERD surface locations can be accessed from the NH-37 through Doomdooma-Baghjan Road and is about 22 km from Doomdooma.

Tropical Evergreen Forest, Tropical Semi Evergreen Forest and Seasonal swamp forests are the typical features of the study area, as the study area is in North East Region biogeographic zone³. The ERD surface and subsurface locations falls within the depositional plains of the River Brahmaputra and its tributaries. The elevation range varies between 110-130 m thus this area is relatively flat. This area falls in humid sub-tropical climate zone with warm seasons and moderately cold winters. The average annual temperature in Tinsukia is 23.7 °C; highest maximum temperature of 27.9 °C in monsoon and the minimum temperature can reach up to 10 °C in winters. It receives an average rainfall of about 2699 mm annually. Alluvial plains are the major physiography of the district followed by piedmont plain, flood plain and hilly terrain.⁴

For Biodiversity & Impact assessment, a combination of an area within a 10 km radius from the boundaries of the PAD 1, PAD 2 and PAD 3 was considered as study area. For the convenience of the survey, the entire study area is divided into grids of 4 x 4 Km. Study plots are laid in each grid to record the present biodiversity and observe ecological conditions. (Refer Figure 1, Pg. 27). A total of 29 study plots and 4 transects were laid in the study area. Line Transects was considered to document the diversity in the Ecological Sensitive Areas. Environmental settings of the ERD surface locations, i.e. well pads are as follows:

PAD 1: The well pad is located in Baghjan village, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. The habitat of this well pad is categorised as a cropland/pastureland. Presence of Baghjan settlements is observed in the vicinity of the well pad location.

PAD 2: The well pad is located in Baghjan village, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. An earthen road passing through the village is connecting the approach road to the well pad. The habitat of this well pad is categorised as grassland. Presence of Dighaltarang and Baghjan settlements is observed in the vicinity of the well pad location.

PAD 3: The well pad is located in Dighaltarang Tea Estate, Doomdooma Tehsil of Tinsukia district. The topography of the area is flat. Approach road to the site is already developed for the transport of the drilling rig, equipment and materials to the site. It will pass through nearby tea estates. The habitat of this well pad is categorised as Tea Plantation. Presence of Dighaltarang settlements is observed in the vicinity of the well pad location.

³ Rodgers, W.A. and Panwar, S.H. (1988) Biogeographical classification of India. New Forest, Dehra Dun, India
⁴ https://slusi.dochet.nic.in/srm/srmabstracts/SRM_39_Tinsukia.pdf

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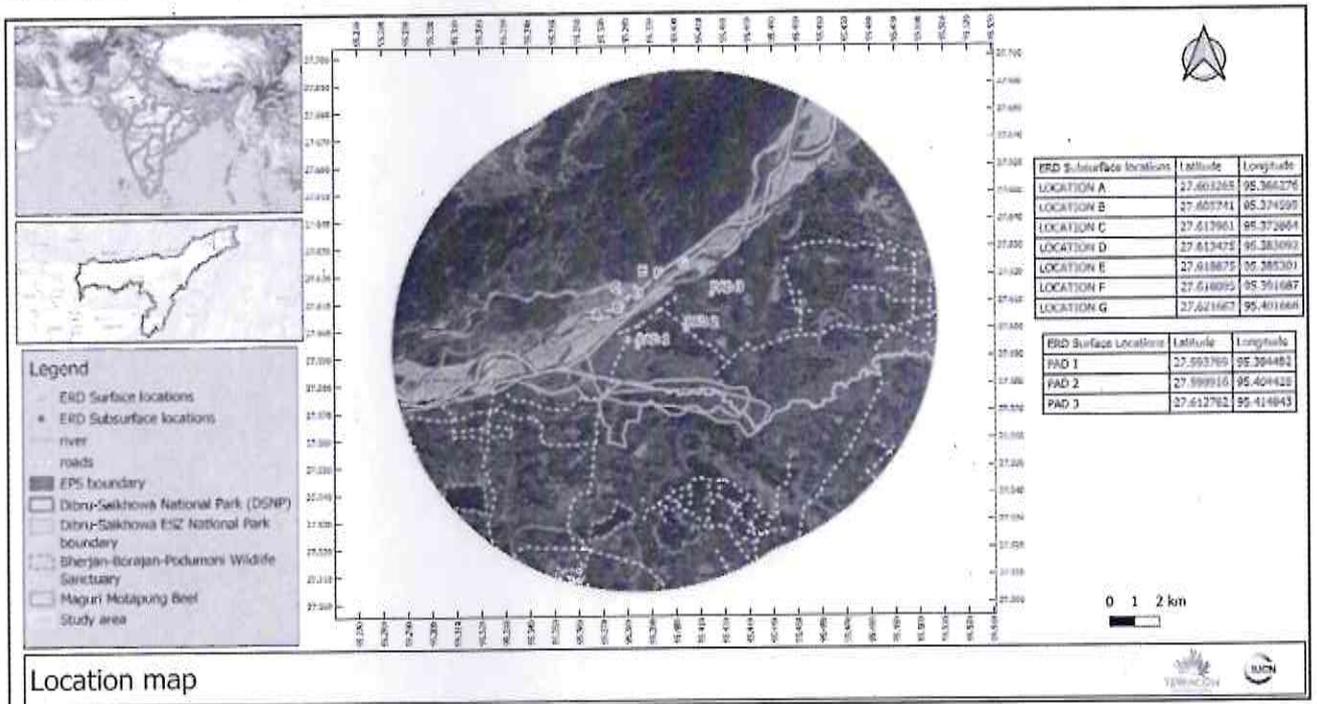


FIGURE 1 LOCATION MAP OF STUDY AREA

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Location for PAD 1 – Cropland/Pasture land from Season 1



Location for PAD 2 – Home Backyard from Season 1

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Location for PAD 3 – Tea Plantation from Season 1

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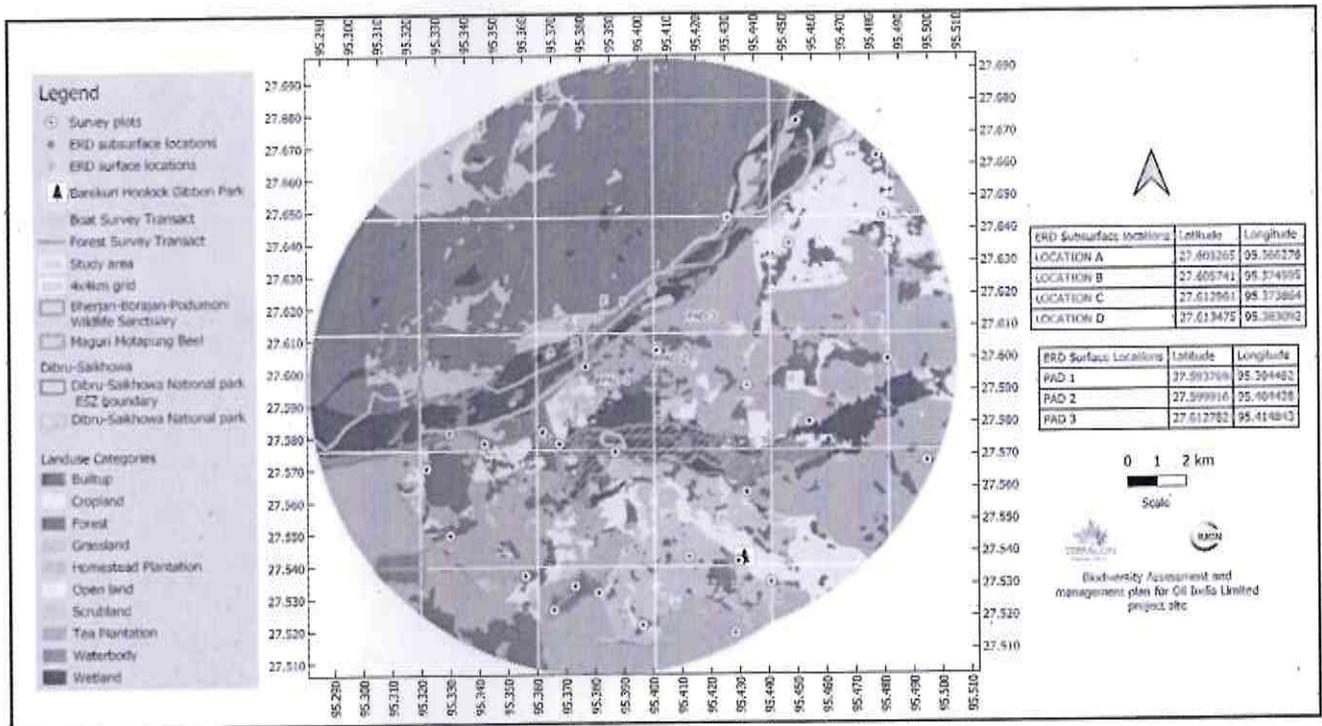


FIGURE 2: LANDUSE MAP OF STUDY AREA WITH 4KM GRID

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A land use map was prepared to understand the distribution of various habitats. The study area comprises of different types of habitats such as Forest, Grassland, Tea Plantation, Wetland, Riverbank, Cropland, Dense Homestead Plantation, Pasture Land, Built up and Open land. These habitats show diversity in floral and faunal species. Baseline data was collected during the monsoon and winter season. For the convenience of the study, following habitats were clubbed together:

Habitat	Sub-habitat
Wetland/Waterbody	Wetland/Waterbody, Riverbank, River
Forest	Forest
Tea plantation	Tea plantation
Homestead plantation	Homestead plantation
Crop land	Cropland, Pastureland
Built up/open land	Settlements, Markets, EPS, Open land

The distribution of study plots across various habitats observed in the study area is as follows:

Habitat	Area (Sq.km.)	Proportion of Study Area (%)	Proportion of Survey Plots laid (%)
Wetland/Waterbody	58.73	16.11	27.27
Forest	98.32	26.98	12.12
Tea plantation	99.47	27.29	27.27
Homestead plantation	16.23	4.45	9.09
Crop land	38.58	10.58	15.15
Built up/open land	53.14	14.58	9.09

More number of survey plots were laid in wetland habitat, as it had various sub-habitats. Homestead plantation found to have many key species restricted to the habitat, scattered throughout the study area.

Ecological important areas – Important Bird Areas (IBA)

Dibru - Saikhowa Complex and Bherjan-Borajan-Podumoni Wildlife Sanctuary are the two, BirdLife International accredited Important Birding Sites (IBA).

Dibru - Saikhowa Complex comprises of Dibru-Saikhowa National Park, Poba Reserve Forest, Kobo chapori (river islands) proposed reserve forest, Amarpur chapori, Maguri and Motapung Beel, and the adjacent riverine tract of the Brahmaputra and Lohit rivers; out of which, only Dibru-Saikhowa National Park and Maguri Motapung Beel fall in the present study area.

Bherjan-Borajan-Podumoni Wildlife Sanctuary comprises of Bherjan (105 ha), Borajan (493 ha) and Podumoni (176 ha) as separate three pockets of lowland tropical forest, present in Tinsukia district, Assam. Bherjan and Podumoni regions fall in the present study area.

The distances of ERD surface locations i.e. PAD sites and ERD sub-surface locations i.e. well sites from Priority Biodiversity Features in the study area are given in Table 2.

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TABLE 5 IBAS IN THE STUDY AREA

Site Name	PA Status	IBA Criteria	IBA site Code
Dibru - Saikhowa Complex ⁵		A1, A2	IN378
Bherjan-Borajan-Podumoni Wildlife Sanctuary ⁶	WLS	A1	IN371

A1= Threatened species; A2 = Restricted Range species; A3= Biome species; A4=Congregatory species

Maguri Motapung Beel

This wetland is situated near Motapung village of Tinsukia district. It is a valuable natural capital for the region, providing critical habitat to numerous species, especially resident and migratory birds. It serves as a fisheries resource to local communities as well as a flood buffer and a water and sediment regime regulator. A small channel connects Maguri Beel with the Dibru River to the North; hence this wetland regime is a critical part of the Dibru-Saikhowa National Park (DSNP), an ecological corridor to Namdhapa National Park, and sustains the ecological integrity of the Indo-Burma Biodiversity Hotspot.



Maguri Motapung Beel

Dibru-Saikhowa National Park (DSNP)

The Dibru-Saikhowa NP proper covers 34,000 ha in the districts of Tinsukia and Dibrugarh in eastern Assam. It is 13 km north of Tinsukia town. It is also a Biosphere Reserve. Dibru-Saikhowa has the largest

⁵ <http://datazone.birdlife.org/site/factsheet/dibru-saikhowa-complex-iba-india>
⁶ <http://datazone.birdlife.org/site/factsheet/bherjan-borajan-podumoni-wildlife-sanctuary-iba-india>

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Salix swamp forest in north-eastern India. Tropical Moist Deciduous, Tropical Semi-evergreen, Evergreen Forests and grassland forms the main habitat type. The original vegetation of the Park was tropical rainforest, but a large part sank by a few meters during the earthquake in 1950, causing significant geomorphological changes. Due to regular flooding, the rainforest gradually gave way to deciduous forest and swamps⁷. The park is surrounded by the Brahmaputra River, Lohit river and Arunachal Hills in the north and Dibru river, Debang river, Dibru and Patkai hills in the south, making for verdant environments.



Dibru-Saikhowa National Park (DSNP)

Bherjan-Borajan-Podumoni Wildlife Sanctuary

Bherjan, Borajan, and Podumoni are three different forest regions disjunct and separated by tea gardens and human habitations. These are entirely on the flat plains of the Brahmaputra Valley, so they lie in the Endemic Bird Area called Assam Plains by BirdLife International. The site lies in Biome-9 (Indo-Chinese Tropical Moist Forest) as classified by BirdLife International. It is a perfect habitat for primates and it nestles many rare birds. Bherjan is almost entirely covered with trees with closed canopy. Delakhat road passes through forest area. The Podumoni region is observed to have a broken canopy and it is surrounded by tea estates, village settlements and croplands.

⁷ Choudhury, A. U. (1998) Mammals, birds and reptiles of Dibru-Saikhowa wildlife sanctuary, Assam, India. *Oryx* 32(3) 192-200.

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Bherjan Forest



Podumoni Forest

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Biodiversity Assessment

The study area falls in North East Region biogeographic zone⁸, which is characterized by Tropical Evergreen Forest, Tropical Semi Evergreen Forest and Seasonal swamp forests. The ERD surface and subsurface locations falls within the depositional plains of the River Brahmaputra and its tributaries. The study area comprises of different types of habitats such as Forest, Tea Plantation, Waterbody, Cropland, Homestead Plantation, Built up and Open land. These habitats show diversity in floral and faunal species. Tea Plantation is the dominant habitat of the study area followed by Forest, Waterbody, Built-up and Open land, Cropland, and Homestead Plantation.

Baseline data was collected during the monsoon and winter season. In the two seasons a total of 86 species of trees, 57 shrubs, 152 herbs and 47 Pteridophytes were recorded under flora; whereas 147 species of Birds, 112 species of Butterflies, 10 species of Mammals, 6 species of Herpetofauna and 19 species of Fishes were recorded under fauna.



Asian Openbills at Maguri Motapung Beel

⁸ Rodgers, W.A. and Panwar, S.H. (1988) Biogeographical classification of India. New Forest, Dehra Dun, India.

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Forest Habitat

It includes protected area of Dibru-Saikhowa National Park and Bherjan-Borajan-Podumoni Wildlife Sanctuary. Area of DSNP falling into the study area is 143.10 Sq. Km. along with Eco-sensitive Zone of 123 Sq. Km.; it has been conserved for its unique and pristine forest and its biodiversity. DSNP has river Dibru at its north and river and river Brahmaputra to its south, and is at the extreme east of State Assam, India. National park is situated in the flood plains of Brahmaputra has among the most vibrant wildness on earth and is also distinct for its pristine scenic beauty and harbors many extremely rare and endangered species of Wildlife.

Bherjan-Borajan-Podumoni Wildlife Sanctuary comprises of Bherjan, Borajan and Podumoni as separate three pockets of lowland tropical forest, present in Tinsukia district, Assam. Bherjan and Podumoni regions fall in the present study area. Area of Bherjan and Podumoni region was 1.21 Sq. Km. and 1.68 Sq. Km. respectively.



Bherjan Forest

Flora Diversity

Unique bio-geographic factors and huge water resource Brahmaputra has contributed a lot to the State unique biodiversity. State is very rich in its endemic plant diversity. Secondary data suggests more than 3000 species of flowering plants have been recorded in Assam which constitutes 25.12% of total floristic wealth of India. Apart from the angiosperms, state is rich in ferns, fern allies and orchid flora. State holds many species primitive angiosperms and Gymnosperms. Variety in huge fern species,

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especially the tree fern species are the special features in the understory here, making the forest most attractive and distinct from the rest of Indian forest.⁹

Complexity in bio-geography has made forest so spectacular that it is often difficult to clearly identify and separate the forest types due to overlapping of forest species. According to the Champion & Seth's "Revised forest types of India", state Assam has 51 forest types/sub types. Further, for convenience, these forest types are broadly classified into 8 forest types. Out of these, District Dibrugarh and Tinsukia have the Tropical Wet Evergreen Forest.¹⁰

Bherjan region has tall trees with closed canopy. It has good number of *Dipterocarpus macrocarpus*, *Lagerstroemia parviflora* and *Terminalia myriocarpa*. Locals use *Mesua ferra*, *Dillenia indica* for eco-friendly dinner plate making. Along the periphery, *Alstonia scholaris*, *Tectona grandis*, *Dillenia indica* was planted. Fairly good diversity of Pteridophytes is observed in the forest. Dhekia lata (*Stenochlaena palustris*), Dragon scale fern *Pyrrhosia piloselloides* and Bird Nest fern (*Asplenium nidus*) are the common pteridophytes of Bherjan.



Stenochlaena palustris



Dillenia indica

Amongst the tree species, Apple (*Dillenia indica*), *Dipterocarpus macrocarpus*, *Lagerstromoea parviflora*, Bishop Wood (*Bischofia javanica*), Borpat (*Ailanthus altissima*), East Indian Almond (*Terminalia myriocarpa*) forms the major tree component.

Understorey of the forest was dominated with *Brassaiopsis sp.*, Hamiltonian Sterculia (*Sterculia hamiltoniana*), Nilgiri Actephila (*Actephila excels*). Apart from the angiosperms, King fern (*Angiopteris evecta*), and Giant Cyathea (*Cyathea gigantean*) are the most prominent tree ferns species of the forest.

The vertical mid zone of forest showed presence of Climbing fern (*Lygodium flexuosus*) Bird Nest's fern (*Asplenium nidus*), Climbing Aroid (*Pothos scandens*) and Climbing Swamp fern (*Stenochlaena palustris*) as pioneers.

Settlements are observed in the vicinity of Podumoni region. Forest was disturbed and is in degrading state, canopy is broken and some of the trees were fallen. Bamboo, *Dillenia indica*, *Lagerstromoea sp.* are common here. Hollong tree (*Dipterocarpus macrocarpus*) is dominant tree species. During the

⁹ <http://www.asbb.gov.in/>

¹⁰ Govt. of Assam, India website

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winter season, Hollong trees were in fluting stage, whereas new growths of bamboo shoots were commonly observed.



Angiopteris evecta



Asplenium nidus



Hollong Tree with seeds

The forest type of Dibru-Saikhowa comprises of semi-evergreen forests, deciduous forests, littoral and swamp forests and patches of wet evergreen forests and prominent grasslands. The Park is renowned for natural regeneration of *Salix* trees.

The Indian Subcontinent possesses tropical tall grasslands which are strongly latitude dependent and climate driven. Grass community or formations *Phragmites*, *Saccharum*, *Imperata* are present across the alluvial soils of the entire north-western Gangetic plain to the eastern Brahmaputra plain descending along the Ganges-Brahmaputra-Meghna watersheds.

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Grasslands cover the major area of area of national park. Three grass species (given below in table) are dominant here in sanctuary. These grass species been tall and densely packet, are been used by the large mammals such as Elephants.

TABLE 6 GRASSES OBSERVED AT DIBRU-SAIKHOWA NATIONAL PARK

Sr. No.	Grass species	Common name	Origin
1	<i>Phragmites karka</i>	Tall Reed	Exotic
2	<i>Saccharum ravennae</i>	Ravenna grass	Native
3	<i>Imperata cylindrical</i>	Cogon grass	Native



Ravenna grass - *Saccharum ravennae* & *Imperata cylindrical* (DSNP)

In spite of being noxious weeds and unpalatable or low palatable to cattle's, both Ravenna Grass and Elephant grass are important species of landscape. Grasses being not favored by cattle's or other herbivores remain untouched and intact. Such unpalatable grasses, in turn, have been assumed to be ideal for proper avian breeding, feeding and roosting ground. Wild buffalos, Elephants, Feral horses and other herbivores depend on grasslands and birds mostly use it to refuge and ambush.

Faunal Diversity

A wide range of birds and butterflies were found in forest habitats. In total 61 birds, 67 butterflies, 5 mammals, and 1 Herpetofauna species was found in the forested habitat of the study areas.

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Birds such as Chestnut tail Starling (*Sturnia malabarica*), Hair Crested Drongo (*Dicrurus hottentottus*), Red vented Bulbul (*Pycnonotus cafer*), White throated Bulbul (*Alophoixus flaveolus*), Great Myna (*Acridotheres grandis*), Oriental Pied Hornbill (*Anthracoceros albirostris*) and Lineated Barbet (*Psilopogon lineatus*) were observed in the forested areas frequently. Rare bird sightings include Rusty-bellied Shortwing (*Brachypteryx hyperythra*) & Lesser racket-tailed Drongo (*Dicrurus remifer*) in Bherjan region, Kalij Pheasant (*Lophura leucomelanos*) in Podumoni region and Lesser Fish-eagle (*Ichthyophaga humilis*) in DSNP regions.

Migratory birds like Scarlet Minivet (*Pericrocotus flammeus*), Long-tailed Shrike (*Lanius schach*), Verditer Flycatcher (*Eumyias thalassinus*), Brown Shrike (*Lanius cristatus*), Large Hawk-cuckoo (*Hierococcyx sparveriioides*) were observed using emergent layer; whereas Grey-bellied Tesia (*Tesia cyaniventer*), Lesser Shortwing (*Brachypteryx leucophris*), Large Niltava (*Niltava grandis*), Small Niltava (*Niltava macgrigoriae*) were observed in the dense under cover of the Bherjan forest. Single individuals of resident birds like Black-napped Monarch (*Hypothymis azurea*) and Little Spiderhunter (*Arachnothera longirostra*) were observed feeding on insects in the Podumoni region.



Great Myna



Lineated Barbet



Scarlet Minivet



Large Niltava

Dibru-Saikhowa complex is very rich in bird life. It is one of the sites in the northeast where highly endangered and elusive species have been observed. The tall wet grasslands of Dibru-Saikhowa are important for many threatened and non-threatened species. White-rumped Vulture (*Gyps bengalensis*), Himalayan Griffon (*Gyps himalayensis*), Griffon Vulture (*Gyps fulvus*) were spotted soaring in the skies of DSNP along with migratory flocks of Black Storks (*Ciconia nigra*). Common Greenshanks (*Tringa nebularia*) along with many other migratory birds were seen on the dried

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riverbed. Mating pairs of Oriental Pied Hornbill (*Anthracoceros albirostris*) and its nesting site was sighted in DSNP.

Rhesus macaque (*Macaca mulatta*) and Northern Pig-tailed Macaque (*Macaca leonina*) were observed in the Bherjan wildlife Sanctuary. Rhesus Macaque (*Macaca mulatta*) was sighted in the Dibru Saikhowa National Park. Presence of Asian Elephant (*Elephas maximus*) was confirmed by the footmarks and dung. Pugmarks of Golden Jackal (*Canis aureus*) were also observed on the dried river bed in the DSNP.

In the study area, Western Hoolock Gibbons (*Hoolock hoolock*) has become extirpated in recent years from Podumoni and Bherjan region of Bherjan-Borajan-Podumoni Wildlife Sanctuary as per the locals, forest guards and forest official, interviewed informally. But interestingly, there is occurrence of Hoolock Gibbons in village homestead plantations/woodlands.



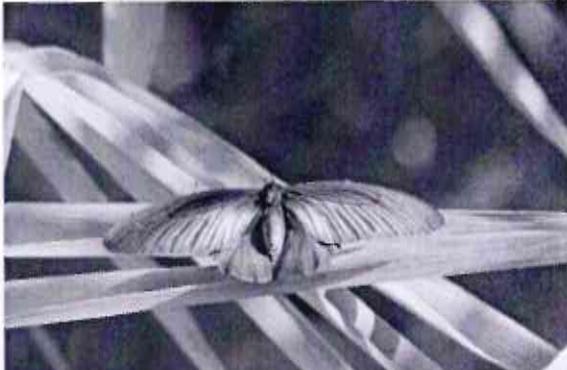
Rhesus Macaque



Northern Pig-tailed Macaque



Wizard Butterfly



Lesser Batwing

A total of 67 species of butterflies were observed in the forest habitat. Wizards (*Rhinopalpa polynice*), Lesser Batwing (*Atrophaneura aidoneus*), Red Lacewing (*Cethosia biblis*), and Angled Red Forester (*Lethe chandica*) were some of the rare sightings from these protected areas to name a few. Large numbers of the butterflies were seen feeding on the flowers of *Sida acuta*, *Eupatorium odoratum*, *Leucas sp.*, *Mikania micrantha*, *Sena tora*, *tectona grandis*, and *Leea sp.* And mud puddling in the wet patches of forests and riverbeds of Dibru River along the DSNP boundaries.

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Himalayan Vulture



Griffon Vulture

A road-kill of Reptile species, Checkered Keelback (*Fowlea piscator*) was observed on the Dhelakhat road passing through the Bherjan region.

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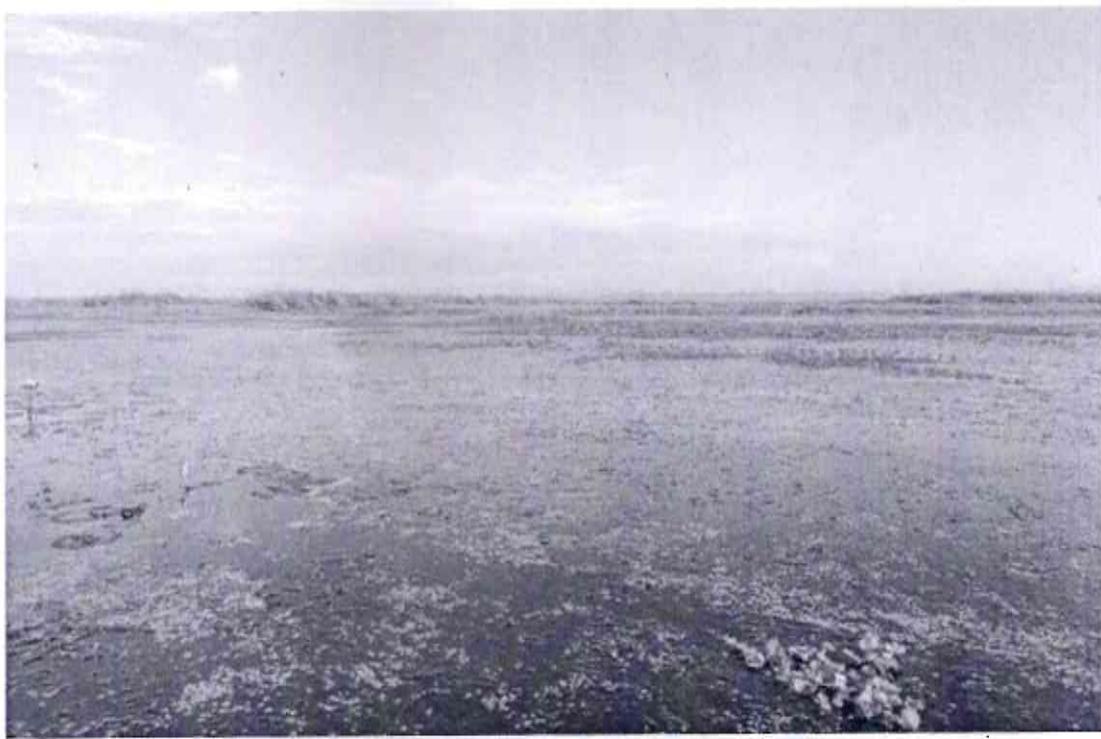


Waterbody Habitat

Waterbodies and its riparian habitats are ecologically diverse and may occur in a range of general habitat types, including damp grasslands, wetlands, marshes, forests, jungles, canyons, and mountains. The primary characteristics of these areas are an active water source and the subsequent vegetation that relies on that water.

They are often home to a wide range of flora and fauna, easily meeting basic survival needs, including food in the form of fish and aquatic invertebrates, a shelter made from aquatic vegetation, and nesting sites within the aquatic vegetation that are sheltered from view.

Waterbody/wetland areas in the study area comprise of Maguri Motapung Beel, Dibru River with its riverbeds and riparian areas. From IBA of Dibru - Saikhowa Complex, Maguri Motapung Beel falls in the wetland habitat of the study area. Maguri Motapung Beel is one of the largest floodplain lakes in upper Brahmaputra basin. Maguri Motapung Beel is connected to Dibru River and is affected by frequent channel changes and sedimentation. A small channel connects the Beel with the Dibru River to the North; hence this wetland regime is a critical part of the Dibru-Saikhowa National Park (DSNP), an ecological corridor to Namdhapa National Park, and sustains the ecological integrity of the Indo-Burma Biodiversity Hotspot. The Beel is also very rich in aquatic life and this has led to development of many fishing camps near it. The nearby areas of the Beel displays grassland environment, creating a suitable shelter for grassland birds.



Maguri Motapung Beel

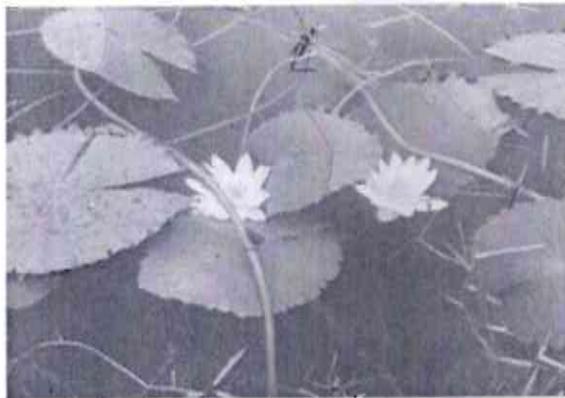
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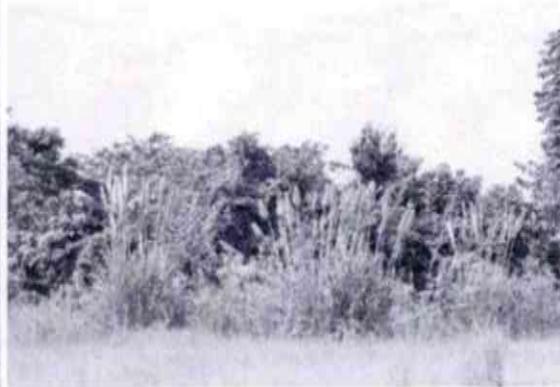
Floral Diversity

A variety of birds were seen nesting, feeding, and perching on the tall reeds of *Phragmites karka* and other low vegetation, such as *Nymphaea sp.*, *Alternanthera sp.*, *Persicaria sp.*, *Diplazium esculantum*, *Colocasia esculentus*, *Doob grass (Cyanodon dactylon)* and other floating/ submerged plants.

It is observed that the alien invasive plant species Water Hyacinth (*Eichhornia crassipes*) has taken over the landscape. 28 Aquatic plant species are recorded in Beel, out of which 4 species are free floating, 7 species submerged in water, 6 species were anchored to the bottom of lake with their leaves and flowers floating on water surface and 11 species on the land with their stem growing inward to the water.



Nymphaea spp.



Ravenna grass

Dibru-Saikhowa is said to have the largest *Salix* swamp forest in north-eastern India. Tropical Moist Deciduous, Tropical Semi-evergreen, Evergreen Forests and grassland forms the main habitat type observed at the national park. On the banks of Dibru River, dense vegetation of Tall Reeds (*Phragmites karka*), Ravenna grass (*Saccharum ravennae*) and Tall reed (*Imperata cylindrica*) were observed. Apart from grasses, river bank has good number of *Dubanga grandiflora*, Red-Silk cotton (*Bombax ceiba*), Utenga (*Dillenia indica*), *Terminalia myriocarpa* species.

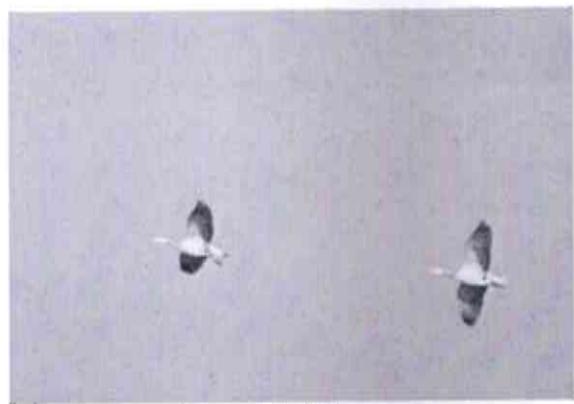
Faunal Diversity

A total of 41 species of birds were recorded in monsoon season and 79 species of birds were recorded during winter season; out of which 34 species of birds are migratory in the study area. Enormous flocks of migratory birds such as Ruddy Shelduck (*Tadorna ferruginea*), Bar-headed Goose (*Anser indicus*), Eurasian Wigeon (*Mareca penelope*), and Wagtails were observed in the Maguri Motapung Beel. Mallard ducks (*Anas platyrhynchos*) dominated the banks of Dibru River. Little Pratincole (*Glareola lactea*), Purple Swaphen (*Porphyrio porphyrio*), Glossy Ibis (*Plegadis falcinellus*), Asian Openbill (*Anastomus oscitans*), Lesser Whistling-duck (*Dendrocygna javanica*), Jacanas, Egrets etc. were most commonly sighted, amongst the resident birds. A mating pair of Oriental Pied hornbill (*Anthracoceros albirostris*) was also observed during the monsoon season along the boundaries of the Beel. Reeds, free floating plants, submerged plants, fish and insect diversity of the Beel provides a good breeding and feeding ground for resident as well as migratory birds. Common Castor (*Ariadne merione*), Chocolate Albatross (*Appias lycida*), Common Grass Yellow (*Eurema hecabe*), Common Mormon (*Papilio polytes*), Lemon Emigrant (*Catopsilia pomona*), Striped Tiger (*Danaus genutia*) and Pale Wanderer (*Pareronia avatar*) were some of the butterflies frequently sighted at the Beel.

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During the boat survey at Dibru River, three adult Gangetic Dolphins (*Platanista gangetica*) were recorded along transect marked in Figure 3 (Pg. 63). Gangetic dolphin (*Platanista gangetica*) is one of the two species of river dolphins found in the India. The Ganges River system in Northern India and the Assam's Brahmaputra River system in of North Eastern India are the major habitats of this endangered river dolphin species. River dolphins also act as indicator of river health. Presence of elephant was confirmed by the dung and foot marks on the banks of Dibru River; dominated by the Elephant Grass. Rhesus macaque (*Macaca mulatta*) and Golden Jackal (*Canis aureus*) were the other two mammals observed on the river banks.



Bar-headed Geese



Glossy Ibis



Rhesus Macaque



Jackal crossing the riverbed



Common Castor



Chocolate Albatross

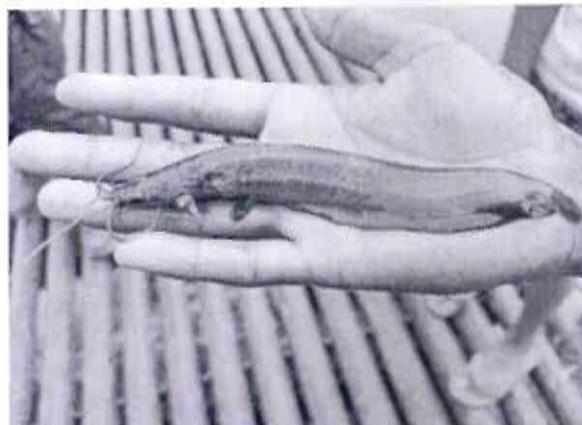
A total of 35 species of butterflies in were sighted in two seasons in the wetland habitat of study area. Wizard (*Rhinopalpa polynice*), Commander (*Moduza procris*), Map Butterfly (*Cyrestis thyodamas*),

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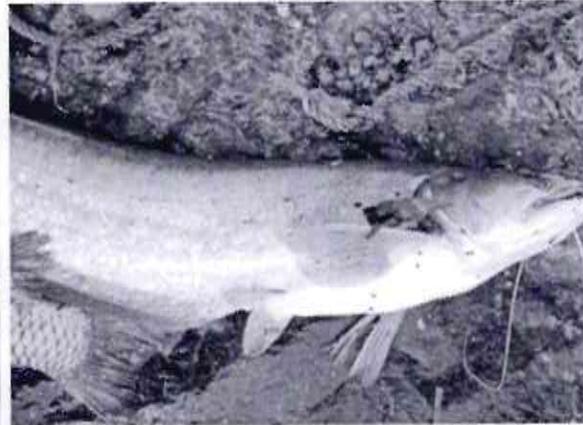


Chocolate Tiger (*Parantica melaneus*), Yellow-crested Spangle (*Papilio elephenor*), Eastern Striped Albatross (*Appias olferna*) were sighted at DNSP.

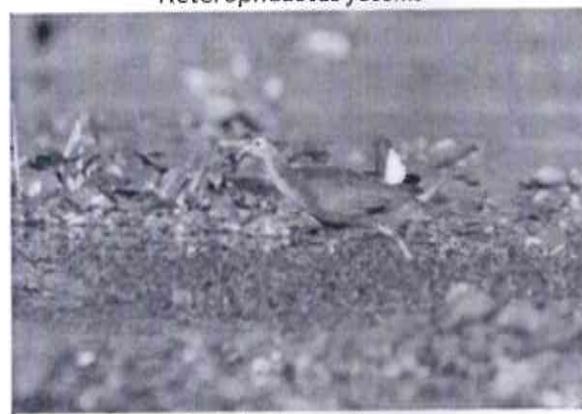
19 species of fish were reported from Maguri Motapung Beel and Dibru River. *Wallago attu* which is categorized as "Vulnerable" in IUCN Red List was also reported. Grass Carp (*Ctenopharyngodon Idella*) was the only exotic species found in fish-catch of the Beel.



Heteropneustes fossilis



Wallago attu



Purple Swamphen



Ruddy Shelduck

Phytoplanktons and Zooplanktons

To assess phytoplankton and zooplankton diversity, water samples were collected from two different locations, preserved and analysed using standard methods.

TABLE 7 STATION DETAILS

Station Name	Area	Location
Station 1	Maguri Motapung Beel	N27.663280 E95.481476

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Station 2	Dibru river	N27.625099 E95.399617
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Phytoplanktons

A total of 16 species of Phytoplanktons with density of 188 no /ml at station 1 and 15 species with density of 174 no/ml at station 2 were recorded in the monsoon season. While in the winter season, a total of 18 species of Phytoplanktons with density of 159 no /ml at station 1 and 19 species of Phytoplanktons with density 181 no/ml at station 2 were recorded.

Group *Bacillariophyceae* were dominant in the Monsoon followed by group *Chloro-Phyceae* and *Cyanophyceae* while in winter season group *Chlorophyceae* were dominant followed by *Bacillariophyceae* and *Cyanophyceae*.

Zooplanktons

Station 1 represents 13 species of zooplankton with 118 no/ml density and Station 2 represents 12 species of zooplankton with 107 no/ml density at station 2 in the monsoon season, while in winter, station 1 represents 12 species of zooplankton with 179 no/ml density at station 1 and station 2 represents 14 species of zooplankton with 140 no/ml density.

Group *Rotifera* and *Cladocera* found dominant followed by *Copepoda* at both station in both seasons. The organisms like *Microcystis sp.*, *Oscillatoria sp.*, *Navicula sp.*, *Euglena sp.*, *Closterium sp.*, *Ankistrodesmus sp.*, *Anabaena sp.*, *Nitzschia sp.*, *Scenedesmus sp.*, among phytoplanktons and zooplanktons forms like *Brachionus sp.*, *Keratella sp.*, *Mesocyclopes sp.* are the water pollution tolerant species.

TABLE 8 LIST OF PHYTOPLANKTON GENERA OBSERVED IN STUDY AREA DURING MONSOON AND WINTER SEASON SURVEY

Sr. No.	Class	Species	Station 1	Station 2
1	Cyanophyceae	* <i>Anabaena sp.</i>	✓	✓
2		<i>Merismopedia spp.</i>	✓	✓
3		* <i>Oscillatoria sp.</i>	✓	✓
4		* <i>Microcystis sp.</i>	✓	✓
5	Chlorophyceae	* <i>Ankistrodesmus sp</i>	✓	✓
6		<i>Actinastrum sp</i>	✓	✓
7		* <i>Closterium sp</i>	✓	✓
8		<i>Pedistrum sp</i>	✓	✓
9		* <i>Scenedesmus</i>	✓	✓
10		<i>Cosmarium sp.</i>	✓	-
11		<i>Eudorina sp</i>	✓	✓
12	Bacillariophyceae	<i>Asterionella sp.</i>	✓	✓
13		<i>Amphora sp.</i>	✓	✓
14		* <i>Navicula sp.</i>	✓	✓
15		* <i>Nitzschia sp.</i>	✓	✓

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16		<i>Synedra sp.</i>	✓	✓
17		<i>Urosolenia sp.</i>	✓	✓
18	Euglenophyceae	<i>*Euglena sp</i>	✓	✓
19	Chrysophyta	<i>Dinobryon sp</i>	✓	✓

Note: * indicates pollution tolerant species

TABLE 9 ZODPLANKTON GENERA OBSERVED IN STUDY AREA DURING MONSOON AND WINTER SEASON SURVEY

Sr. No.	Genera	Species	Station 1	Station 2
1	Rotifera	<i>*Brachionus sp</i>	✓	✓
2		<i>Plationus sp</i>	✓	✓
3		<i>*Keratella sp.</i>	✓	✓
4		<i>Trichocerca sp</i>	✓	✓
5		<i>Filinia sp.</i>	✓	-
6	Copepoda	<i>*Mesocyclops sp</i>	✓	✓
7		<i>Thermocyclops sp.</i>	✓	✓
8	Cladocerans	<i>Diaphanosoma sp.</i>	✓	✓
9		<i>Scapholeberis sp.</i>	✓	✓
10		<i>Bosminopsis sp.</i>	✓	✓
11		<i>Moinodaphnia sp.</i>	✓	✓
12		<i>Insect larva</i>	✓	✓
13		<i>Mosquito larva</i>	✓	✓

Note: * indicates pollution tolerant species

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Tea Plantation Habitat

Large areas of district Tinsukia and Dibrugarh are under Tea plantations. Both commercial tea estates and home backyard tea plantation are seen throughout the study area. Locally very few homestead tea gardens were present. Tea leaves harvested are exported internationally.

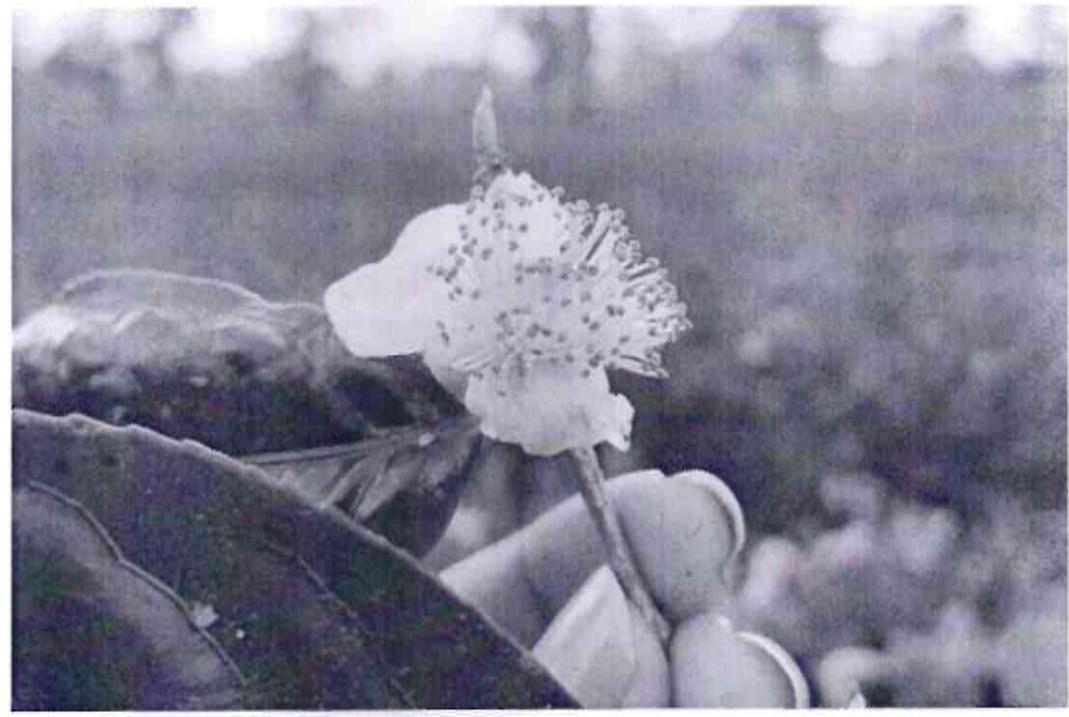


Tea Plantation Habitat

Floral Diversity

Fast growing trees were planted in the rows in tea gardens to provide shade. Tree species planted include, the Chinese Albizia (*Albizia chinensis*), *Albizia lenticularis*, Indian Poison Berry (*Melia azedarach*). In home backyard Tea plantations, along with the above tree species, Areca nut (*Areca catechu*) was also recorded.

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Camellia sinensis – Flower of Tea Plant

Faunal Diversity

Tea plantations are intensive monoculture of *Camellia sinensis* species with sparse tree cover of Chinese Albizia (*Albizia chinensis*), Albizia lenticularis, Indian Poison Berry (*Melia azedarach*). Most of the tea estates in the study area are adjacent to Bherjan forest region, Maguri Motapung Beel and Dibru River, which forms an ecotone zone. This area does not show a gradient in floral community but displays an abrupt switch from one habitat type to another.

A total of 45 species of birds were observed in the two seasons in Tea plantation habitat. Insectivorous birds such as Common Myna (*Acridotheres tristis*), Jungle Myna (*Acridotheres fuscus*), Great Tit (*Parus major*), Red-vented Bulbul (*Pycnonotus cafer*), and Green bee-eaters (*Merops orientalis*) were a common sight in the tea gardens.



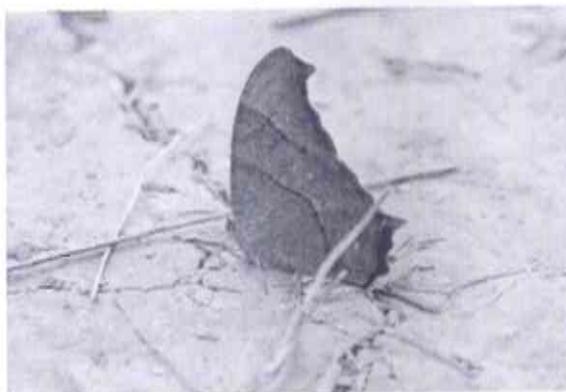
Asian Barred Owlet



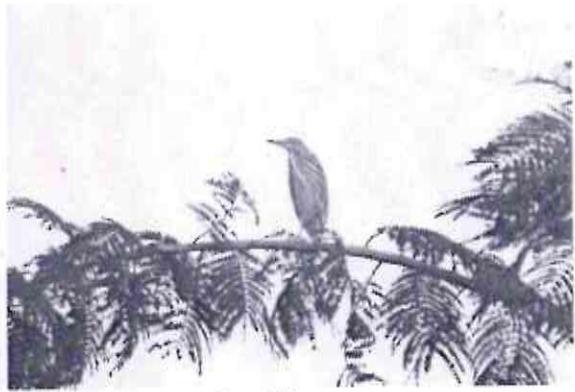
Jungle Myna

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Tea is perennial mono-culture crop. It provides a relatively steady microclimate and food supply for insect and mite pests; which in turn attracts insectivorous birds. Resident birds such as Asian barred Owllet (*Glaucidium cuculoides*), Green Billed Malkova (*Phaenicophaeus tristis*) and migratory birds such as Small (*Niltava macgrigoriae*) and Large Niltava (*Niltava grandis*), Rusty-bellied shortwing (*Brachypteryx hyperythra*) etc. were also seen using the ecotone region. Tea estates adjacent to the wetlands, birds such as Cattle egret (*Bubulcus ibis*), Greater (*Phalacrocorax carbo*) & Little Cormorant (*Microcarbo niger*), Pond heron (*Ardeola grayii*), Osprey (*Pandion haliaetus*) were seen roosting on tall trees of Albizia.



Dark Evening Brown



Pond Heron



Roadkill of Checkered Keelback



Indian Roller

Mammals such as Hoary-bellied Squirrels (*Callosciurus pygerythrus*) were encountered during the surveys. Presence of Leopards, Golden Jackals (*Canis aureus*), and Hare were confirmed from the locals and workers.

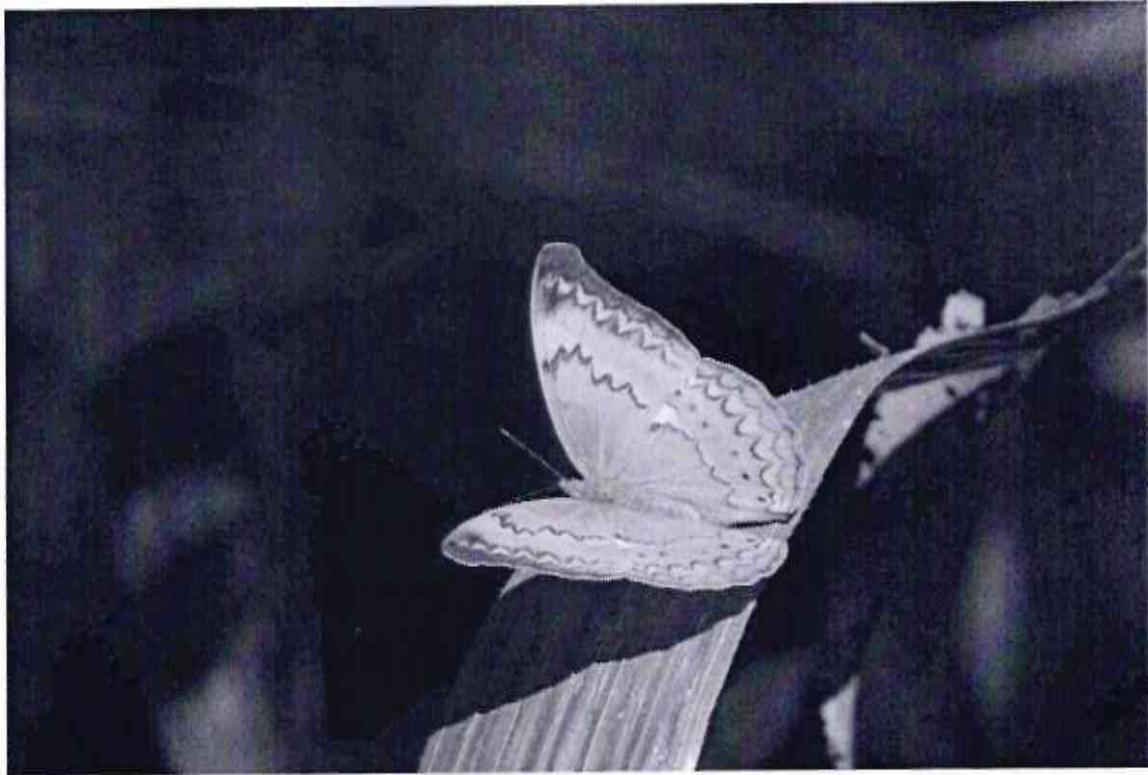
A total of 47 species of butterflies were observed in the two seasons in Tea plantation habitat. Common Grass Yellow (*Eurema hecabe*), Grey Pansy (*Junonia atlites*), Common Gull (*Cepora nerissa*), Lemon Emigrant (*Catopsilia pomona*), Peacock Pansy (*Junonia almana*), Striped Tiger (*Danaus genutia*), Indian Wanderer (*Pareronia hippia*), Dark Evening Brown (*Melanitis phedima*), Pale Wanderer (*Pareronia avatar*), Common Five-ring (*Ypthima baldus*), Yeoman (*Cirrochroa tyche*), Plain Tiger (*Danaus chrysippus*), Three-spot Grass Yellow (*Eurema blanda*) were seen in the Tea Plantation Habitat.

Two roadkill of Checkered Keelbacks (*Fowlea piscator*) were observed on the Delakhat road, on the edges of tea garden and Bherjan Forest boundary.

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The well PAD 3 is located in Dighaltarang Tea Estate of Doomdooma Tehsil. Birds such as Common Myna (*Acridotheres tristis*), Indian Roller (*Coracias benghalensis*), Red-vented Bulbul (*Pycnonotus cafer*) and butterflies such as Common Grass Yellow (*Eurema hecabe*), Lemon Emigrant (*Catopsilia pomona*), and Striped Tiger (*Danaus genutia*) were the observed in this area along with *camellia sinensis* tea plantation.



Common Yeoman

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Cropland Habitat

Cropland majorly comprised of paddy fields of rice. Crop land when not in cultivation is used as a pasture land.



Floral Diversity

Few areas were under the agriculture. Paddy fields were observed in the study area. After harvesting the land remains fallow and is used as a pasture/grazing land for cattle, sheep and goat grazing.

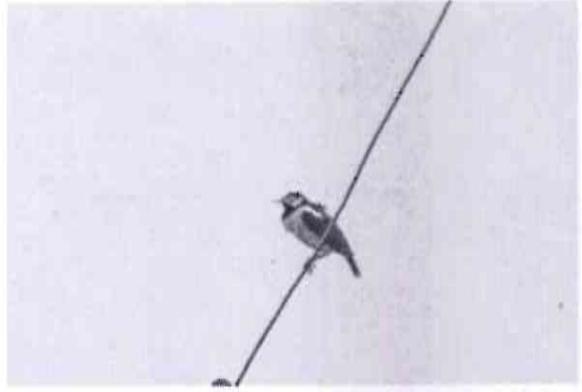


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Faunal Diversity

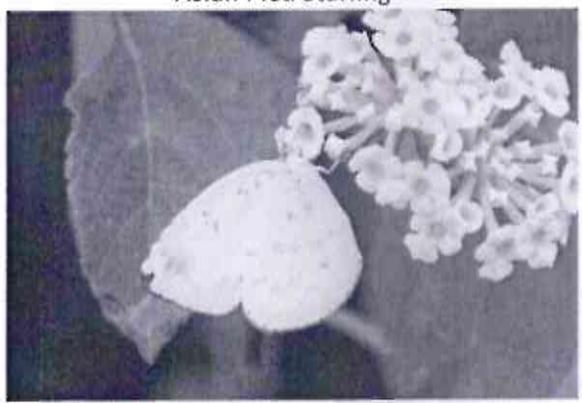
A variety of management practices such as land preparation, crop establishments, irrigation, nutrient and pest management, harvesting within the paddy field facilitate to create different habitats with different ecotones and suitable food for bird species.



Asian Pied Starling



Cattle Egret



Grass Yellow Butterfly



Striped Tiger

A total of 43 species of birds were observed in the two seasons in Cropland Habitat. The insects and worms in paddy field attract insectivorous birds such as Jungle Myna (*Acridotheres fuscus*), Cattle Egret (*Bubulcus ibis*), Common Myna (*Acridotheres tristis*), Asian Pied Starling (*Gracupica contra*), and Red-vented Bulbul (*Pycnonotus cafer*). These birds also act as a pest control for the paddy field. Migratory birds sighted during the survey are Barn swallows (*Hirundo rustica*), Common Stonechat (*Saxicola torquatus*), Rosy Pipit (*Anthus roseatus*). A single individual of Lesser Adjutant (*Leptoptilos javanicus*), which falls in the Near Threatened category of IUCN Red List of Threatened Species, was observed.

Hoary-bellied Squirrel (*Callosciurus pygerythrus*) was the mammal species sighted in the Cropland. A troop of Northern Pig-tailed Macaques (*Macaca leonina*) was sighted in the Bherjan forest area was observed feeding on rice crop uprooted from the adjacent field.

A total of 19 species of butterflies were observed in the two seasons in Cropland Habitat. Common Grass Yellow (*Eurema hecabe*) was the most dominant butterfly species in this habitat.

The well PAD 1 is located in Dighaltarang Tea Estate of Doomdooma Tehsil, falls into Cropland Habitat category. Birds such as Common Myna (*Acridotheres tristis*), Indian Roller (*Coracias benghalensis*),

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Red-vented Bulbul (*Pycnonotus cafer*) and butterflies such as Common Grass Yellow (*Eurema hecabe*), Lemon Emigrant (*Catopsilia pomona*), and Striped Tiger (*Danaus genutia*) were the observed in this area along with *camellia sinensis* tea plantation.

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Homestead Plantation Habitat

Homestead plantation is naturally or planted trees on community or private land. Bamboo and timber woods are planted in this area.



Homestead Plantation

Floral Diversity

Naturally or planted trees on community or private land are cultivated in these areas. Tea plantations were prominently seen in the backyards of the houses as well as in the between patches of the dense homestead plantation. Lofty emergent trees top of Jackfruit (*Artocarpus heterophyllus*), Burr-flower (*Neolamarkia cadamba*) and Hollong tree (*Dipterocarpus macrocarpus*), Devils tree (*Alstonia scholaris*) were being used as by Western Hoolock Gibbons (*Hoolock hoolock*) for swinging through the forest and foraging for food. Some of these shy individuals also use Bamboo patches for crossing through the forests.



Areca nut Plantation in Homesteads



Gibbon feeding on Kadamba Tree

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Some important tree species observed were *Mangifera indica*, *Melia azedarach*, *Aegle marmelos*, *Delonix regia*, *Ficus religiosa*, *Syzigium cumini*, *Gmelina arborea*, etc.

Faunal Diversity

Survey plots were laid in the Homestead plantations of Barekuri Village. A total of 14 species of birds were observed in the two seasons in homestead plantations. Birds like Blue-throated Barbet, Common Myna (*Acridotheres tristis*), Oriental Magpie Robin (*Copsychus saularis*) etc. were the common birds sighted during the survey in this area. Owl species such as Brown Boobook (*Ninox scutulata*) & Asian Barred Owllet (*Glaucidium cuculoides*) were observed roosting in the dense bamboo plantations.



Blue-throated Barbet



Common Myna



Brown Boobook



Western Hoolock Gibbons

Western Hoolock Gibbons (*Hoolock Hoolock*) have inhabited in the homestead plantations of Na-Matapung Gaon, Borgaon, Denka Gaon, Dighal Sako Gaon, Baghjan Gaon, and Dhelakhat Gaon Villages. Western Hoolock Gibbon (*Hoolock Hoolock*) is the only ape species found in India; it is an extremely shy and strictly arboreal animal, is classified as Endangered by IUCN Red List. These families of Gibbons in this region have adapted themselves to coexist with humans. They were observed foraging and singing songs on Jackfruit, Burr-flower trees, Hollong tree, Devils trees. Hoary-bellied Squirrel (*Callosciurus pygerythrus*) was also a mammal species found in these homestead plantations.

A total of 37 species of butterflies were observed in the two seasons in homestead plantations. Great Orange-tip (*Hebomoia glaucippe*), Punchinello (*Zemeros flegyas*), Grey Pansy (*Junonia atlites*) and Red Helen (*Papilio helenus*) were some of the commonly sighted species in this area.

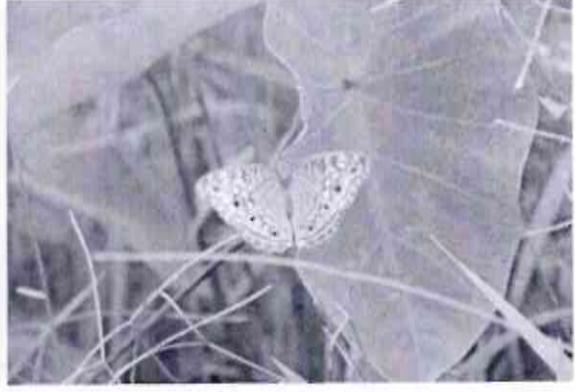
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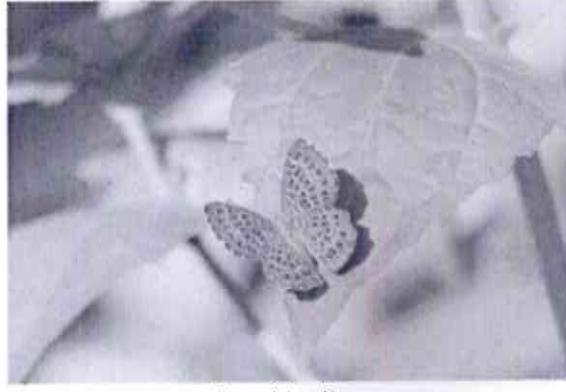
The well PAD 2 is located in Baghjan village of Doomdooma Tehsil; it has the habitat of homestead plantation/backyard. Birds such as Common Myna (*Acridotheres tristis*), Red-vented Bulbul (*Pycnonotus cafer*), and Rufous Treepie (*Dendrocitta vagabunda*) were the observed in this area.



Hoary – Bellied Squirrel



Grey Pansy



Punchinello



Red Helen

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Built up and Openland Habitat

Roadside plantations, settlements and market areas encompassed built ups habitat. The survey plots were laid at Guijan Market, Plastic park industrial area, and Baghjan EPS. Compared to other plots low diversity was observed in these areas.



Built-Up Habitat

Floral Diversity

These Built up landscapes were modified by the addition of the horticulture varieties. Roadsides walkways were planted with avenue trees species. In villages, the front yards of the houses had small homestead tea gardens.

In total 9 species of trees, 4 species of Shrubs and 14 species Herbs were observed in the two seasons. Flora such as Burr-flower (*Myrtagyna parviflora*), Pongam (*Pongamia pinnata*) and Devil's tree (*Alstonea scholaris*) were predominant in this habitat.

Faunal Diversity

Human dominated built-up areas showed less diversity compared to the other landuse. A total of 18 species of birds and 18 species of butterflies were observed in the two seasons in Built up and open land Habitats.

Birds such as Jungle Myna (*Acridotheres fuscus*), Eurasian Tree Sparrow (*Passer montanus*) and butterflies like Common Lascar (*Pantoporia hordonia*) and Lemon Emigrant (*Catopsilia pomona*) were predominant.

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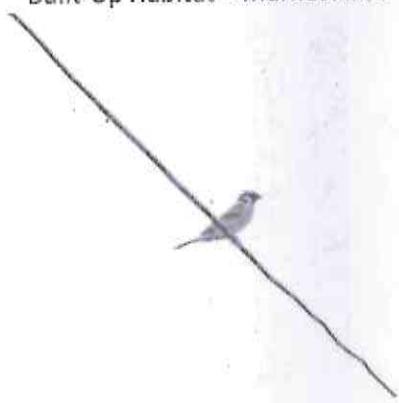
Angshuman Advocate



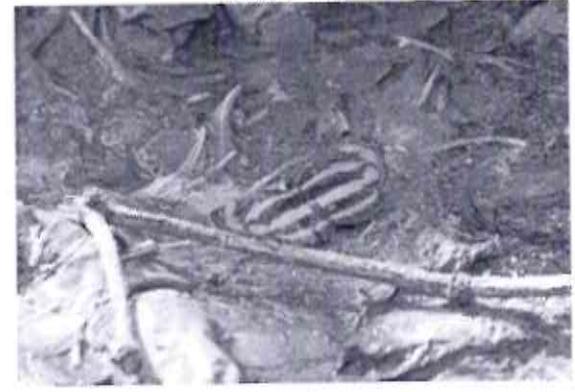
Built-Up Habitat - Market Area



Jungle Myna



Eurasian Tree Sparrow

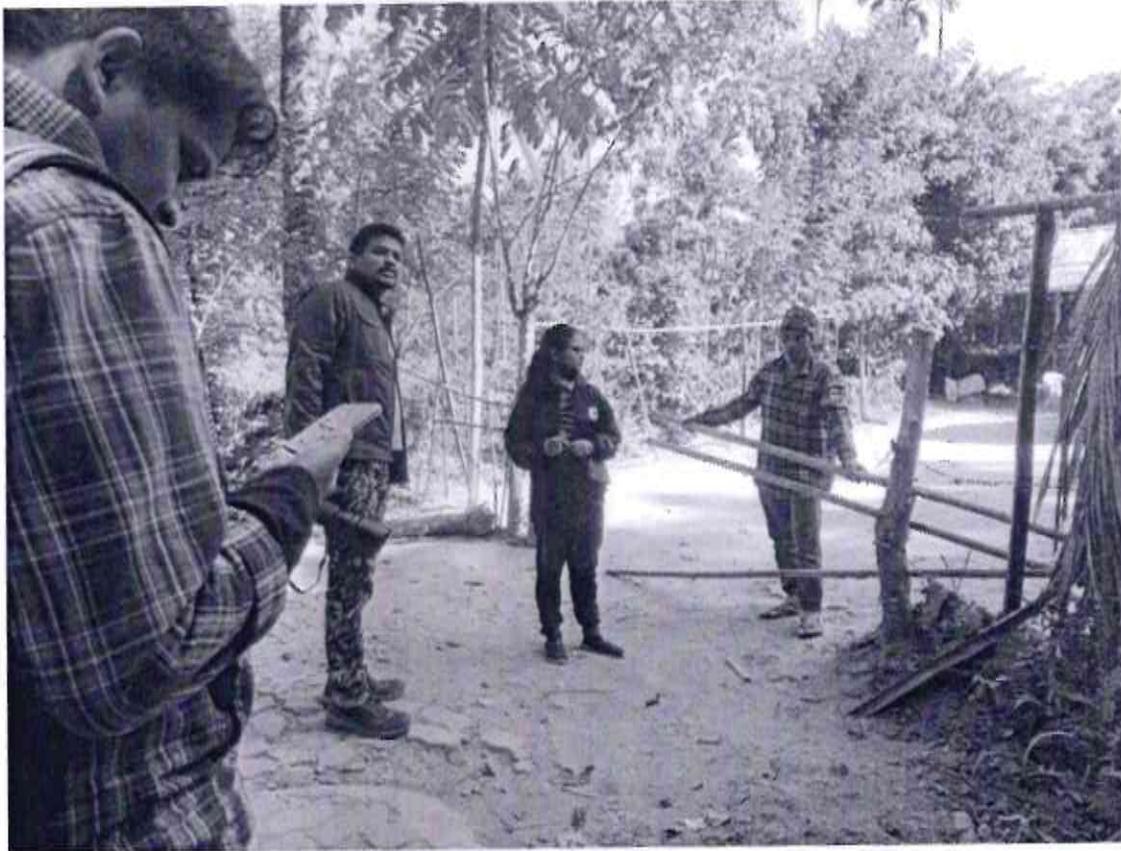


Common Lascar

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Socio Ecological Survey



Socio Ecological Survey at Barekuri Village

Informal discussions with the locals revealed that Dighal Haku Gaon is famously known as Barekuri Hoolock Gibbon Park, it has 22 families of Gibbons in homestead plantation/woodland of the village, as per the last counting done the villagers. Apart from Gibbons, Slow Loris and Indian Leopards were also rarely sighted around the village. Tea workers and officials also revealed that leopards have been sighted using the tea gardens as the corridors to move around in the study area along with Jackals and Hares.

Forest guards and officials confirmed that Western Hoolock Gibbons are no longer sighted in Podumoni and Bherjan regions of Bherjan-Borajan-Podumoni Wildlife Sanctuary but can be sighted in Dibru Saikhowa National Park. Other mammals mentioned by them in Podumoni and Bherjan regions were Common Palm Civet (*Paradoxurus hermaphroditus*), Small Indian Civet (*Viverricula indica*), Slow Loris (*Nycticebus bengalensis*), Capped Langur (*Trachypithecus pileatus*), and small wild cats; whereas Stump-tailed Macaque (*Macaca arctoides*), Wild Water Buffalo (*Bubalus arnee*), Jungle cat (*Felis chaus*), Clouded leopard (*Neofelis nebulosa*), Wild Boar (*Sus scrofa*), Sambar (*Rusa unicorn*), Indian crested porcupine (*Hystrix indica*), otters (Family: Mustelidae) are mammals seen in DSNP.

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Locations of important Mammal species sighted in the study area

Western Hoolock Gibbons (*Hoolock hoolock*) were sighted in Homesteaded plantations whereas other macaques such as Northern Pig-tailed (*Macaca leonina*), Assamese (*Macaca assamensis*) and Rhesus (*Macaca mulatta*) were observed in the Forested habitats. Ganges River Dolphin (*Platanista gangetica*) was sighted swimming in Dibru River. Following table shows the locations of mammals sighted in the study area:

TABLE 10 LOCATIONS OF IMPORTANT MAMMAL SPECIES SIGHTED IN THE STUDY AREA

Mammal Species	Latitude	Longitude
Assamese Macaque	27.5249	95.3662
Northern Pig-tailed Macaque	27.5298	95.3818
Golden Jackal	27.5771	95.3437
Indian Grey Mongoose	27.5801	95.3637
Indian Flying Fox	27.5783	95.3299
	27.5291	95.3791
	27.5618	95.4307
Asian Elephant	27.6453	95.4295
Ganges River Dolphin	27.6379	95.4232
	27.6267	95.4049
	27.6541	95.4385
Rhesus Macaque	27.6326	95.4112
Hoary-bellied Squirrel	27.5253	95.3672
	27.5322	95.3737
	27.5294	95.3814
	27.5387	95.4303
	27.5194	95.3966
Western Hoolock Gibbon	27.5678	95.4046
	27.5319	95.3882
	27.5361	95.4163
	27.5398	95.4303
	27.5388	95.4112
	27.5671	95.3921

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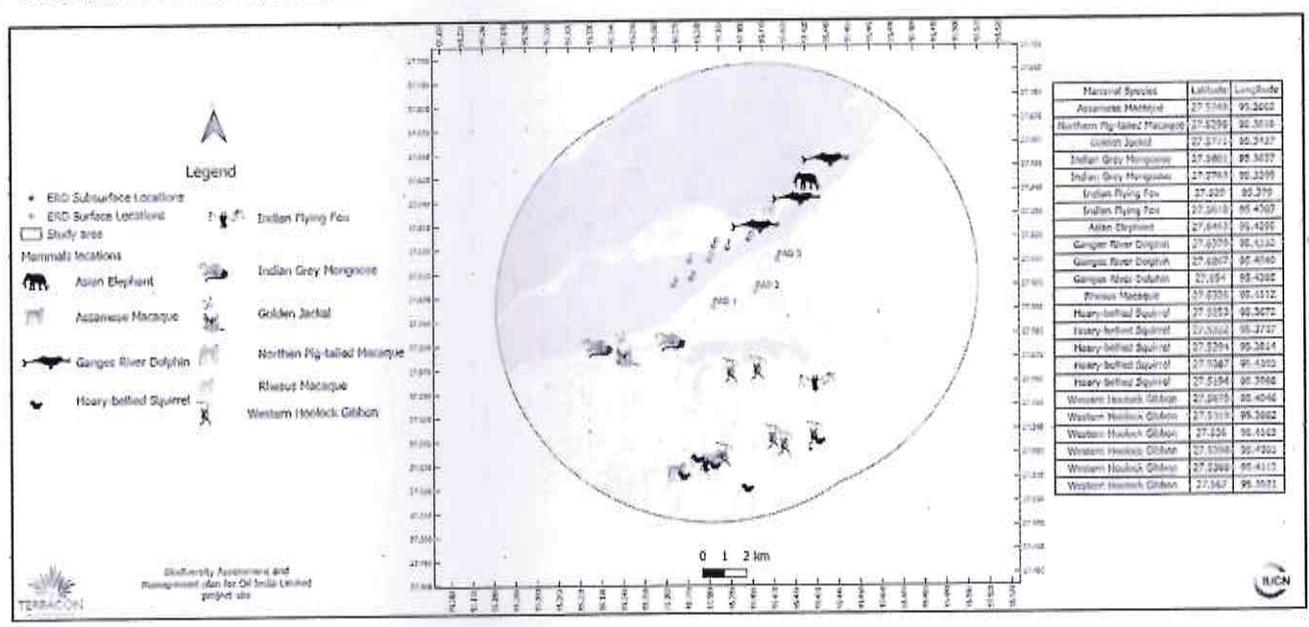


FIGURE 3 LOCATION OF IMPORTANT MAMMAL SPECIES SHOWN IN THE STUDY AREA

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Species of Special Concern

Biodiversity data collected in the study area is analyzed qualitatively as well as quantitatively. Qualitative analysis involves referencing the IUCN (International Union for Conservation of Nature and Natural Resources) Red List for worldwide population and conservation status of the species and Indian Wildlife (Protection) Act (WPA), 1972 which provides legal protection level to different species in India. This information helps predict the sensitive species present in the study area to formulate an action plan for their protection and conservation within the study area.

The quantitative analysis involves the calculation of relative density and relative frequency for the recorded population of floral and faunal biodiversity. These values indicate species with the densest population, most frequently encountered species and areas with good biodiversity richness.

IUCN (International Union for Conservation of Nature and Natural Resources) Red List of Threatened Species

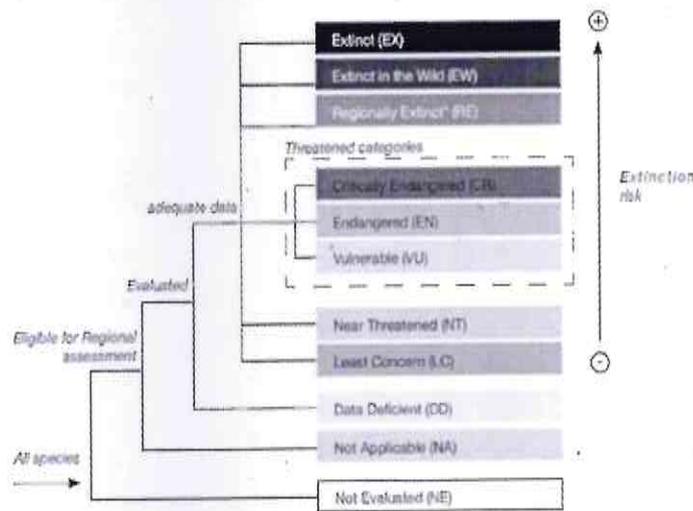


FIGURE 4 IUCN RED LIST CATEGORIES

The IUCN Red List is a critical indicator of the health of the world's biodiversity. Far more than a list of species and their status, it is a powerful tool to inform and catalyze action for biodiversity conservation and policy change, critical to protecting the natural resources we need to survive. It provides information about a range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions.

The IUCN Red List of Threatened Species is widely recognized as the most comprehensive global approach for evaluating the conservation status of plant and animal species. The Red List has been created by applying a rigorous set of scientific quantitative criteria. It is widely recognized as the most comprehensive and reliable data on the conservation status of a species. The red list categorizes all the species in 8 broad categories with varying degrees of conservation importance. These categories are prepared based on certain criteria. The most critical categories are the 'threatened categories' consisting of Vulnerable, Endangered and Critically Endangered Species; While, 'Near Threatened'

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category denotes likelihood of a species to fall in the threatened categories due to the decline in the population.

Fauna

White-rumped Vulture (*Gyps bengalensis*) was sighted soaring in the DSNP, which falls under Critically Endangered category of IUCN Red List. Lesser Adjutant (*Leptoptilos javanicus*), a large solitary scavenging bird was observed in the croplands and in Maguri Motapung Beel along with Common Pochard (*Aythya ferina*), Swamp Francolin (*Francolinus gularis*), three of which fall in the Vulnerable category of IUCN Red List.

Western Hoolock Gibbons (*Hoolock hoolock*), the only ape species found in India, were sighted swinging along high canopies of Barekuri Village, Na-Matapung Gaon, Borgaon, Denka Gaon, Dighal Sako Gaon, Baghjan Gaon, and Dhelakhat Gaon Villages Assam. Secondary data suggests presence of Western Hoolock Gibbons (*Hoolock hoolock*) in the DSNP regions; however, no sightings were occurred in the study period. Asian Elephant (*Elephas maximus*) footprints were observed on the riverbed's regions of DSNP whereas Ganges River Dolphin (*Platanista gangetica*) was seen moving across Dibru River, on the edges of DSNP. All of these mammals fall in the Endangered category of IUCN Red List.

Wallago attu, is a widely consumed fish in the study area, falls under Vulnerable category of IUCN Red List. During Fish market surveys, this fish found in the fish catch, captured from Maguri Motapung Beel as well as from Dibru River by the fishermen.

As the Table 11 suggests, 7 birds and one mammal species, falling in the Near Threatened category of IUCN Red List were also observed in the study area.

TABLE 11 FAUNA SPECIES UNDER IUCN RED LIST

Sr. No.	Species Name	Scientific name	IUCN status
Birds			
1	Lesser Adjutant	<i>Leptoptilos javanicus</i>	VU
2	Red-breasted Parakeet	<i>Psittacula alexandri</i>	NT
3	Rusty-bellied Shortwing	<i>Brachypteryx hyperythra</i>	NT
4	Common Pochard	<i>Aythya ferina</i>	VU
5	Swamp Francolin	<i>Francolinus gularis</i>	VU
6	Oriental Darter	<i>Anhinga melanogaster</i>	NT
7	Ferruginous Duck	<i>Aythya nyroca</i>	NT
8	Lesser Fish-eagle	<i>Ichthyophaga humilis</i>	NT
9	Himalayan Griffon	<i>Gyps himalayensis</i>	NT
10	White-rumped Vulture	<i>Gyps bengalensis</i>	CR
11	Black-tailed Godwit	<i>Limosa limosa</i>	NT
Mammals			
1	Western Hoolock Gibbon	<i>Hoolock hoolock</i>	EN
2	Assamese Macaque	<i>Macaca assamensis</i>	NT
3	Northern Pig-tailed Macaque	<i>Macaca leonina</i>	VU
4	Asian Elephant	<i>Elephas maximus</i>	EN
5	Ganges River Dolphin	<i>Platanista gangetica gangetica</i>	EN

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Fishes			
1	-	Wallago attu	VU

Flora

No IUCN Red Listed floral Species were observed during the survey conducted.

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Wildlife (Protection) Act, 1972 Schedules

Indian Wildlife (Protection) Act, 1972 (here onwards mentioned as WPA) categorizes the wildlife of India in six different schedules, the first five of which are for animals and the sixth for plants. Organisms listed in these schedules are accorded varying degrees of protection, with animals falling under Schedule I and Schedule II being accorded maximum protection. Table 12 explains the degree of protection for each schedule.

TABLE 12 WILDLIFE (PROTECTION) ACT, 1972 SCHEDULES

Schedules	Description
Schedule I and Schedule II	Provide absolute protection – offences under these are charged with the highest penalties
Schedule III and IV	Provide protection, penalties milder than that of Schedule I and Schedule II
Schedule V	'Vermin' animals as per the act
Schedule VI	Plants that are prohibited from cultivation and planting

Thus, schedule I and II are most essential from a conservation point of view. It is important to know whether any species under these schedules are present in an area, their population status and threats to implement conservation measures.

Fauna

Lesser Fish-eagle (*Ichthyophaga humilis*) and White-rumped Vulture (*Gyps bengalensis*) were observed near the forested regions of DSNP. Kalij Pheasant (*Lophura leucomelanos*) was observed in the thickets of Podumoni region of Bherjan-Bhorajan-Podumoni wildlife sanctuary. Osprey (*Pandion haliaetus*) was observed perched on a tree near the riparian areas of Maguri Motapung Beel. These birds along with mammals such as Western Hoolock Gibbon (*Hoolock hoolock*), Asian Elephant (*Elephas maximus*), and Ganges River Dolphin (*Platanista gangetica*) are protected under schedule I of the wildlife (protection) Act, 1972.

Four mammal species which are Rhesus Macaque (*Macaca mulatta*), Assamese Macaque (*Macaca assamensis*), Northern Pig-tailed Macaque (*Macaca leonina*), Golden Jackal (*Canis aureus*) and Indian Grey Mongoose (*Urva edwardsii*) are found to be protected under schedule II of the WPA.

In terms of butterfly species documented during survey, 4 species were found to be protected under schedule I of the WPA and 19 under schedule II of the WPA. One reptile species 'Checkered Keelback' (*Fowlea piscator*) was found to be placed in schedule II of the WPA.

TABLE 13 FAUNA SPECIES UNDER WPA SCHEDULE

Sr. No.	Species Name	WPA schedule
Birds		
1	Osprey	I
2	Kalij Pheasant	I
3	Lesser Fish-eagle	I
4	White-rumped Vulture	I
Mammals		
1	Western Hoolock Gibbon	I

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2	Rhesus Macaque	II
3	Assamese Macaque	II
4	Northern Pig-tailed Macaque	II
5	Golden Jackal	II
6	Indian Grey Mongoose	II
7	Asian Elephant	I
8	Ganges River Dolphin	I
Butterflies		
1	Eastern Striped Albatross	II
2	Chocolate Albatross	II
3	Common Pierrot	I
4	Danaid Eggfly	I
5	Grey Count	II
6	Common Gull	II
7	Common Duffer	I
8	Great evening brown	II
9	Metallic Cerulean	II
10	Orchid Tit	I
11	Blackvein Sergeant	II
12	Common Gem	II
13	Sylhet Oakblue	II
14	Tawny Rajah	II
15	Pale Wanderer	II
16	Clear Sailer	II
17	Double-branded Bushbrown	II
18	Wizard	II
19	Yellow-crested Spangle	II
20	Tamil Oakblue	II
21	Chinese Bushbrown	II
22	Pale Four-Lineblue	II
23	Lesser Gull	II
Reptiles		
1	Checkered Keelback	II

Flora

No floral species falling in schedule of WPA 1972 was observed during the survey conducted.

Invasive Species

The species documented during the study was screened through the IUCN Global Invasive Species Database for documenting the invasive species. *Trapa natans* and *Eichhornia crassipes*, *Ceratophyllum demersum* and *Hydrilla verticillata*, *Ipomoea aquatic* are the species exclusively dominating the waterscapes. Out of which *Ceratophyllum demersum* and *Hydrilla verticillata* are water submerged

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species, and *Trapa natans* and *Eichhornia crassipes* are water surface floating species. *Ipomoea aquatic* is marginal species, growing along the periphery of lake. *Imperata cylindrica* is found around the wetland habitat.

Ageratum conyzoides, *Alternanthera sessilis*, *Eupatorium odoratum*, *Mikania micrantha*, *Senna tora* are the terrestrial plant species and were recorded in all habitats in the study area.

TABLE 14 IUCN GLOBAL INVASIVE SPECIES (GISD) SPECIES IN STUDY AREA

Sr. No.	Scientific Name	Habit	English Common Name
1	<i>Ageratum conyzoids</i>	Herbs	Billy Goat Weed
2	<i>Alternanthera sessilis</i>	Herbs	Dwarf Copperleaf
3	<i>Ceratophyllum demersum</i>	Herbs	Coon Tail
4	<i>Eichhornia crassipes</i>	Herbs	Common Water Hyacinth
5	<i>Eupatorium odoratum</i>	Shrubs	Siam Weed
6	<i>Hydrilla verticillata</i>	Herbs	Hydrilla
7	<i>Imperata cylindrica</i>	Herbs	Cogon Grass
8	<i>Ipomoea aquatic</i>	Herbs	Water Spinach
9	<i>Lantana camera</i>	Shrubs	West Indian Lantana
10	<i>Mikania micrantha</i>	Herbs	
11	<i>Mimosa pudica</i>	Herbs	Touch Me Not
12	<i>Potamogeton crispus</i>	Herbs	Curled Pondweed
13	<i>Solanum torvum</i>	Shrubs	Turkey Berry
14	<i>Solanum viarum</i>	Shrubs	Tropical Soda Apple
15	<i>Trapa natans</i>	Herbs	Water Chestnut
16	<i>Ipomea carnea</i>	Shrubs	Bush Morning Glory
17	<i>Senna tora</i>	Herbs	Sickle Pod

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Findings from Secondary Literature Review

Assam nestles a number of charismatic mammalian fauna Rhino, Elephant, Tiger, Pygmy hog, Hispid hare, Golden langur, Leopard, Golden Cat, Clouded leopard, Himalaya palm civet, Binturong, Himalayan black bear, Sloth bear, Gaur, Water buffalo, Sambar, Hog deer, Barking deer, Swamp deer etc. Wildlife in Assam is given protection through a network of 5 National Parks, 20 Wildlife Sanctuaries, three Tiger Reserves and five Elephant Reserves.

Dibru - Saikhowa Complex and Bherjan-Borajan-Podumoni Wildlife Sanctuary are the two, BirdLife International accredited Important Birding Sites (IBA).

Dibru - Saikhowa Complex comprises of Dibru-Saikhowa National Park, Poba Reserve Forest, Kobo chapori (river islands) proposed reserve forest, Amarpur chapori, Maguri and Motapung Beel, and the adjacent riverine tract of the Brahmaputra and Lohit rivers; out of which, only Dibru-Saikhowa National Park and Maguri Motapung Beel fall in the present study area.

Bherjan-Borajan-Podumoni Wildlife Sanctuary comprises of Bherjan (105 ha), Borajan (493 ha) and Podumoni (176 ha) as separate three pockets of lowland tropical forest, present in Tinsukia district, Assam. Bherjan and Podumoni regions fall in the present study area.

The Bherjan-Borajan-Padumoni WLS is one of the smallest wildlife sanctuaries of Assam covering 7.22 km² of area spreading across three blocks located in Tinsukia district of the Upper Brahmaputra Valley of Assam, India which consists of three separate forests, namely Bherjan, Borajan and Podumoni. Bherjan, Borajan and Podumoni are tiny isolated pockets of lowland tropical forest¹¹. The Sanctuary area has some very significant patches of remnants of Assam Valley Tropical wet Evergreen Forest interspersed with Easter Seasonal Swamp Forest and Assam alluvial plains semi-evergreen forests¹². The three areas are disjoint and unconnected by tea gardens and human settlement. These are entirely on the flat plains of the Brahmaputra Valley. There are small, scattered marshes, with swamps, covered with dense growth of grass and *Alpinia* herb. The natural vegetation of all these areas is tropical wet evergreen 'rainforest' type.¹¹

Bherjan is almost entirely covered with trees with a closed canopy. The original vegetation has been replaced by a fairly old mixed plantation dominated by the deciduous species *Lagerstroemia parviflora* and *Terminalia myriocarpa*. The Podumoni part is mostly in a degraded state due to large-scale felling. The canopy has been very badly broken up. Only a few mature trees of *Artocarpus*, *Bombax*, *Lagerstroemia*, and *Mesua* species can be seen. Borajan is a pocket of excellent rainforest, dominated by *Dipterocarpus macrocarpus*. Except for Teak, all the species as in the other two forest pockets are found. Bamboo species are found in all areas¹¹.

The forest is the home for an endangered primate species, i.e., Western Hoolock Gibbon (*Hoolock hoolock*) and ideal habitat for primate species like the Bengal Slow Loris (*Nycticebus bengalensis*), Assamese Macaque (*Macaca assamensis*), Pig-tailed Macaque (*Macaca leonina*), Rhesus Macaque (*Macaca mulatta*), Capped Langur (*Trachypithecus pileatus*), Stump-tailed Macaque (*Macaca*

¹¹ Borah, P. & J. Barukial (2021). On the pteridophytes of Bherjan-Borajan-Padumoni Wildlife Sanctuary, Assam, India. *Journal of Threatened Taxa* 13(12): 19781-19790

¹² <https://moef.gov.in/wp-content/uploads/2021/06/berjan-borajan.pdf>

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arctoides).¹¹ Species which are not strictly confined to top canopy like Rhesus macaque and Pig tailed Macaque can be found throughout the study area, including in proximity to the settlements.¹³

The major avian species found in the area are White-rumped Vulture (*Gyps bengalensis*), Slender-billed Vulture (*Gyps tenuirostris*), Lesser Adjutant (*Leptoptilos javanicus*), Rusty-bellied Shortwing (*Brachypteryx hyperythra*).

Other fauna of the sanctuary include the Short-tailed Mole (*Euroscaptor micrura*), Chinese Pangolin (*Manis pentadactyla*), Golden Jackal (*Canis aureus*), Leopard Cat (*Prionailurus bengalensis*), Leopard (*Panthera pardus*), Tiger (*Panthera tigris*), Asiatic Elephant (*Elephas maximus*), Common Giant Flying Squirrel (*Petaurista petaurista*), Pallas's Squirrel (*Callosciurus erythraeus*), Malayan Giant Squirrel (*Ratufa bicolor*), Chinese Porcupine (*Hystrix hodgsoni*), Wild Boar (*Sus scrofa*), and Barking Deer (*Muntiacus muntjak*)¹⁴.

Maguri Motapung Beel is one of the major floodplain wetlands situated in the Tinsukia; covering an area of 1000 ha, located about 3.8 km away from the Guijan Ghat, the gateway of Dibru- Saikhowa National park and biosphere reserve.¹⁵ The Beel complex is 12 km north of Tinsukia town.

In Maguri Motapung Beel wetland, *Nelumbo nucifera*, *Brasenia schreberi*, *Euryale ferox*, *Trapa natans* and *Hydrocharis dubia*, these floating leaved *macrophytes* provide shade and shelter for fish, and waterfowl often eat their seeds. They also provide various economic benefits for the local people.¹⁵

Maguri and Motapung, a complex of Beels, are fringed with wide marshes, water channels, and tall to medium grassland. The Maguri-Motapung area is very rich in birdlife, especially marsh birds and water birds. Critically endangered species from area are White-bellied Heron (*Ardea insignis*), White-rumped Vulture (*Gyps bengalensis*), Slender-billed Vulture (*Gyps tenuirostris*), Red-headed Vulture (*Aegypius calvus*), Baer's Pochard (*Aythya baeri*) and Bengal Florican (*Houbaropsis bengalensis*). The endemic birds are Black-breasted Parrotbill (*Paradoxornis flavirostris*) and Marsh Babbler (*Pellorneum palustre*).

Some of the migratory bird species visiting the Beel includes the Ruddy Shelduck (*Tadorna ferruginea*), Baikal Teal (*Sibirionetta formosa*), Bar-Headed Goose (*Anser indicus*), Falcated Duck (*Anser indicus*), Ferruginous Duck (*Aythya nyroca*), Northern Pintail (*Anas acuta*), Eurasian Wewton (*Mareca penelope*), Common Teal (*Anas crecca*), Black-Headed Ibis (*Threskiornis melanocephalus*), Glossy Ibis (*Plegadis falcinellus*), Eurasian Curlew (*Numenius arquata*) etc.¹⁴

Other fauna includes Hog Deer (*Axis porcinus*), Ganges River Dolphin (*Platanista gangetica*), Bengal Monitor Lizards (*Varanus bengalensis*) and Asian Water Monitor (*Varanus salvator*), Indian Cobra (*Naja kaouthia*) and Indian Rock Python (*Python molurus*).¹⁴

Due to its unique topography and ecological conditions, Assam harbours a diverse ichthyofaunal resource. About 217 fish species have been reported from this area. The species includes *Chitala*

¹³ Anwaruddin Choudhury; The Hoolock Gibbon (*Hoolock hoolock*) in Tinsukia and Dibrugarh districts of Assam, India, *Asian Primates Journal* 1(2), 2009

¹⁴ Rahmani, A. R., Islam, M. Z., & Kasambe, R. M. (2016). Important bird and biodiversity areas in India: Priority sites for conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (UK), 1992.

¹⁵ Lahon, D. (2019). The Density of Floating-Leaved Aquatic Plants During the Monsoon Season: A Case Study of Maguri Motapung Wetland of Assam, India. *Think India Journal*, 22(10), 5604-5609.

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chitala, Danio devario, Amblypharyngodon mola, Puntius sarana, Cirrhinus mrigala, Cyprinus carpio, Ctenopharyngodon idella, Hypophthalmichthys molitrix, Lepidocephalichthys guntea, Puntius sophore, Mystus tengara, Chanda nama, Labeo gonius, Osteobrama cotio, Glossogobius giuris, Trichogaster fasciata, Xenentodon cancila, Macrognathus aral, Macrognathus pancalus, Mastacembelus, armatus, Channa sp., Wallago attu, Heteropneustes fossilis, Trichogaster lalius, Clarias magur etc. In Maguri Motapung Beel, abundant fish species are *Puntius sophore, Mystus tengara, Chanda nama, Labeo gonius, Osteobrama cotio, Glossogobius giuris, Trichogaster fasciata, Xenentodon cancila, Macrognathus aral, Macrognathus pancalus* and three exotic carps are *Cyprinus carpio, Ctenopharyngodon idella and Hypophthalmichthys molitrix*.¹⁶

In Maguri Motapung Beel, mollusc diversity belongs to Viviparidae, Ampullaridae, Thiaridae, Pachychilidae, Lymnaeidae, Planorbidae, Unionidae, Cyrenidae, Sphaeriidae. Mollusc such as *Indoplanorbis exustus, Intha umbilicalis, Lymnaea acuminata, Brotia costula, Tarebia lineata, Tarebia granifera, Melanoides tuberculata, Plotia scabra, Pila virens, Pila globosa, Angulyagra oxytropis, Angulyagra microchaetophora, Idiopoma dissimilis, Mekongia crassa and Bellamya bengalensis* belong to Gastropoda; and *Lamellidens marginalis, Lamellidens corrianus, Parreysia corbis, Parreysia smaragdites, Parreysia lima, Parreysia pachysoma, Corbicula assamensis, Corbicula striatella, Sphaerium indicum and Sphaerium austeni* belong to Bivalvia.¹⁷

From Dibru - Saikhowa Complex, **Dibru-Saikhowa National Park** fall in the study area; it is located at Dibrugarh and Tinsukia Districts of Assam. The National Park represents a unique geo-morphological structure created by the river Brahmaputra and its tributaries, and the water channels, especially the Brahmaputra, forming an important habitat for the Gangetic Dolphin (*Platanista gangetica*)¹⁸. The entire Reserve is placed in the low laying flood plain of the mighty Brahmaputra River and Lohit River bordering the North and the Dibru River bordering the south.

The forest types of the Dibru-Saikhowa Biosphere Reserve consist of semi-evergreen, deciduous, littoral and swamp forests and patches of wet evergreen forests. Diverse vegetation types of the reserve support a variety of floristic elements that accounted for over 680 species (464 genera and 143 families) of flowering plants that represents an array of life forms like tree (126 spp.), shrubs and under shrubs (155), herbs including aquatics (295), climbers and twiners (81), epiphytes (19) and parasites (4). Of the total, dicotyledonous plants accounted for 511 species (350 genera and 169 families) while the rest 169 species under 114 genera and 27 families are monocotyledonous plants. The legume family Fabaceae is the largest family with 35 genera and 66 Species. Poaceae (39 genera & 50 species) and Asteraceae (27 genera & 32 species) are the other largest families in the reserve. The fig plant i.e. Ficus is the largest genus among the Dicotyledons and *Cyperus* among the monocotyledons.¹⁹

The original natural vegetation of the National Park was tropical wet evergreen rainforest (1/1/1B/C1 Assam valley Tropical wet evergreen forest) with grassland and reed beds (1/4/4D/2S1: Eastern wet alluvial grasslands and 1/4/4D/SS: Eastern seasonal swamp forests) in the riverine tracts and

¹⁶ Kalita, P., Pathak, S., & Deka, P. (2016). A preliminary study on Ichthyofaunal resource of Matapung-Maguri Beel of Tinsukia district of Assam, India. *Intl J of Fauna and Biol Studies*, 3(4), 97-102.
¹⁷ Kardong, Devid & Puzari, Munmi & Sonowal, Jyotish. (2020). Diversity of freshwater mollusc in Maguri Beel Tinsukia district in Assam, India; *International Journal of Current Research* 8. 29169-29176
¹⁸ <https://moef.gov.in/wp-content/uploads/2019/10/dibru-saikhowa.pdf>
¹⁹ Chaudhry, Shivaji. (2012). *Dibru Saikhowa Biosphere Reserve, Brahmaputra Valley, India*

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depressions. During the great earthquake of 1950, large parts of the reserve sank by a few meters, resulting in the regular flooding of the area. This was followed by the emergence of a new type of vegetation. 'Salix swamps' (1/4/4D/SS2 Barringtonia swamp forests) and deciduous forest now dominate the reserve, and evergreen forest is now restricted to a few patches. About a third of the national park is covered with *Salix tetrasperma* and *Bischofia javanica*—the most abundant tree species. *Dipterocarpus macrocarpus* trees, which were common before 1950, are now rare. Grassland and reed beds cover another third of the park (1/3/1/S2b Eastern Hollock Forests and 1/4/4D/2S1: Eastern wet alluvial grasslands). The main reed and grass species are *Arundo donax*, *Phragmites karka*, *Imperata cylindrica*, *Saccharum* spp. etc. The core area of Dibru Saikhowa Biosphere Reserve is a mosaic of habitat types, the diversity of which is reflected in the faunal diversity it supports. The core is characterized by littoral and swamp forests, semi-evergreen forests, deciduous forests and patches of wet evergreen forests.

Assam the second largest state of North-East India is a rich store house of Orchids in India. The total number of species may be around 193 under 71 genera out of which 27 are endemic. The Dibru-Saikhowa National Park and Biosphere Reserve has been a natural dwelling home of a wide variety of orchids. So far, 35 species of epiphytic orchids and 8 species of terrestrial orchid have been recorded from this area. The Orchid flora of Dibru-Saikhowa National Park is a valuable natural resource. Out of these 35 are epiphytic and 8 are terrestrial. The various species *Aerides multiflorum*, *A. rosea*, *A. odorata*, *Cymbidium bicolor*, *C. dayanum*, *Dendrobium moschatum*, *D. fimbriatum*, *D. nobile*, *D. transparens*, *D. lituiflorum*, *D. aphyllum*, *D. aduncum*, *Micropera rostratum*, *Rhynchostylis albiflora*, *R. retusa* along with some species *Acampe papilliosa*, *Aerides multiflorum*, *A. odoratum*, *Cleisostoma appendiculatum*, *Cymbidium dayanum*, *Dendrobium nobile*, *Gastrochilus calceolaris*, *Habenaria stenopetala*, *Rhynchostylis albiflora*, *Zeuxine lindleyana*, *Cymbidium bicolor*, *Micropera rostratum*, *Promatocalpa undulatum*, *Robiquetia spathulata* are observed in the DSNP.^{20 21 22}

The Wildlife (Protection) Act 1972 protected six species are Beddome's cycad (*Cycas beddomei*), Blue Vanda (*Vanda coerulea*), Kuth (*Sassurea lappa*), Ladies slipper orchids (*Paphiopedilum* spp.), Pitcher plant (*Nepenthes khasiana*), Red Vanda (*Ranthera imshootiana*) also said to be observed in the DSNP.²²

About 958 species and subspecies of birds have so far been reported or likely to occur in Assam. This is the highest diversity of birds in any of the Indian states. Arunachal Pradesh comes next with more than 750 species. About 500 species of birds were reported by the Forest Department from Dibru-Saikhowa National Park. The Dibru Saikhowa Biosphere Reserve is the proposed Ramsar site and falls in the course of two major international fly-ways of migratory birds. There are around 50 species of globally threatened avifauna reported in the National Park²³. The resident birds of Dibru-Saikhowa National Park include White-bellied Heron (*Ardea insignis*), Greater Adjutant (*Leptoptilos dubius*), Lesser Adjutant (*Leptoptilos javanicus*), White-winged Duck (*Asarcornis scutulata*), Pallas's Fish-eagle (*Haliaeetus leucorhynchus*), Swamp Francolin (*Francolinus gularis*), Black-breasted Parrotbill

²⁰ Hedge, S.N., 2000. Orchid Biodiversity of North East India. *J. Assam Sci. Soc.* 41(4): 289 – 311.

²¹ Rao, A.N. 1995. New Contribution to the Orchid flora of North East India during 1950-1990, with special reference to Arunachal Pradesh- A review. *J. Econ. Taxon. Bot. (Addl. Ser.)* 11: 49 – 63

²² Gogoi, Khyanjeet. (2010). Orchid flora of Dibru –Saikhowa National Park and Biosphere Reserve, Assam, India. *Pleione*. 4. 124 - 134

²³ Nongmaithem, R. & Lodhi, Mahendra & Samal, Prasanna & Dhyani, P.P. & Sharma, Subrat. (2016). Faunal diversity and threats of the Dibru-Saikhowa Biosphere Reserve: A study from Assam, India. 7. 523-532

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(*Paradoxornis flavirostris*), Jerdon's Bushchat (*Saxicola jerdoni*), Spot-billed Pelican (*Pelecanus philippensis*), Oriental Darter (*Anhinga melanogaster*), Bengal Florican (*Houbaropsis bengalensis*), etc.²⁴

The avifaunal species that are winters visitor in the area include Bar-headed goose (*Anser indicus*), Ruddy shelduck (*Tadorna ferruginea*), Eurasian teal (*Anas crecca*), Common greenshank (*Tringa nebularia*), European starling (*Sturnus vulgaris*), Chestnut-bellied rock thrush (*Monticola rufiventris*), Rosy pipit (*Anthus roseatus*), Dusky warbler (*Phylloscopus fuscatus*), Red-throated thrush (*Turdus ruficollis*), Lesser whitethroat (*Sylvia curruca*), Eastern crowned warbler (*Phylloscopus coronatus*), Chestnut-crowned warbler (*Phylloscopus castaniceps*), Green-crowned warbler (*Phylloscopus burkii*), etc.²⁵ Dibru-Saikhowa area is among the most important wintering sites in Assam of the Black Stork (*Ciconia nigra*).

The unique habitat and climate of DSNP makes a hotspot for Butterfly fauna.²⁶ Early European lepidopterists explored this biodiversity hotspot between 1840 and 1950. A total of 125 species are found in DSNP; amongst these Cornelian (*Deudorix epijarbas amatius*), Common Duffer (*Discophora sondaica*) are protected under Schedule I (part IV), Common Gem (*Poritia hewitsoni*), Assam Banded Lineblue (*Prosotas aluta coelestis*), Royal Cerulean (*Jamides caerulea*), Chinese Branded Swift (*Pelopidas sinensis*), Pea Blue (*Lampides boeticus*), Pointed Ciliate Blue (*Anthene lycaenina*), Broad-bordered Sylhet Oakblue (*Arhopala silhetensis silhetensis*), Broad-bordered Dusted Oakblue (*Arhopala bazaloides bazaloides*), Common Onyx (*Horaga onyx*), Chinese Bushbrown (*Mycalesis gotama*), Myanmarese Wizard (*Rhinopalpa polynice birmana*), Assam Unbroken Sergeant (*Athyma pravara acutipennis*), Blackvein Sergeant (*Athyma ranga*), Grey Count (*Tanaecia lepidea*) are in Schedule II (part II) and Striped Blue Crow (*Euploea mulciber*), Complete Paint-brush Swift (*Baoris farri*), Chinese Branded Swift (*Pelopidas sinensis*) listed in Schedule IV of Wildlife Protection Act, 1972.²⁷

Dibru-Saikhowa National Park houses numerous species of unique & endangered mammals such as Chinese Pangolin, Wild Water Buffalo, Dhole, Asian Elephants, Tigers, Bengal Slow Loris, Western Hoolock Gibbon, South Asian River Dolphin, Hog Deer etc.²⁸ It is a key protected area for the Endangered Wild Water Buffalo (*Bubalus arnee*). Assam is the stronghold of the wild water buffalo in the world having 4-5th of the known population.²⁹ Primate species present in Dibru-Saikhowa National Park are Slow Loris (*Nycticebus coucang*), Southern Pig-tailed Macaque (*Macaca nemestrina*), Rhesus Macaque (*Macaca mulatta*) Assamese Macaque (*Macaca assamensis*), Capped Langur (*Trachypithecus pileatus*) and Western Hoolock Gibbon (*Hoolock hoolock*)³⁰. Some of the key fauna of the Dibru-Saikhowa National Park includes Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Sloth Bear (*Melursus ursinus*), Barking Deer (*Muntiacus muntjak*), Hog Deer (*Axis porcinus*), Great Indian one horned rhinoceros (*Rhinoceros unicornis*), Pygmy hog (*Parcula salvanius*). The national park

²⁴ Choudhury, A. (1998). Mammals, birds and reptiles of Dibru-Saikhowa Sanctuary, Assam, India. *Oryx*, 32(3), 192-200
²⁵ Nongmalthem, R. & Lodhi, Mahendra & Samal, Prasanna & Dhyani, P.P. & Sharma, Subrat. (2016). Faunal diversity and threats of the Dibru-Saikhowa Biosphere Reserve: A study from Assam, India. 7. 523-532
²⁶ Evans, W. H. 1932. *The Identification of Indian Butterflies*. (Second Edition). Bombay Natural History Society, Mumbai, India. 454 pp.
²⁷ Das, G. N., Tamuly, T., Hussain, A., Boruah, A. & Das, S. 2017. An update list of butterflies (Lepidoptera) of Dibru-Saikhowa National Park, North-East India. *Munis Entomology & Zoology*, 12 (2): 408-418
²⁸ Integrated Biodiversity Assessment Tool Proximity Report Oil India Limited Project
²⁹ Choudhury, A. Upward trend in numbers of the wild water buffalo (*Bubalus arnee*)
³⁰ Choudhury A. (2001) Primates in Northeast India: An Overview of their Distribution and Conservation Status. *Wildlife and Protected Areas* 1(1), 92-101

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shelters a small population of feral horses as well. ³¹ Elephants use the Dibru-Deomali elephant corridor for migration. The Dibru-Deomali elephant corridor includes D' Ering WLS, Jonai and Kobo Chapori areas (Assam), Dibru-Saikhowa National Park, Joypur RF and Deomali Forest Division. Consequently, this whole area is under the Dibru-Deomali Elephant Reserve³².

Two aquatic mammals were reported from in the study area, they are Eurasian otter (*Lutra lutra*) and Gangetic Dolphin (*Platanista gangetica*). Both of these two animals can only be encountered in the Brahmaputra River and the numerous streams flowing through the DSNP.

Reptiles species of the Dibru-Saikhowa National Park are Bengal Monitor Lizards (*Varanus bengalensis*), Common monitor lizard (*Varanus salvator*), Assam Roofed Turtle (*Pangshura sylhetensis*), Brown roof turtle (*Pangshura smithii*), Narrow-headed softshell (*Chitra indica*), Southeast asian box turtle (*Cuora amboinensis*), Spotted pond turtle (*Geoclemys hamiltonii*), Asian leaf turtle Indian (*Cyclemys dentata*), Gharial (*Gavialis gangeticus*), King cobra (*Ophiophagus hannah*) and Indian Rock Python (*Python molurus*) etc.²⁴

A total of 64 genera and 104 species of fish fauna belonging to 29 families and 11 orders are recorded from National Park. The family Cyprinidae exhibited a maximum number of species, followed by the family Bagridae, family Channidae, family Sisoridae species. The dominant genera are *Chanda*, *Labeo*, *Puntius*, *Mystus* and *Barilius*.³¹ Amphibians such as Common Indian Toad (*Duttaphrynus melanostictus*), Common Indian Bull Frog (*Hoplobatrachus tigerinus*), Field Frog (*Limnonectes limnocharis*), and Tree Frog (*Ploypedates leucomystax*) are observed in the NP area.³¹

Following table of Key Biodiversity Areas is generated by using IBAT (Integrated Biodiversity Assessment Tool Proximity Report) on 08 July 2021 (GMT) that includes full list of protected areas, Key Biodiversity Areas in the 10 km buffer of the study area.

Area name	Distance
Bherjan-Borajan-Podumoni Wildlife Sanctuary	10 km
Dibru - Saikhowa Complex	10 km
Maguri and Motapung Beels	10 km

Following table of species is generated by using IBAT (Integrated Biodiversity Assessment Tool Proximity Report) on 08 July 2021 (GMT) that includes full list of threatened species are potentially found in the protected areas & Key Biodiversity Areas in the 50 km buffer of the study area.

TABLE 15 LIST OF SPECIES IS GENERATED BY USING IBAT IN THE 50 BUFFERS OF THE STUDY AREA

Sr. No.	Common Name	Scientific Name	IUCN Status	Population Trend	Biome
Flora					
1	Love Apple	<i>Paris polyphylla</i>	VU	Decreasing	Terrestrial

³¹ Nongmaithem, R. & Lodhi, Mahendra & Samal, Prasanna & Dhyani, P.P. & Sharma, Subrat. (2016). Faunal diversity and threats of the Dibru-Saikhowa Biosphere Reserve: A study from Assam, India. 7. 523-532

³² Bharath Sundaram et. al (2003) The Asian elephant (*Elephas maximus*): its habitat, status and distribution in Arunachal Pradesh, India

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2	-	<i>Oryza malampuzhaensis</i>	VU	Decreasing	Terrestrial
3	Atlas Daisy	<i>Anacyclus pyrethrum</i>	VU	Decreasing	Terrestrial
4	-	<i>Magnolia pealiانا</i>	EN	Decreasing	Terrestrial
5	-	<i>Magnolia gustavii</i>	CR	Decreasing	Terrestrial
Birds					
1	Baer's Pochard	<i>Aythya baeri</i>	CR	Decreasing	Freshwater
2	Bengal Florican	<i>Houbaropsis bengalensis</i>	CR	Decreasing	Terrestrial
3	White rumped Vulture	<i>Gyps bengalensis</i>	CR	Decreasing	Terrestrial
4	Red-headed Vulture	<i>Sarcogyps calvus</i>	CR	Decreasing	Terrestrial
5	White-bellied Heron	<i>Ardea insignis</i>	CR	Decreasing	Terrestrial, Freshwater
6	Yellow-breasted Bunting	<i>Emberiza aureola</i>	CR	Decreasing	Terrestrial, Freshwater
7	Manipur Bush-quail	<i>Perdica manipurensis</i>	EN	Decreasing	Terrestrial, Freshwater
8	White-winged Duck	<i>Asarcornis scutulata</i>	EN	Decreasing	Terrestrial, Freshwater
9	Masked Finfoot	<i>Heliopais personatus</i>	EN	Decreasing	Terrestrial, Freshwater
10	Indian Skimmer	<i>Rynchops albicollis</i>	EN	Decreasing	Terrestrial, Freshwater
11	Black-bellied Tern	<i>Sterna acuticauda</i>	EN	Decreasing	Terrestrial, Freshwater
12	Pallas's Fish eagle	<i>Haliaeetus leucoryphus</i>	EN	Decreasing	Terrestrial, Freshwater
13	Steppe Eagle	<i>Steppe Eagle</i>	EN	Decreasing	Terrestrial
14	Greater Adjutant	<i>Leptoptilos dubius</i>	EN	Decreasing	Terrestrial, Freshwater
15	Swamp Grassbabbler	<i>Laticilla cinerascens</i>	EN	Decreasing	Terrestrial, Freshwater
16	Swamp Francolin	<i>Francolinus gularis</i>	VU	Decreasing	Terrestrial, Freshwater
17	Chestnut-breasted Partridge	<i>Arborophila mandellii</i>	VU	Decreasing	Terrestrial
18	Great Slaty Woodpecker	<i>Mulleripicus pulverulentus</i>	VU	Decreasing	Terrestrial
19	Rufous-necked Hornbill	<i>Aceros nipalensis</i>	VU	Decreasing	Terrestrial
20	Pale-capped Pigeon	<i>Columba punicea</i>	VU	Decreasing	Terrestrial
21	Sarus Crane	<i>Grus antigone</i>	VU	Decreasing	Terrestrial, Freshwater
22	River Tern	<i>Sterna aurantia</i>	VU	Decreasing	Terrestrial, Freshwater, Marine

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23	Greater Spotted Eagle	<i>Clanga clanga</i>	VU	Decreasing	Terrestrial, Freshwater
24	Eastern Imperial Eagle	<i>Aquila heliaca</i>	VU	Decreasing	Terrestrial, Freshwater
25	Lesser Adjutant	<i>Leptoptilos javanicus</i>	VU	Decreasing	Terrestrial, Freshwater, Marine
26	Grey-sided Thrush	<i>Turdus feae</i>	VU	Decreasing	Terrestrial
27	Marsh Babbler	<i>Pellorneum palustre</i>	VU	Decreasing	Terrestrial
28	Jerdon's Babbler	<i>Chrysomma altirostre</i>	VU	Decreasing	Terrestrial, Freshwater
29	Black-breasted Parrotbill	<i>Paradoxornis flavirostris</i>	VU	Decreasing	Terrestrial, Freshwater
30	Slender-billed Vulture	<i>Gyps tenuirostris</i>	CR	Decreasing	Terrestrial
Mammals					
1	Chinese Pangolin	<i>Manis pentadactyla</i>	CR	Decreasing	Terrestrial
2	Wild Water Buffalo	<i>Bubalus arnee</i>	EN	Decreasing	Terrestrial, Freshwater
3	Asian Elephant	<i>Elephas maximus</i>	EN	Decreasing	Terrestrial
4	Dhole	<i>Cuon alpinus</i>	EN	Decreasing	Terrestrial
5	Tiger	<i>Panthera tigris</i>	EN	Decreasing	Terrestrial
6	Bengal Slow Loris	<i>Nycticebus bengalensis</i>	EN	Decreasing	Terrestrial
7	Western Hoolock Gibbon	<i>Hoolock hoolock</i>	EN	Decreasing	Terrestrial
8	South Asian River Dolphin	<i>Platanista gangetica</i>	EN	Unknown	Freshwater
9	Hog Deer	<i>Axis porcinus</i>	EN	Decreasing	Terrestrial, Freshwater
10	Mishmi Hills Hoolock Gibbon	<i>Hoolock hoolock ssp. mishmiensis</i>	EN	Decreasing	Terrestrial
11	Blond-bellied Langur	<i>Trachypithecus pileatus ssp. pileatus</i>	EN	Decreasing	Terrestrial
12	Gaur	<i>Bos gaurus</i>	VU	Decreasing	Terrestrial
13	Sun Bear	<i>Helarctos malayanus</i>	VU	Decreasing	Terrestrial
14	Stump-tailed Macaque	<i>Macaca arctoides</i>	VU	Decreasing	Terrestrial
15	Clouded Leopard	<i>Neofelis nebulosa</i>	VU	Decreasing	Terrestrial
16	Leopard	<i>Panthera pardus</i>	VU	Decreasing	Terrestrial
17	Fishing Cat	<i>Prionailurus viverrinus</i>	VU	Decreasing	Terrestrial, Freshwater
18	Greater One-horned Rhino	<i>Rhinoceros unicornis</i>	VU	Decreasing	Terrestrial
19	Capped Langur	<i>Trachypithecus pileatus</i>	VU	Decreasing	Terrestrial
20	Asiatic Black Bear	<i>Ursus thibetanus</i>	VU	Decreasing	Terrestrial

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21	Northern Pig-tailed Macaque	<i>Macaca leonina</i>	VU	Decreasing	Terrestrial
22	Binturong	<i>Arctictis binturong</i>	VU	Decreasing	Terrestrial
23	Sambar	<i>Rusa unicorn</i>	VU	Decreasing	Terrestrial
24	Asian Small-clawed Otter	<i>Aonyx cinereus</i>	VU	Decreasing	Terrestrial, Freshwater, Marine
25	Western Hoolock Gibbon	<i>Hoolock hoolock ssp. hoolock</i>	VU	Decreasing	Terrestrial
Reptiles					
1	Spotted Pond Turtle	<i>Geoclemys hamiltonii</i>	EN	Decreasing	Terrestrial, Freshwater
2	Tricarinate Hill Turtle	<i>Melanochelys tricarinata</i>	EN	Decreasing	Terrestrial, Freshwater
3	Indian Eyed Turtle	<i>Morenia petersi</i>	EN	Decreasing	Terrestrial, Freshwater
4	Indian Softshell Turtle	<i>Nilssonina gangetica</i>	EN	Decreasing	Terrestrial, Freshwater
5	Black Softshell Turtle	<i>Nilssonina nigricans</i>	CR	Decreasing	Terrestrial, Freshwater
6	Gharial	<i>Gavialis gangeticus</i>	CR	Decreasing	Terrestrial, Freshwater
7	Assam roofed Turtle	<i>Pangshura sylhetensis</i>	CR	Decreasing	Terrestrial, Freshwater
8	Southeast Asian Box turtle	<i>Cuora amboinensis</i>	EN	Decreasing	Terrestrial, Freshwater
9	Indian Peacock Softshell Turtle	<i>Nilssonina hurum</i>	EN	Decreasing	Terrestrial, Freshwater
10	Keeled Box Turtle	<i>Cuora mouhotii</i>	EN	Decreasing	Terrestrial, Freshwater
11	Mugger	<i>Crocodylus palustris</i>	VU	Stable	Terrestrial, Freshwater
12	King cobra	<i>Ophiophagus hannah</i>	VU	Decreasing	Terrestrial
Amphibians					
1	Rotung Oriental Frog	<i>Ingerana borealis</i>	VU	Decreasing	Terrestrial, Freshwater
Fishes					
1	-	<i>Devario horai</i>	EN	Decreasing	Freshwater
2	-	<i>Lepidocephalichthys arunachalensis</i>	EN	Unknown	Freshwater
3	-	<i>Amblyceps arunachalensis</i>	EN	Unknown	Freshwater
4	-	<i>Tor putitora</i>	EN	Decreasing	Freshwater
5	-	<i>Wallago attu</i>	VU	Decreasing	Freshwater
6	-	<i>Bagarius yarrelli</i>	VU	Decreasing	Freshwater
7	-	<i>Aborichthys tikaderi</i>	VU	Unknown	Freshwater
8	-	<i>Devario assamensis</i>	VU	Unknown	Freshwater

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Crustaceans					
1	-	<i>Liotelphusa quadrata</i>	VU	Unknown	Freshwater

Data used to generate the IBAT report is as follows:

- UNEP-WCMC and IUCN, 2021. Protected Planet: The World Database on Protected Areas (WDPA)[On-line], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net - July 2021.
- BirdLife International (on behalf of the KBA Partnership), 2021. Key Biodiversity Areas - April 2021. IUCN, 2021.
- IUCN Red List of Threatened Species - April 2021

Bherjan-Borajan-Podumoni Wildlife Sanctuary, Maguri Motapung Beel, and Dibru - Saikhowa National Park along with Dibru River provide important aquatic habitats for birds, butterflies, fish, amphibians, reptiles, and mammals.

Species Richness Map

The forest habitat shows the highest species richness having an overall good diversity compared to others. It is followed by waterbodies which is a congregation point of many migratory and resident birds like Ruddy Shelduck (*Tadorna ferruginea*), Glossy Ibis (*Plegadis falcinellus*), Purple Swampphen (*Porphyrio porphyrio*), Mallard (*Anas platyrhynchos*), Eurasian Wigeon (*Mareca penelope*), Wagtails, Egrets, Jacanas etc. Human dominated Built-up areas show the least species richness. Pad 1, 2 and 3 lies in the Cropland, homestead plantation and tea plantation respectively and shows medium to low species richness.

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The species richness was mapped according to their presence of in the habitats.

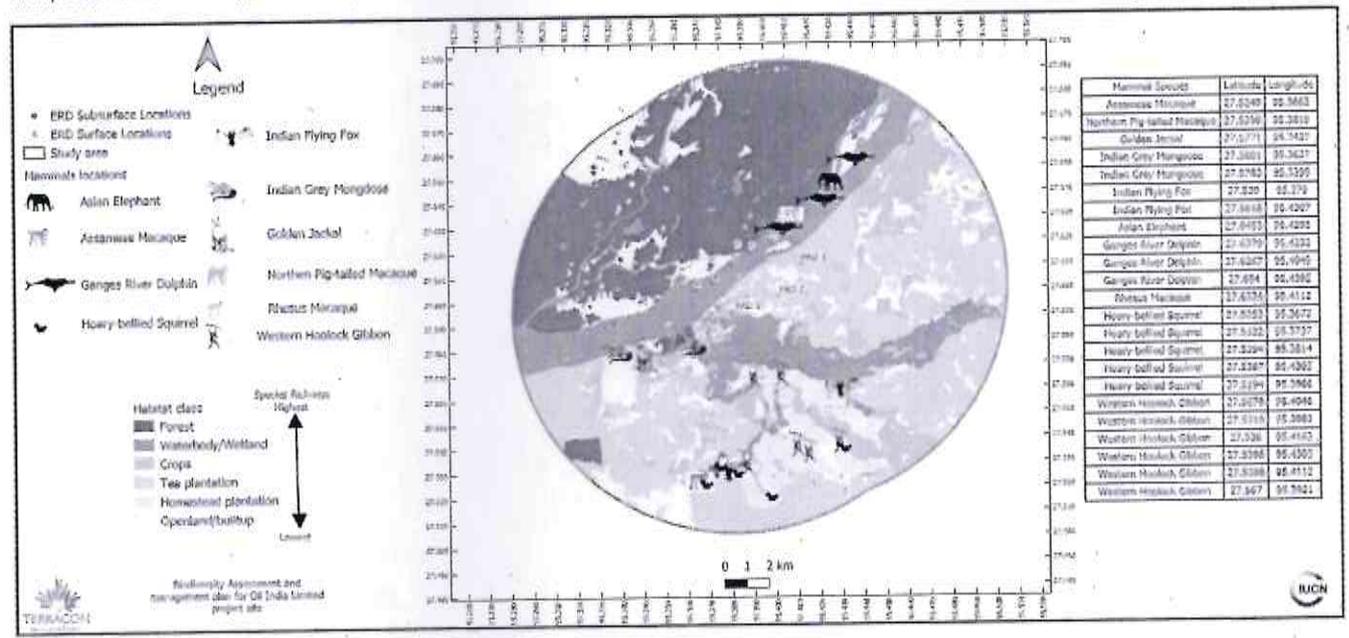


FIGURE 5: SPECIES RICHNESS MAP

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Analysis

To gain a perspective on the population trend of various species present in the study area, relative frequency and relative density i.e. frequency and density of each species for frequencies and densities of all the species of taxa found in the study area, are considered. These values give us the species of fauna and flora that is encountered most commonly (relative frequency value) and in most numbers (relative density value).

The floral diversity of the study area shows a wide spectrum, from species of scrubland forests, dry deciduous forests to species of riparian habitats. The floral diversity is bound to change as per seasonal changes.

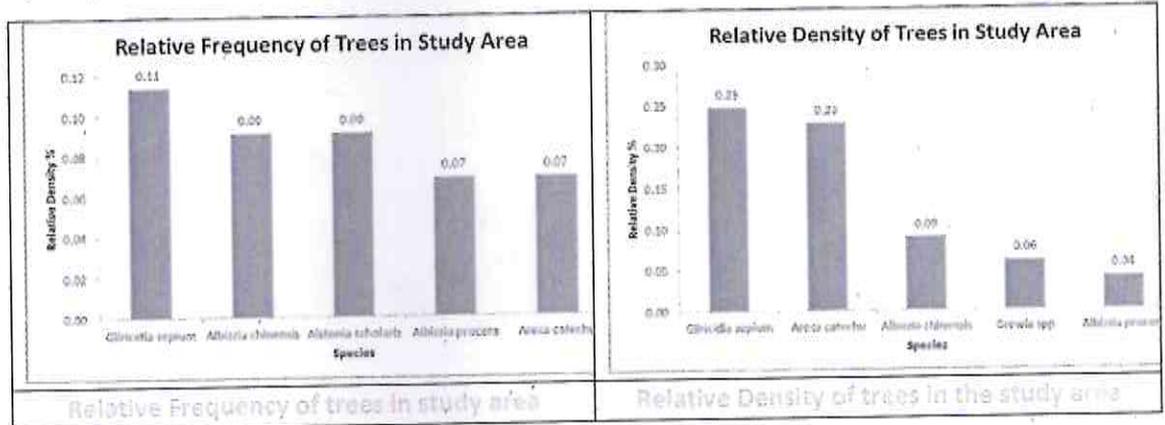
The present study was carried out in August and December, representing monsoon and winter vegetation and related fauna respectively. Analysis of recorded population and diversity in the study area is discussed in this section.

Flora – Season 1 (Monsoon)

Trees

The quantitative analysis involves calculation of relative density, relative for the recorded population of floral and faunal biodiversity. These values indicate species with densest population, most frequently encountered species and areas with good biodiversity.

For primary data collection, circular plot of 10m radius was laid for trees. Considering the same center, another circle of 5m radius was taken for the shrubs. On the periphery to the shrub circle, total four-square plots of 1X1 sq. were placed radially, for herbs.



Relative frequency of trees in study area

Alstonia Scholari was observed in all plots. *Albizzia chinensis* is common tree species in tea gardens. *Areca catechu* with good density is restricted to the homestead tea gardens. Good density of *Gliricidia sepium* is only observed near Pad II and Barekuri Gibbon Park area. In study area, forest plots being few, wild trees are not showing dominance in graph.

Relative density of trees in the study area

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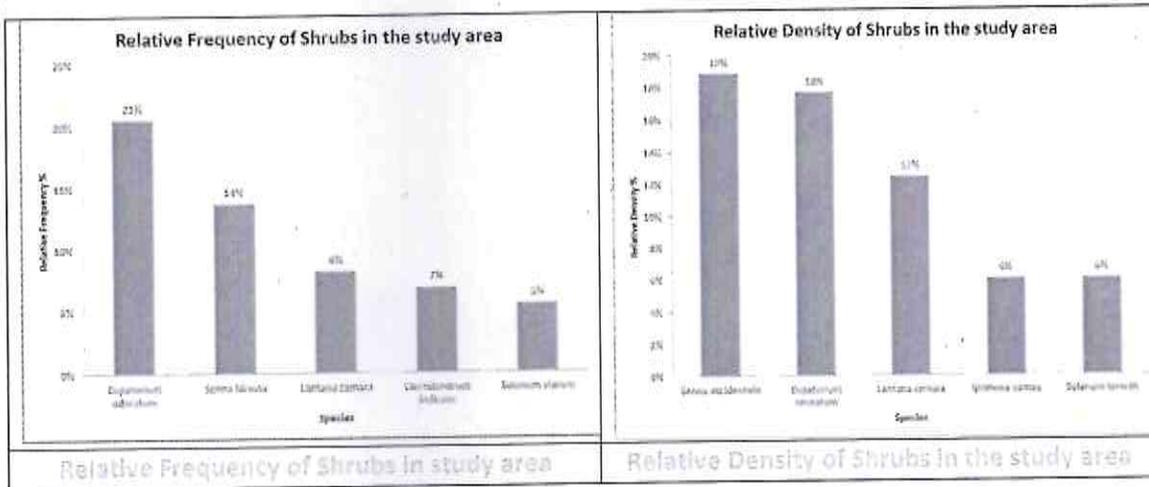


With respect to the data analysed, spreads to trees species seems to be even. *Albizzia chinensis* is common trees in the study area planted in the tea estates. *Alstonia scholaris*, *Albizzia procera* and *Gliricidia sepium* are dominant in landscape. *Areca catechu* is reported from Homestead tea gardens.

Shrubs

Relative frequency of Shrubs in study area

Eupatorium and *Senna hirtua* is widely spread in the landscape. *Lantana camara*, *Senna occidentalis* and *Solanum viarum* are common species in forest landscape. Shrub community is evenly distributed.



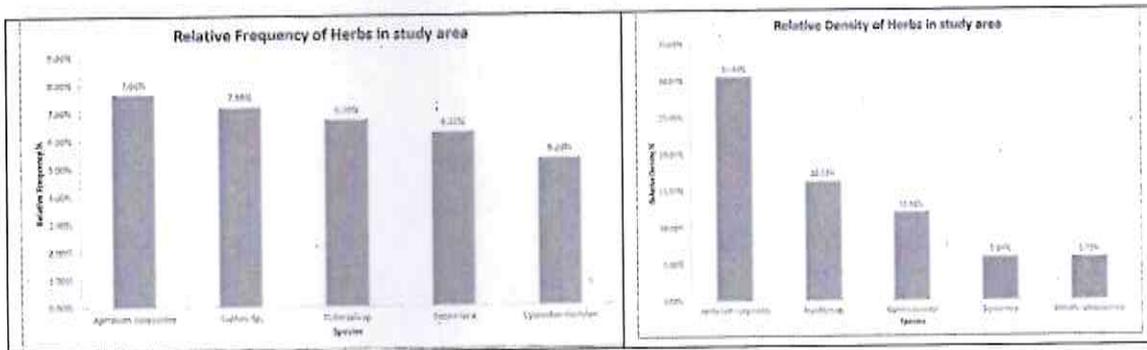
Relative density of Shrubs in the study area

Eupatorium odoratum, *Lantana camara* and *Senna occidentalis* all three alien invasive species has invaded the study area. *Ipomoea carnea* is dominant in wetland habitat.

Herbs

Relative frequency of Herbs in study area

Ageratum conyzoides shows its dominance in all the landscapes. *Aspidium sp.* and *Asplenium nidus* are dominant in forest landscapes whereas, *Senna tora* and *Cleome rutidosperma* forms the dominant around waterbodies. Moreover, the species dominance seems to be even in the respective landscape.



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Relative Frequency of Herbs in study area	Relative Density of Herbs in the study area
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Relative density of Herbs in the study area

With respect to the data analysed, the herbs community seems to be distributed evenly, through the landscape in their respective habitat.

Fauna – Season 1 (Monsoon)

Birds

	<p>In Monsoon Season, omnivores and insectivores' birds like Common myna (<i>Acridotheres tristis</i>), Cattle Egret (<i>Bubulcus ibis</i>), Red Vented Bulbul (<i>Pycnonotus cafer</i>), Rufous Treepie (<i>Dendrocitta vagabunda</i>), Jungle myna (<i>Acridotheres fuscus</i>) were common seen throughout the study area.</p>
<p>Relative frequency of Birds in study area</p>	
<p>Relative density of Birds in the study area</p> <p>This is be due to ground-foraging habits of most of the above-mentioned bird and greater availability of insects and flies during the monsoon season in the tea plantation, croplands and wetlands. Huge flocks of Barn swallow (<i>Hirundo rustica</i>) and Jungle myna (<i>Acridotheres fuscus</i>) were found in the wetlands and agricultural areas hence showing the high density.</p>	

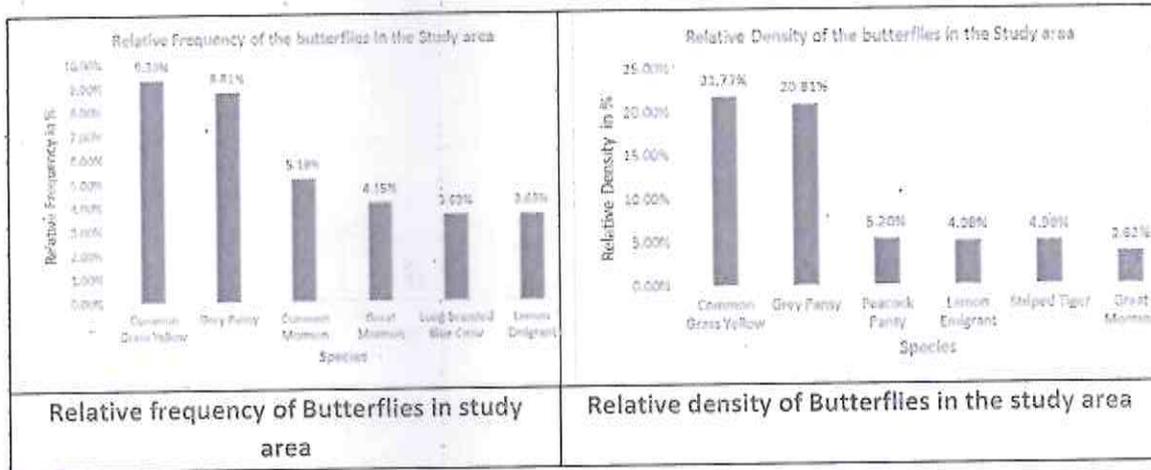
Butterflies

Common Grass yellow (*Eurema hecabe*) and Grey Pansy (*Junonia atlites*) were found to have the highest frequency and highest density due to availability of large source of both nectar and food plants, in tea plantation and forested areas. Swallowtails such as Great Mormon (*Papilio memnon*) and Common Mormon (*Papilio polytes*) are also attracted to the flowering trees throughout the study area. The adults usually fly rapidly at tree-top height, except when they come down to feed at flowering bushes or to look for oviposition sites. *Citrus maxima* is a host plant for these two *Papilio*

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species, was found throughout the study area. Availability of wet patches for mud puddling along with abundant herbs added to the high species number.



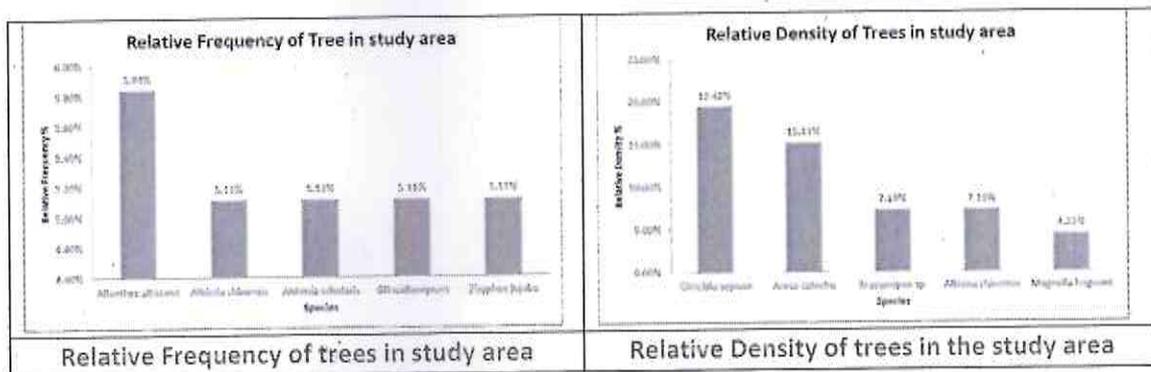
Flora – Season 2 (Winter)

Trees

Relative frequency of trees in study area

Distribution of tree species is even through the landscape. *Albizia chinensis* is common trees planted in the tea estates.

Alstonia scholaris, *Albizia procera*, *Ailanthus altissima* and *Gliricidia sepium* are not dominant in landscape but individuals are reported at many places showing their presence in most of the area. *Areca catechus* are reported from Homestead tea gardens. *Gliricidia sepium* is invasive in in Australia, Hawaii, the Philippines, Cook Islands, French Polynesia, Tonga, Singapore, Comoros, and Trinidad and Tobago. The plant is seen to have negative effects on native flora and fauna.³³



Relative density of trees in the study area

³³ <https://www.cabi.org/isc/datasheet/25380#tosummaryOfinvasiveness>

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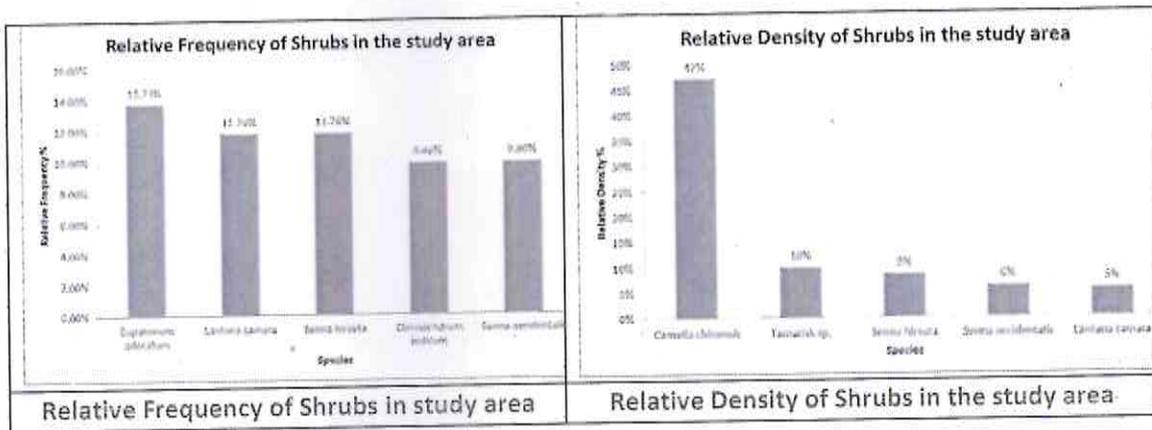


Tea gardens occupies the majority of the region in the study area. *Albizzia chinensis* is common tree species in tea gardens. Eventhough the tea landscape is vast, density of *Albizzia chinensis* is low in the data collected. The reason for this can be given as the large spacing between two individuals planted of the tree in the tea plantation. *Areca catechu* with good density is restricted to the homestead tea gardens. Good density of *Gliricidia sepium* is only observed near Pad II and Barekuri Gibbon Park area. In study area, forest area being few, wild trees are not showing dominance in graph even though they are forming good dense community.

Shrubs

Relative frequency of Shrubs in study area

Shrub community is showing even distribution across the study area. *Eupatorium odoratum*, *Lantana camara*, *Senna hirsuta* and *Senna occidentalis* are frequently distributed over the landscape. *Clerodendrum indicum* was mostly observed along the agriculture and forest.



Relative density of Shrubs in the study area

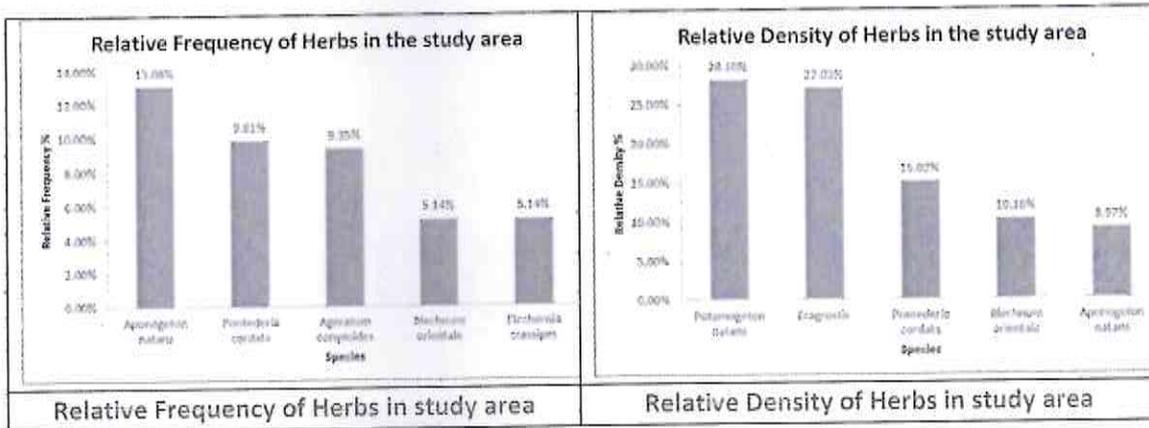
Tea plant (*Camellia sinensis*) is observed in large quantities due to Tea plantation. Other species *Senna hirsuta*, *Senna occidentalis* and *Lantana camara* are showing even dominance in all landscapes whereas, *Tamrisk* occupies the periphery of all water bodies.

Herbs

Relative frequency of Herbs in study area

Ageratum conyzoides were recorded all habitats. Waterloving species like, *Pontederia cordata*, *Aponogeton natans* were observed where ever the water was accumulated in small pools. Other herbs community is evenly distributed in the study area.

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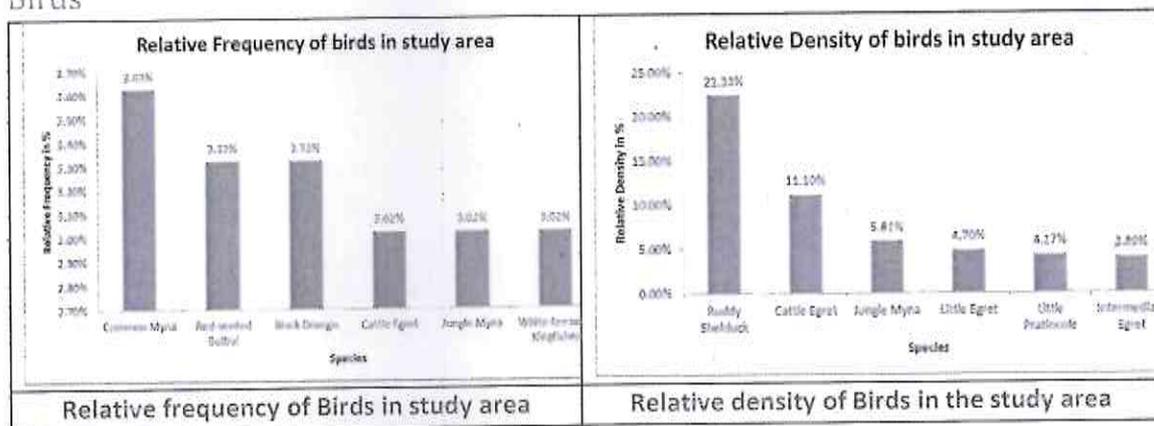
Relative density of Herbs in study area

Water loving species *Potamogeton natans* and *Pontederia cordata* are found in the agriculture plots where water was accumulated, and around the Maguri-Motapung beels (Wetland). Other herb community showed the even dominance in all habitats.

Herb diversity is high across the all habitats, but in terms of density herbs are low. The probable reason for the low density could be the removal of herbs species from the tea plantations and home stead gardens which covers the large area of study area.

Fauna- Season 2 (Winter)

Birds



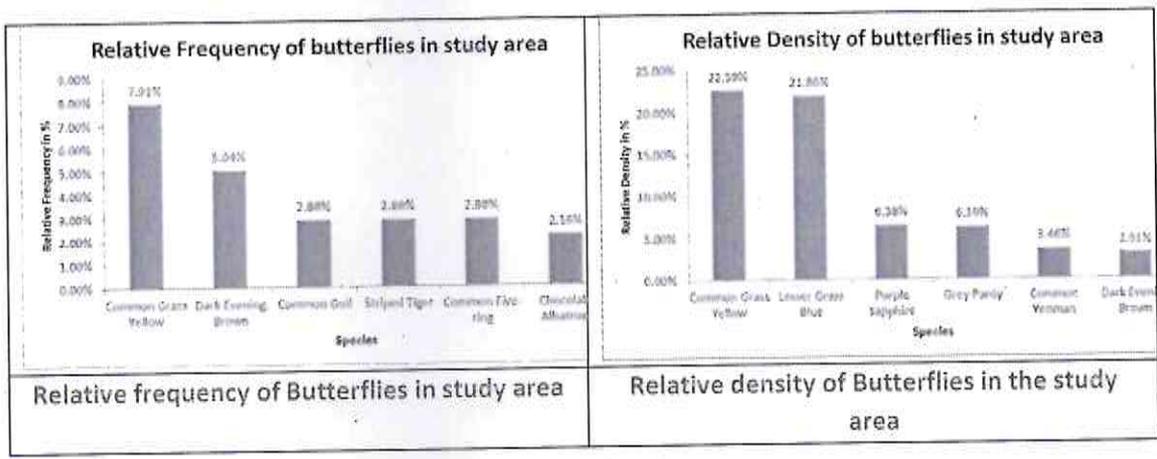
In Season two omnivores and insectivores' birds like Common myna (*Acridotheres tristis*), Black drongo (*Dicurus macrocerus*), Cattle Egret (*Bubulcus ibis*), Red Vented Bulbul (*Pycnonotus cafer*), Jungle myna (*Acridotheres fuscus*) were common seen throughout the study area. Agriculture area, tea plantation and wetland provided steady microclimate and food supply for insect.

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Huge flocks of Ruddy shelduck (*Tadorna ferruginea*), more than 500 individuals, were observed in Maguri Motapung Beel and also isolated pairs were observed at the other wetlands of the study area, hence showing the highest density in the season two. Ruddy shelduck (*Tadorna ferruginea*) is an extreme high-altitude migrant. Asian populations of this bird are mostly migratory in nature which migrates to winter at lower latitudinal and altitudinal freshwater or saline water sources, grasslands, marshlands, open steppe, upland plateaus and mountainous regions reaching up to 5000m in Himalayas in India.

Butterflies



Common Grass yellow (*Eurema hecabe*) was found to be the one with highest frequency and highest density due to availability of flowering plants species such as *Sida acuta*, *Eupatorium odoratum*, *Leucas sp.*, *Mikania micrantha*, *Sena tora*, *tectona grandis*, and *Leea spp.*

Many morphs of Dark Evening Brown (*Melanitis phedima*) were seen throughout the study area; as the host plants from family Poecce were in greater numbers in the study area. Purple Sapphire (*Heliophorus epicles*) was seen in abundantly in the Podumoni region of Bherjan-Borajan-Podumoni Wildlife Sanctuary.

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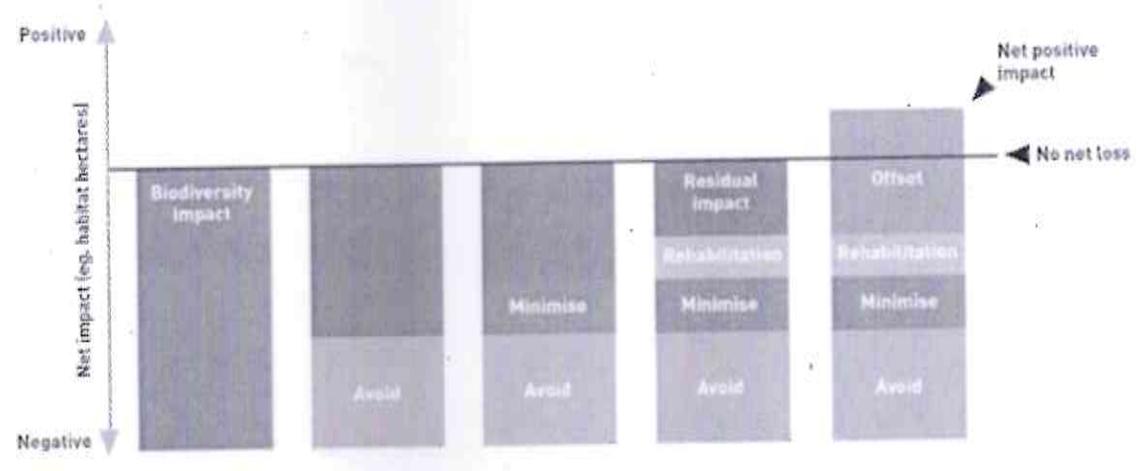


Biodiversity Impact Assessment Approach

The Mitigation Hierarchy

The mitigation hierarchy is a set of guidelines, established through the International Finance Corporation's Performance Standard 6, meant to help development projects prepare mitigation measures for impacts with the aim to reduce negative impacts on biodiversity. The hierarchy follows avoidance, minimization, restoration/rehabilitation, and offsets in order to compensate for development impacts and negative effects on the environment.

Stage of mitigation hierarchy has been provided as below:



Avoidance

This measure is based on the prevention of impacts so they do not occur or do not negatively affect environmentally sensitive areas.

Minimisation

This measure intends to reduce duration, intensity, and extension of impact.

Rehabilitation/ Restoration

This measure is focused on bringing back affected areas to their initial conditions.

Offset

When previous mitigation actions have been effectively implemented, the residual impact could be managed through an offset measure.

Impact Assessment Criteria

The activities associated with oil and gas exploration, development, production generates diverse range of environmental changes, and many times these changes are irreversible. The most common environmental problems associated with industrial activities are conversion of land, deforestation, soil erosion, disturbance to surface and ground water system of the area, visual intrusion, water, air, and

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noise pollution, soil contamination, reduction of faunal and floral diversity and abundance due to habitat loss and degradation, increased risk of public health hazards and resource.

This report assessed and identified the potential impacts on the environment that could be anticipated from the planned oil & gas exploration drilling activity in ERD Surface Locations in Baghjan Petroleum Mining Lease (PML), Tinsukia District, Assam.

Biodiversity Impact Assessments are standard processes of analysing the impacts or potential impacts of projects on the existing environment. Through identifying the type and magnitude of impacts, mitigation measures can be developed accordingly. The methodology is adopted from IUCN Biodiversity Indicator and Reporting System (BIRS) report.³⁴

The impact assessment process consisted of three steps:

- A. **Identification of Potential Impacts:** A thorough secondary literature review was carried out to determine the possible impacts of the oil and gas exploration on biodiversity. The identified impacts were then screened and classified according to the phases and activities involved in the operations. During the primary survey, the study area was assessed against the pre-identified impacts and their relevance to the site.
- B. **Categorization of Impacts:** The identified impacts were screened through likelihood, severity and potential of mitigation using biodiversity impact matrix. This step helps in justifying the significance of a particular impact.
- C. **Biodiversity Risk Assessment:** This stage involves assessment of risk to biodiversity in the study area from exploration activities. The determination of the risk category will be based on two factors:
 - Biodiversity Importance Category (BIC) of site
 - Severity and Likelihood of the Potential Impact

This would lead to formation of biodiversity risk matrix to identify the level of risk to biodiversity due to this impact. The risk is then summed up based on their severity.

³⁴ <https://portals.iucn.org/library/sites/library/files/documents/2014-055.pdf>

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Identification of Potential Impacts

The impacts on biodiversity attributes are identified and evaluated considering the types and magnitude of exploration operation. In general, impact prediction methods argue that the foremost step in impact appraisal must consider and identify activities that are likely to bring significant changes in the environmental conditions of the exploration site. Both planned and unplanned operations of Baghjan PML - ERD Surface Locations were screened and analysed for all possible impacts. The broader types of impact on the biodiversity are identified under activities carried out for different phases:

TABLE 16 PLANNED AND UNPLANNED OPERATIONS OF BAGHJAN PML - ERD SURFACE LOCATIONS

Phase of the project	Activities under each phase
Pre-drilling Phase	Removal of vegetation
	Emission of fugitive dust and deposition on vegetation
	Storage of construction materials
	Handling of oil, chemical and waste
	Operation of construction machinery/equipment
	Widening of approach road
	Vehicular movement
Drilling Phase	Spillage of chemical, spent mud, hazardous waste
	Operation of DG sets
	Vehicular movement
	Generation of Wastewater
	Alternation of existing illumination levels
	Removal of ground water
Decommissioning Phase	Increased noise generation
	Disposal of decommissioning waste materials
	Emission of fugitive dust and deposition on vegetation
	Improper closing of the well
	Disposal of construction waste
	Demobilization activity
	Vehicular movement

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Biodiversity Impact Matrix

After the identification of relevant impact, the evaluation of severity of these impacts is carried out based on two factors:

a) The likelihood of the impact on Habitat/ecosystems and/or species and

Species	<ul style="list-style-type: none"> Globally threatened/Scheduled species as per the WPA, 1972 in the area. Presence of restricted-range species. Invasive non-native species. Species used by local communities.
Habitat/Ecosystem	<ul style="list-style-type: none"> Operational site overlaps with conservation priority areas. Habitat contributing to species ecology (critical habitats).

b) The magnitude of impact which accounts for the type of the impact and the potential to which this impact could be mitigated through targeted measures.

The type of impact considers the following aspects:

Impact extent/scale	<ul style="list-style-type: none"> Entire habitat loss Partial habitat loss Specific area affected in the habitat
Direct or indirect impact	<ul style="list-style-type: none"> Direct mortality of individuals due to site activities Indirect mortality of individuals from reduced prey resources due to pollution of watercourses
Frequency of impact	<ul style="list-style-type: none"> Single event Recurring Constant
Duration of impact	<ul style="list-style-type: none"> Short-term Medium-term Long-term Permanent

c) The magnitude of impact can be categorised according to the following definitions:

Major / Irreversible or Very Difficult to Mitigate	An impact resulting in a permanent effect on the distribution and/or abundance of a habitat, species assemblage/community or population, in such a way as to alter the integrity of the feature and its conservation status. This type of effect would reduce the integrity of the feature and its conservation status.
Moderate / Difficult to Mitigate	An impact resulting in a long-term but reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population. This type of effect would have neutral long-term implications for the integrity of the feature or its conservation status.

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Minor / Easily Mitigated or Reversed Naturally	An impact resulting in a short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population.
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The biodiversity impact matrix is used to analyze each impact and assign the category based on the severity. It plots Likelihood of Impacts on the Y-axis and Magnitude of Impacts on X-axis. Likelihood of Impacts is further broken down into three components: **Certain/Likely; Somewhat Likely and Unlikely**, whilst the magnitude of impact is as described in the definitions above.

		Magnitude of Impact		
		Major / Irreversible or Very Difficult to Mitigate	Moderate / Difficult to Mitigate	Minor / Easily Mitigated or Reversed Naturally
Likelihood of Impact (In Absence of Action Plan)	Certainly / Likely	(A) Very High	(B) High	(D) Low
	Somewhat Likely	(A) Very High	(C) Medium	(D) Low
	Unlikely	(B) High	(D) Low	(D) Low

(IUCN's biodiversity measurement methodology Biodiversity Indicator Reporting System (BIRS))

The assessment of impact through Biodiversity Impact Matrix resulted in assigning the category to each impact relevant to the study area.

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The output of the Biodiversity Impact Identification and Matrix for ERD surface locations is presented below:

TABLE 17 BIODIVERSITY IMPACT IDENTIFICATION AND MATRIX

Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
Impact 1	There will be increase in the ambient noise levels ¹ in and around the drill sites due to the project activities, which will lead to changes in abundance, disruption of species' communication, breeding, nesting and roosting patterns.	1) Heavy construction machinery 2) Vehicular Movement 3) Drilling activities 4) Diesel engines for power generation 5) Mud Pumps 6) Air Compressors	Operations Decommissioning	Certainly/ Likely	Moderate	High
Impact 2	Increase in underwater noise and vibration in the river water by the equipment and machinery used during the drilling would be most noticeable in the immediate surrounding area and would hamper the natural movement of dolphins, fishes, and turtles, which would prevent them from meeting their biological requirements. It may also affect the echolocation properties of dolphins.			Somewhat Likely	Moderate	Medium

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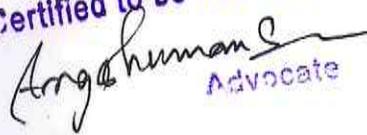


Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
Impact 3	Air pollutants can affect wildlife through the disruption of endocrine functions, organ injury, increased vulnerability to stresses and diseases, lower reproductive success, and possible mortality.	<ol style="list-style-type: none"> 1) Combustion of diesel in the diesel engines of power generators. 2) Flaring and burning of gas during the testing of well will lead to the release of pollutants including un-burnt hydrocarbons. 3) Dust and Air pollutants from vehicular exhaust. 4) Fugitive emission during Construction of waste pits, filling of site and handling of construction material, during drilling operations (loading, unloading, handling of drilling mud, chemical additives, cement and cement additives), from storages of volatile chemicals and fuels at site. 	Predrilling phase Operations Decommissioning	Somewhat Likely	Moderate	Medium
Impact 4	Wastewater and formation water will be generated during drilling activity, and the domestic wastewater from the labor camps which may contain chemical and biological	<ol style="list-style-type: none"> 1) Rig wash and dewatering of spent mud and washing of drill cuttings 2) Floor washings, pump, seal leakages, spillages will comprise of chemical 	Operations Decommissioning	Somewhat Likely	Moderate	Medium

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Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
	contaminants. If discharged untreated may adversely affect the surface water quality.	ingredients. 3) Domestic wastewater generation				
Impact 5	Surface run off from drilling waste (cuttings and drilling mud) storage areas, hazardous waste (waste oil, used oil, etc.) storage areas and chemical storage areas is likely to be contaminated and have potential to impact water quality of the receiving waterbody. This will affect the ecological sensitive area of the waterbody like migratory and resident bird habitats, fish habitat, breeding and nursing ground for fishes, and also habitat Gangetic Dolphin. Degradation of water quality will affect the primary productivity of the river	Solid waste Generated During project 1) Organic Kitchen Waste from Labor camps 2) Drill Cuttings and Waste Drilling Mud contacting Barite, Bentonite and Traces of Heavy metal 3) Acid – Lead Batteries used during drilling of well 4) Used & Waste oil 5) Packaging wastes like paper, plastic, cardboards etc. 6) Decommissioning waste	Operations Decommissioning	Somewhat Likely	Moderate	Medium
Impact 6	Contamination of soil due to spillage of hazardous waste, chemicals, cement, fuel, lubricants, (spent oil & used oil), batteries, e-waste and municipal			Somewhat Likely	Moderate	Medium

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Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
	waste affect the soil microbes and bacterial growth and can affect the soil quality.					
Impact 7	Spillage of drill cuttings, drilling mud and drilling fluid during storage on the nearby open soil may lead to change of soil characteristics due to chemical contamination.			Somewhat Likely	Minor	Low
Impact 8	Surface runoff during monsoon season from the construction site, construction material & waste storage area and spillage area have the potential to degrade soil quality due to deposition of foreign materials, hydrocarbon and other hazardous waste.			Somewhat Likely	Moderate	Medium
Impact 9	Kitchen Waste from Labor camps if not disposed properly can attract rodents, snakes, monkeys etc. which may lead to human-wildlife conflict on the site.			Somewhat Likely	Minor	Low
Impact 10	Change in Land use and species composition along with loss of native vegetation.	1) Removal of vegetation during construction of pads and Widening of approach	Pre-drilling phase	Likely	Major	Very high

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Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
Impact 11	Faunal dispersal and loss of feeding ground.	road and new infrastructure for drilling activities		Likely	Moderate	High
Impact 12	Site clearance and stripping of top soil during site construction may result in increase in soil erosion and loss of fertile soil.	2) Removal of top soil from the land procured during construction of pads and Widening of approach road		Somewhat Likely	Minor	Low
Impact 13	Increase in silt load in the surface run-off will in turn increase the suspended solids load on immediate surroundings which may affect local floral and faunal species and ecosystems. This may either enhance or reduce biomass of plankton communities. It may also affect photosynthetic abilities of phytoplanktons.			Somewhat Likely	Moderate	Medium
Impact 14	Illumination with artificial lighting as drilling is conducted continuously for 24 hours and thus may cause significant effects on local faunal species like: 1) they might abandon breeding or roosting. 2) Change in migratory patterns 3) Biological stress on animals	Alternation of existing illumination levels for 4 months during drilling	Operations	Likely	Minor	Low
Impact 15	Decreased habitat use and increase in the roadkill of native Fauna/livestock.	Increase in Vehicular traffic	Predrilling phase Operations	Likely	Major	Very high

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Biodiversity Impact Assessment Study at DSNP, Assam

Impact 16	Damage to existing nearby flora	Decommissioning	Likely	Major	Very high
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Impacts	Description	Activities	Phase	Likelihood of Impact	Magnitude of Impact	Impact category
Impact 17	Over use of ground water may lower the ground water table	Abstraction of ground water.	Operations	Somewhat Likely	Minor	Low
Impact 18	During drilling activity, different aquifer will be intersected which may get contaminated by chemicals, lubricants, oil etc.	Ground water cutting during drilling activity	Operations	Somewhat Likely	Moderate	Medium
Impact 19	Alteration of onsite micro-drainage pattern leading to potential problems of water logging in the agricultural land and low-lying areas, which may affect habitats of reptiles, and mortality of floral species.	Well site and Access roads will be raised to a height of one and half a meter more than the high flood level of past ten-twenty years	Predrilling phase Operations	Somewhat Likely	Minor	Low

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IN CASE OF EXTREME EVENTS VIZ. BLOWOUTS				
Impacts	Description	Likelihood of Impact	Magnitude of Impact	Impact category
Impact 20	Large amount of oil and associated pollutants will be discharged in the surrounding environment. (Such as Nitrogen, Sulphur dioxide, Carbon monoxide, HCOH (formaldehyde) etc.)	Likely	Moderate	High
Impact 21	Surrounding landscapes will be burned down due to explosion & blowout	Likely	Moderate	High
Impact 22	Sudden rise in the ambient temperature	Likely	Minor	Low
Impact 23	Oil spills may destroy nearby aquatic & terrestrial vegetation and dependant fauna	Likely	Major	Very high
Impact 24	Post blowout, inhalation or ingestion of toxic pollutants in mammals such as Gangetic River Dolphin, may to lead to physiological damage leading to death	Likely	Major	Very high
Impact 25	Inhalation or ingestion of toxic pollutants in the livestock post blowout may to lead to physiological damage leading to death.	Likely	Moderate	High
Impact 26	Avifauna can be affected due to external oiling, oil ingestion, and egg oiling and habitat changes. External oiling disrupts feather structure, causes matting of feathers, and produces eye and skin irritation.	Likely	Major	Very high
Impact 27	Oil exposure to Amphibians will affect their growth and avert the process of metamorphosis	Likely	Moderate	High
Impact 28	Oil layer on water will prevent absorption of atmospheric oxygen. Low dissolved oxygen levels	Likely	Minor	Low

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	will deteriorate aquatic ecosystem.			
Impact 29	Oil layer will gradually sink in the river bed, increasing the risk of Hydrocarbons bioaccumulate in aquatic organisms and affect the food chain	Likely	Major	Very high
Impact 30	Oil spills or discharges may either enhance or reduce biomass of plankton communities. It may also affect photosynthetic abilities of phytoplanktons.	Likely	Minor	Low
Impact 31	Increase in the ambient noise levels, due to the blowout will be detrimental to terrestrial as well as aquatic fauna.	Likely	Minor	Low
Impact 32	Soil contamination due to oil spill will render it infertile, in turn reducing its productivity	Likely	Moderate	High

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Biodiversity Risk Assessment

The Biodiversity Risk Assessment involves the determination of risk to biodiversity from the exploration. This stage will guide in formulation of corrective measures in Biodiversity Management Plan (BMP) and Biodiversity Action Plan (BAP) to reduce the risk at an acceptable level.

The purpose of the risk assessment is to identify the potential risk from exploration and categorize them in four categories: Critical; Severe; Moderate, Minor and Negligible.

The Biodiversity Importance Category is intrinsic and will remain the same irrespective of the sites operations but the impact measures are based on the mixture of likelihood of impacts and the possibility of mitigation. The Biodiversity Risk Matrix is used to define risk category for each impact.

Biodiversity Importance Category

Importance	Criterion
Category A	<ul style="list-style-type: none"> • Presence of Vulnerable, Threatened, Endangered and/or Scheduled species of flora and fauna. • Habitat of significant importance to endemic and/or restricted range species. • Habitat (including corridors) supporting nationally or globally significant concentrations of migratory and/or congregatory species. • Highly threatened and/or unique ecosystems. • Areas subject to formal designation and or protection due to their special habitats and/or species assemblages. • Areas not subject to formal protection but which have high biodiversity value and are subject to informal community protection and veneration (e.g., sacred groves, community biodiversity harvesting area). • Areas associated with key evolutionary processes.
Category B	<ul style="list-style-type: none"> • Area lacking the criteria identified in BIC A above, but dominated by native vegetation and/or relatively undisturbed natural habitat. • Area adjacent (within 5 km) of a location satisfying one or more of the criteria in BIC A above.
Category C	<ul style="list-style-type: none"> • Site is heavily modified, intensely managed landscape such as long-established brown field area, urban setting (including monoculture).

BIC for ERD surface locations

The ERD surface locations are such as PAD 1 is cropland/pastureland, for PAD 2 it is home backyard and for PAD 3 is Tea Plantation which are all modified habitats. There is no presence of ecological habitat or any important species within the ERD surface locations. The surrounding forest habitat provided habitat for several globally and nationally important floral and faunal species. The aquatic bodies in the surrounding area are habitat to several migratory birds. Considering these facts, the Biodiversity Importance Category for ERD surface locations can be considered as **Category B**.

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Biodiversity Risk Matrix

The biodiversity risk is a principal tool for risk assessment against the potential impacts. The matrix plots Biodiversity Importance Category on y axis and against severity and likelihood of expected impacts on x axis.

Biodiversity Importance of Category (sensitivity of species, habitat or sustaining ecosystem)	Biodiversity Impact			
	Very High	High	Medium	Low
Category A	Critical	Severe	Moderate	Minor
Category B	Severe	Moderate	Minor	Minor
Category C	Minor	Minor	Minor	Negligible

The Output of the Biodiversity Risk Matrix for ERD surface locations is presented below:

TABLE 18 BIODIVERSITY RISK MATRIX FOR ERD SURFACE LOCATIONS

Impacts	Description	Impact mitigation category	Biodiversity Risk
Impact 1	There will be Increase in the ambient noise levels in and around the drill sites due to the project activities, which will lead to changes in species abundance, disruption of species communication, breeding, nesting and roosting patterns.	High	Moderate
Impact 2	Increase in underwater noise and vibration in the river water by the equipment and machinery used during the drilling would be most noticeable in the immediate surrounding area and would hamper the natural movement of dolphins, fishes, and turtles, which would prevent them from meeting their biological requirements. It may also affect the echolocation properties of dolphins.	Medium	Minor

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Impacts	Description	Impact mitigation category	Biodiversity Risk
Impact 3	Air pollutants may affect wildlife through the disruption of endocrine function, organ injury, increased vulnerability to stresses and diseases; lower reproductive success, and possible mortality.	Medium	Minor
Impact 4	Wastewater and formation water will be generated during drilling activity, and the domestic wastewater from the labor camps which may contain chemical and biological contaminants. If discharged untreated may adversely affect the surface water quality.	Medium	Minor
Impact 5	Surface run off from drilling waste (cuttings and drilling mud) storage areas, hazardous waste (waste oil, used oil, etc.) storage areas and chemical storage areas is likely to be contaminated and have potential to impact water quality of the receiving waterbody. This will affect the ecologically sensitive areas of the waterbody like migratory and resident bird habitats, fish habitat, breeding and nursing ground for fishes, and also habitat Gangetic Dolphin. Degradation of water quality may affect the primary productivity of the river.	Medium	Minor
Impact 6	Contamination of soil due spillage of hazardous waste, chemicals, cement, fuel, lubricants, (spent oil & used oil), batteries, e-waste and municipal waste affect the soil microbes and bacterial growth and can affect the soil quality.	Medium	Minor
Impact 7	Spillage of drill cuttings, drilling mud and drilling fluid during storage on the nearby open soil may lead to change of soil characteristics due to chemical contamination.	Low	Minor
Impact 8	Surface runoff during monsoon season from the construction site, construction material & waste storage area and spillage area have the potential to degrade soil quality due to deposition of foreign materials, hydrocarbon and other hazardous waste	Medium	Minor

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Impacts	Description	Impact mitigation category	Biodiversity Risk
Impact 9	Kitchen waste from labor camps if not disposed properly can attract rodents, snakes, monkeys etc. that may lead to human-wildlife conflict on the site.	Low	Minor
Impact 10	Change in Land use and species composition along with loss of native vegetation.	Very high	Severe
Impact 11	Faunal dispersal and loss of feeding ground.	High	Moderate
Impact 12	Site clearance and stripping of top soil during site construction may result in increase in soil erosion and loss of fertile soil.	Low	Minor
Impact 13	Increase in silt load in the surface run-off will in turn increase the suspended solids load on immediate surroundings which may affect local floral and faunal species and ecosystems.	Medium	Minor
Impact 14	Illuminated with artificial lighting as drilling is conducted continuously for 24 hours and thus may cause significant effects on local faunal species like 1) They might abandon breeding or roosting. 2) Change in migratory patterns 3) Biological stress on animals	Low	Minor
Impact 15	Decreased habitat use and Increase in the roadkill of native fauna - early morning and late evening times on the transportation route.	Very high	Severe
Impact 16	Damage to existing nearby flora.	Very high	Severe
Impact 17	Over use of ground water may lower the ground water table.	Low	Minor
Impact 18	During drilling activity, different aquifer will be intersected which may get contaminated by chemicals, lubricants, oil etc.	Medium	Minor
Impact 19	Alteration of onsite micro-drainage pattern leading to potential problems of water logging in the agricultural land and low-lying areas, which may affect habitat of reptiles, and mortality of floral species.	Low	Minor

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IN CASE OF EXTREME EVENTS VIZ. BLOWOUTS			
Impact 20	Large amount of oil and associated pollutants will be discharged in the surrounding environment. (Such as Nitrogen, Sulphur dioxide, Carbon monoxide, HCOH (formaldehyde) etc.)	High	Moderate
Impact 21	Surrounding landscapes will be burned down due to explosion & blowout	High	Moderate
Impact 22	Sudden rise in the ambient temperature	Low	Minor

Based on the mapping of the potential impacts against the Biodiversity Risk Matrix, the risk to biodiversity due to the operations can be defined as High, Medium or Low. This activity determines the level of initiatives to be taken at site to minimize the risk. To conclude the Biodiversity Risk for a site, the following conditions can be considered.

- If one or more risks are at Critical or Severe, then the overall risk at site will be identified as **High**
- If no risks with Critical or Severe, but one or more risks at the site as Moderate, then the overall risk at site will be identified as **Medium**
- If all risks on biodiversity at the site are at Minor or Negligible, then the overall risk at site will be identified as **Low**

As three of the identified risks, i.e. Impact 10, Impact 15, Impact 16 fall in the **Severe category** in the biodiversity risk matrix, it can be concluded that the overall risk for the given study on Biodiversity is 'HIGH'.

In case of extreme events such as blowouts, as four of the identified risks, i.e. Impact 23, Impact 24, Impact 26, and Impact 29 fall in the **Severe category** in the biodiversity risk matrix, along with above mentioned three impacts, it can be concluded that the overall risk for the given study on Biodiversity is 'HIGH'.

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Mitigation Measures

- Consideration of alternate routes for transportation of heavy vehicles to avoid movement through Bherjan Forest area.
- Monitoring of RET species including Gangetic Dolphin in Dibru Saikhowa National Park & Maguri Motapung Beel should be carried out during the drilling phase
- Native Plantation activities should be carried out in the ERD surface well periphery.
- Offset native plantation should be considered in the nearby area.

Detailed mitigation measures with action plans according to the threat categories identified, will be suggested in the next project deliverable- Comprehensive Biodiversity Management Plan, which will be encompassing the implementation as well as monitoring framework.

Conclusions

For Biodiversity Assessment for OIL India Limited, Baghjan, baseline data was collected during the monsoon and winter season. Tea Plantation is the dominant habitat of the study area followed by Forest, Waterbody, Built-up and Open land, Cropland, and Homestead Plantation.

In monsoon season, 40 species of trees, 33 shrubs, 62 herbs and 13 Pteridophytes were recorded under flora; whereas 65 species of Birds, 70 species of Butterflies, 4 species of Mammals, 4 species of Herpetofauna and 17 species of Fishes were recorded under fauna.

In winter season, 45 species of trees, 33 shrubs, 86 herbs and 20 Pteridophytes were recorded under flora; whereas 133 species of Birds, 80 species of Butterflies, 10 species of Mammals, 2 species of Herpetofauna and 19 species of Fishes were recorded under fauna.

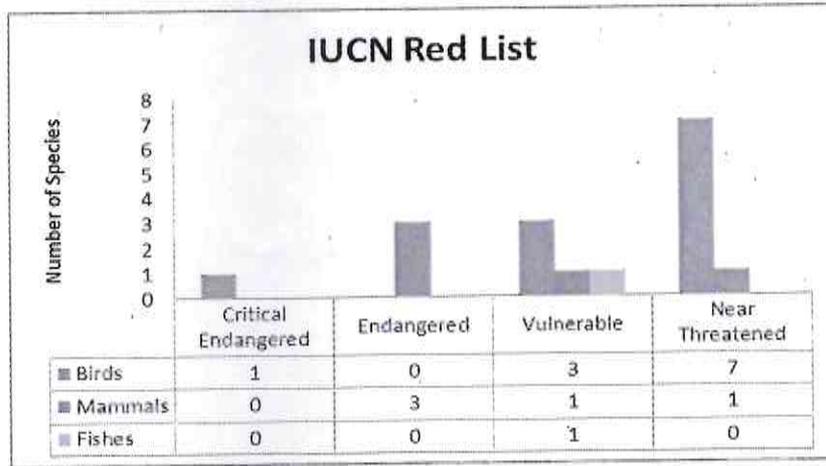
Taxa	Season 1	Season 2	COMBINED
Birds	65	133	147
Butterflies	70	80	112
Mammals	4	10	10
Herpetofauna	4	2	6
Fishes	17	19	19
Trees	40	45	86
Shrubs	33	33	57
Herbs	62	86	152
Pteridophytes	13	20	47

In the two seasons a total of 86 species of trees, 57 shrubs, 152 herbs and 47 Pteridophytes were recorded under flora; whereas 147 species of Birds, 112 species of Butterflies, 10 species of Mammals, 6 species of Herpetofauna and 19 species of Fishes were recorded under fauna.

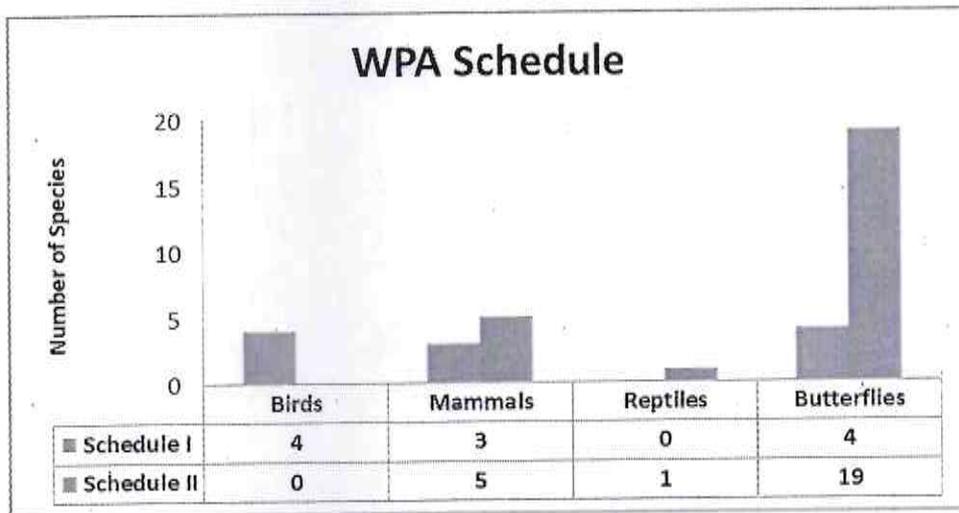
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Various species falling under IUCN Red List and WPA Schedules were observed during the primary data collection. Number of species falling under IUCN Red List across the taxa are as follows:



Number of species falling under WPA Schedules across the taxa are as follows:



In terms of species documented during survey, 4 species of birds, 3 species of mammals, 4 species of butterflies were found to be protected under schedule I of the WPA and 5 species of mammals, 19 species of butterflies and 1 species of reptiles were found to be protected under schedule II of the WPA.

Group	WPA schedule	
	WPA schedule I	WPA schedule II
Birds	4	-
Mammals	3	5
Butterflies	4	19
Reptiles	-	1

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The study area was screened for all the possible impacts due to exploration and the relevance of each impact was noted. These identified impacts were screened through a biodiversity impact matrix where the likelihood of impacts and the magnitude of impact was taken in consideration to identify the level of significance.

In addition to the impacts, a risk assessment to identify the potential risk from the exploration study was conducted through a matrix of Biodiversity Importance Category (sensitivity of species, habitat, or sustaining ecosystem) and the biodiversity impact (likelihood and magnitude of the Impact).

The **Biodiversity Importance Category** for the given study can be considered as **Category B** due to presence of forest and aquatic habitats supporting rich biodiversity.

As three of the identified risks, i.e. Impact 10, Impact 15, and Impact 16 fall in the 'Severe category' in the biodiversity risk matrix, it can be concluded that the overall risk for the given study on Biodiversity is 'HIGH'.

In case of extreme events such as blowouts, as four of the identified risks, i.e. Impact 23, Impact 24, Impact 26, and Impact 29 fall in the Severe category in the biodiversity risk matrix, along with above mentioned three impacts, it can be concluded that the overall risk for the given study on Biodiversity is 'HIGH'.

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Appendix

Table 19 List of flora observed in study area in Season 1 (Monsoon) & Season 2 (Winter)

Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
1	<i>Albizia chinensis</i>	Chinese albizia	Sau koroi	Fabaceae	-	-	Tree	✓	✓
2	<i>Albizia procera</i>	White siris	Siris	Fabaceae	LC	-	Tree	✓	✓
3	<i>Alstonia scholaris</i>	Devil tree	Satiana	Apocynaceae	LC	-	Tree	✓	✓
4	<i>Anthocephalus cadamba</i>	Burflower tree	Kadam	Rubiaceae	-	-	Tree	✓	✓
5	<i>Areca catechu</i>	Areca palm	Tamul	Arecaceae	-	-	Tree	✓	✓
6	<i>Artocarpus heterophyllus</i>	Jackfruit	Kothal	Moraceae	-	-	Tree	✓	✓
7	<i>Bauhinia variegata</i>	-	-	Fabaceae	-	-	Tree	✓	✓
8	<i>Bischofia javanica</i>	Bishop Wood	Urium	Phyllanthaceae	LC	-	Tree	✓	✓
9	<i>Bixa orellana</i>	Lipstick tree	Sendur gos	Bixaceae	LC	-	Tree	✓	✓
10	<i>Bambax ceiba</i>	Cotton tree	Simalu	Bombacaceae	LC	-	Tree	✓	✓
11	<i>Callicarpa arborea</i>	Beautyberry tree	-	Lamiaceae	-	-	Tree	✓	✓
12	<i>Caryota urens</i>	Fish tail palm	Sowat gos	Arecaceae	LC	-	Tree	✓	✓
13	<i>Cassia fistula</i>	Golden shower tree	Sonar	Fabaceae	LC	-	Tree	✓	✓
14	<i>Chukrasia tabularis</i>	Chitta gong wood	Boga-poma	Meliaceae	LC	-	Tree	✓	✓
15	<i>Citrus limon</i>	Lemon	Nemu	Rutaceae	-	-	Tree	✓	✓
16	<i>Citrus maxima</i>	Pomelo	Robab tenga	Rutaceae	LC	-	Tree	✓	✓
17	<i>Delonix regia</i>	Royal poinciana	Krishnasura	Fabaceae	LC	-	Tree	✓	✓
18	<i>Dillenia indica</i>	Elephant apple	Ou tenga	Dilleniaceae	LC	-	Tree	✓	✓
19	<i>Dipterocarpus macrocarpus</i>	Hollong tree	Hollong	Dipterocarpaceae	-	-	Tree	✓	✓
20	<i>Duabana grandiflora</i>	-	-	Combretaceae	-	-	Tree	✓	✓
21	<i>Erythrina sp.</i>	Indian Coral Tree	Madaar	Fabaceae	LC	-	Tree	✓	✓
22	<i>Ficus asperrima</i>	Forest Sandpaper Fig	-	Moraceae	LC	-	Tree	✓	✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
23	<i>Ficus racemosa</i>	Cluster fig	-	Moraceae	LC	-	Tree	✓	✓
24	<i>Ficus religiosa</i>	Sacred fig	Ahot gos	Moraceae	-	-	Tree	✓	✓
25	<i>Garcinia sp.</i>	Malabar tamarind	Thekera	Clusiaceae	-	-	Tree	✓	✓
26	<i>Garuga pinnata</i>	Grey Downy Balsam	Pama	Burseraceae	-	-	Tree	✓	✓
27	<i>Glochidion sp.</i>	Cheese trees	-	Phyllanthaceae	-	-	Tree	✓	✓
28	<i>Gmelina arborea</i>	White Teak	Gomari	Verbenaceae	LC	-	Tree	✓	✓
29	<i>Lagerstroemia speciosa</i>	Queen's crepe-myrtle	Azar	Lythraceae	-	-	Tree	✓	✓
30	<i>Macaranga denticulata</i>	Blistery Macaranga	-	Euphorbiaceae	-	-	Tree	✓	✓
31	<i>Magnolia champaca</i>	Champak	Titasopa	Magnoliaceae	LC	-	Tree	✓	✓
32	<i>Magnolia hodgsonii</i>	Hodgson magnolia	Borhomthuri	Magnoliaceae	LC	-	Tree	✓	✓
33	<i>Melia azedarach</i>	Chinaberry	Ghora-nim	Meliaceae	LC	-	Tree	✓	✓
34	<i>Mesua ferrea</i>	Ceylond ironwood	Nahor	Clusiaceae	-	-	Tree	✓	✓
35	<i>Murraya koenigii</i>	Curry leaf tree	Narasingha	Meliaceae	-	-	Tree	✓	✓
36	<i>Oroxylum indicum</i>	Indian trumpet flower	Bhatghila	Bignoniaceae	-	-	Tree	✓	✓
37	<i>Phyllanthus assamicus</i>	-	-	Phyllanthaceae	-	-	Tree		✓
38	<i>Pongamia pinnata</i>	Indian Beech Tree	Koroch	Fabaceae	LC	-	Tree	✓	✓
39	<i>Pritchardia pacifica</i>	Fan palm	-	Arecaceae	-	-	Tree		✓
40	<i>Shorea robusta</i>	Sal tree	Sal	Dipterocarpaceae	LC	-	Tree	✓	✓
41	<i>Tectona grandis</i>	Teak	Sagun	Verbenaceae	-	-	Tree	✓	✓
42	<i>Terminalia bellirica</i>	Baheda	Bhomora	Combretaceae	-	-	Tree	✓	✓
43	<i>Terminalia myriocarpa</i>	-	-	Combretaceae	-	-	Tree		✓
44	<i>Ziziphus mauritiana</i>	Indian jujube	Bogori	Rhamnaceae	-	-	Tree	✓	✓
45	<i>Actephila excels</i>	Nilgiri Actephila	-	Phyllanthaceae	-	-	Shrub		✓
46	<i>Bambusa sp.</i>	-	-	Poaceae	-	-	Shrub		✓
47	<i>Brassaiopsis sp.</i>	-	-	Araliaceae	-	-	Shrub		✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
48	<i>Calamus tenuis</i>	Palm	Bet	Arecaceae	LC	-	Shrub		✓
49	<i>Cleodendrum infortunatum</i>	Hill glory flower	Dhapatita	Verbenaceae	-	-	Shrub		✓
50	<i>Cleome gynandra</i>	Spiderwisp	-	Cleomaceae	-	-	Shrub		✓
51	<i>Diploclisia sp.</i>	-	-	Menespermeaceae	-	-	Shrub		✓
52	<i>Eupatorium odoratum</i>	Siam weed	Jarmoni ban	Asteraceae	-	Yes	Shrub		✓
53	<i>Globba sp.</i>	-	-	Zingiberaceae	-	-	Shrub		✓
54	<i>Ipomea carnea</i>	Bush morning glory	Bih Kolmou	Convolvulaceae	-	-	Shrub		✓
55	<i>Lantana camera</i>	West Indian lantana	-	Verbenaceae	-	Yes	Shrub		✓
56	<i>Leea indica</i>	Bandicoot Berry	Kukur jihwa	Vitaceae	LC	-	Shrub	✓	✓
57	<i>Lippia alba</i>	Bushy matgrass	Pahu-kuta	Verbenaceae	-	-	Shrub	✓	✓
58	<i>Manihot esculenta</i>	Bitter cassava	Simalu alu	Euphorbiaceae	DD	-	Shrub	✓	✓
59	<i>Melastoma malabarthicum</i>	Malabar melastoma	Phutkola	Melastomaceae	-	-	Shrub	✓	✓
60	<i>Mezoneuron cucullatum</i>	Hooded-flowered brasiletto	-	Fabaceae	-	-	Shrub		✓
61	<i>Mussaenda roxburgii</i>	East Himalayan mussanda	Sonarupa	Rubiaceae	-	-	Shrub	✓	✓
62	<i>Mycetia nutans</i>	-	-	Rubiaceae	-	-	Shrub		✓
63	<i>Myriophyllum tuberculatum</i>	Red Watermilliffoil	-	Haloragaceae	-	-	Shrub	✓	✓
64	<i>Pandanus sp.</i>	-	-	Pandanaceae	-	-	Shrub	✓	✓
65	<i>Pandanus unguifer Hook.</i>	-	-	Pandanaceae	-	-	Shrub	✓	✓
66	<i>Pothos scandens</i>	Climbing Aroid	-	Araceae	-	-	Shrub	✓	
67	<i>Rhaphidophora decursiva</i>	Creeping Philodendron	-	Araceae	-	-	Shrub	✓	
68	<i>Schefflera arboricola</i>	Dwarf Umbrella tree	-	Araliaceae	-	-	Shrub	✓	

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
69	<i>Schefflera venulosa</i>	Dwarf Umbrella tree	-	Araliaceae	-	-	Shrub		✓
70	<i>Senna alata</i>	Candle stick senna	Kharpat	Fabaceae	LC	-	Shrub	✓	✓
71	<i>Senna hispida</i>	Hairy senna	-	Fabaceae	-	-	Shrub	✓	✓
72	<i>Senna occidentalis</i>	Stinking weed	Bor medelua	Fabaceae	-	-	Shrub	✓	✓
73	<i>Smilax sp.</i>	-	-	Smilacaceae	-	-	Shrub	✓	✓
74	<i>Solanum diaphyllum</i>	twoleaf nightshade	-	Solanaceae	-	-	Shrub	✓	✓
75	<i>Solanum torvum</i>	Turkey berry	Hati bhekuri	Solanaceae	-	Yes	Shrub	✓	✓
76	<i>Solanum viarum</i>	Tropical soda apple	Tit bhekuri	Solanaceae	LC	Yes	Shrub	✓	✓
77	<i>Sterculia hamiltonina</i>	Hamiltonian starculla	-	Malvaceae	-	-	Shrub	✓	✓
78	<i>Tamarix sp.</i>	-	-	Tamariaceae	-	-	Shrub	✓	✓
79	<i>Thunbergia coccinea</i>	Scarlet Clock Vine	Chonga lota	Acanthaceae	-	-	Shrub		✓
80	<i>Thunbergia laurifolia</i>	Laurel Clock Vine	-	Acanthaceae	-	-	Shrub		✓
81	<i>Urena lobata</i>	-	-	Malvaceae	-	-	Shrub	✓	✓
82	<i>Vallisneria spiralis</i>	Vallisneria	-	Hydrocharitaceae	-	-	Shrub	✓	
83	<i>Cynodon dactylon</i>	Scutch grass	Dubori bon	Poaceae	-	-	Herb	✓	✓
84	<i>Polygonum hydropiper</i>	Water pepper	Patharua bihalagani	Polygonaceae	LC	-	Herb	✓	✓
85	<i>Acampe rigida (Orchid)</i>	Stiff Acampe	-	Orchidaceae	-	-	Herb	✓	✓
86	<i>Achyranthes aspera</i>	Devil's horsewhip	Hati-huria	Piperaceae	-	-	Herb	✓	✓
87	<i>Acorus calamus</i>	Sweet flag	-	Acoraceae	-	-	Herb	✓	✓
88	<i>Ageratum conyzoids</i>	Billy goat weed	-	Asteraceae	LC	Yes	Herb	✓	✓
89	<i>Alternanthera sp. (Button like)</i>	Joy weed, Copperleaf	-	Amaranthaceae	-	-	Herb	✓	✓
90	<i>Alternanthera sessilis</i>	Dwarf copperleaf	Matikaduri	Amaranthaceae	-	Yes	Herb	✓	✓
91	<i>Amaranthus spinosus</i>	Spiny amaranth	Hati khutura	Amaranthaceae	-	-	Herb	✓	✓
92	<i>Amaranthus viridis</i>	Green Amaranth	-	Amaranthaceae	-	-	Herb	✓	✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
93	<i>Amorphophallus campanulatus</i>	Elephant Foot Yam	-	Araceae	-	-	Herb	✓	✓
94	<i>Aponogeton natans</i>	Floating lace plant	-	Aponogetonaceae	LC	-	Herb		✓
95	<i>Asplenium nidus</i>	Bird's-nest Fern	-	Aspleniaceae	-	-	Herb	✓	
96	<i>Bidens pilosa</i>	Beggarticks	-	Asteraceae	-	Yes	Herb	✓	✓
97	<i>Bidens sp.</i>	-	-	Asteraceae	-	-	Herb	✓	
98	<i>Boehmeria sp.</i>	-	-	Urticaceae	-	-	Herb		✓
99	<i>Cardiospermum halicacabum</i>	Balloon Vine	-	Sapindaceae	LC	-	Herb	✓	✓
100	<i>Centella asiatica</i>	Indian Pennywort	-	Apliaceae	LC	-	Herb	✓	✓
101	<i>Centratherum punctatum</i>	Brazilian Bachelor's Button	-	Asteraceae	-	-	Herb	✓	✓
102	<i>Ceratophyllum demersum</i>	Coon tail	-	Ceratophyllaceae	LC	Yes	Herb	✓	✓
103	<i>Cleome rutidospermum</i>	Fringed spiderflower	-	Capparaceae	-	-	Herb	✓	✓
104	<i>Cleome viscosa</i>	Yellow Spider flower	-	Cleomaceae	-	-	Herb	✓	✓
105	<i>Clerodendrum chinense</i>	Chinese Glory Bower	-	Verbenaceae	LC	-	Herb	✓	✓
106	<i>Clerodendrum colebrookeanum</i>	East Indian Glory Bower	Nephaphu	Verbenaceae	-	-	Herb	✓	✓
107	<i>Clerodendrum indicum</i>	-	-	-	-	-	Herb		✓
108	<i>Colocasia esculenta</i>	Wild taro	-	Araceae	LC	-	Herb	✓	✓
109	<i>Cuphea sp.</i>	False heather	-	Lythraceae	-	-	Herb	✓	✓
110	<i>Cynodon dactylon</i>	Bermuda grass	Doob	Poaceae	-	-	Herb	✓	
111	<i>Dichanthium annulatum</i>	Sheda grass, Blue stem	-	Poaceae	-	-	Herb	✓	✓
112	<i>Eclipta prostrata</i>	False daisy	-	Compositae	LC	-	Herb		✓
113	<i>Eichhornia crassipes</i>	Common water hyacinth	Jal Kumbhi	Pontederiaceae	-	Yes	Herb	✓	✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
114	<i>Eleusine indica</i>	Indian goosegrass	Bobosa- bon	Poaceae	-	-	Herb	✓	✓
115	<i>Eragrostis sp.</i>	Bunch grass	-	Poaceae	-	-	Herb	✓	✓
116	<i>Gynura sp.</i>	-	-	Asteraceae	-	-	Herb	✓	✓
117	<i>Hydrilla verticillata</i>	Hydrilla	-	Hydrocharitaceae	LC	Yes	Herb	✓	✓
118	<i>Hydrocotyle sibthorpioides</i>	Lawn marsh pennywort	-	Araliaceae	-	-	Herb	✓	✓
119	<i>Impatiens balsamina</i>	Balsams	Keruphul	Balsaminaceae	-	-	Herb	✓	✓
120	<i>Imperata cylindrica</i>	Cogon grass	-	Poaceae	-	-	Herb		✓
121	<i>Ipomoea aquatica</i>	Water spinach	-	Convolvulaceae	LC	Yes	Herb		✓
122	<i>Ipomoea carnea</i>	Pink morning glory	-	Convolvulaceae	-	-	Herb		✓
123	<i>Kyllinga sp.</i>	Green Water Sedge	-	Cyperaceae	LC	-	Herb	✓	✓
124	<i>Leca indica</i>	Bandicoot Berry	Kukur jihwa	Vitaceae	LC	-	Herb	✓	
125	<i>Lemna perpusilla</i>	Tiny duckweed	-	Araceae	LC	-	Herb		✓
126	<i>Leonurus sibiricus</i>	Honey weed	-	Lamiaceae	-	-	Herb	✓	✓
127	<i>Leucas aspera</i>	Common leucas	Doron	Lamiaceae	-	-	Herb	✓	✓
128	<i>Lindernia crustacea</i>	Malaysian Lindernia	-	Linderniaceae	LC	-	Herb	✓	✓
129	<i>Lippia alba</i>	Bushy Lippia	Pitona, Hierba negra	Verbenaceae	-	-	Herb	✓	✓
130	<i>Ludwigia perennis</i>	Perennial water primrose	Bon Jalakla	Onagraceae	LC	-	Herb	✓	✓
131	<i>Luisia trichorrhiza</i>	Hairy-Root Luisia	-	Orchidaceae	-	-	Herb	✓	✓
132	<i>Mazus sp.</i>	-	-	Mazaceae	-	-	Herb	✓	✓
133	<i>Mimosa pudica</i>	Touch me not	Lajuki lota	Fabaceae	-	Yes	Herb	✓	✓
134	<i>Musa x paradisiaca</i>	Banana	-	Musaceae	-	-	Herb	✓	✓
135	<i>Najas graminea</i>	Ricefield water-nymph	-	Hydrocharitaceae	LC	-	Herb		✓
136	<i>Najas indica</i>	Guppy grass	-	Hydrocharitaceae	LC	-	Herb		✓
137	<i>Najas marina</i>	Holly leaved Naiad	-	Hydrocharitaceae	LC	-	Herb		✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
138	<i>Nelumbo nucifera</i>	Sacred Lotus	Kamal	Padam	DD	-	Herb	✓	✓
139	<i>Nymphaea nauchali</i>	Blue lotus	-	Nymphaeaceae	LC	-	Herb		✓
140	<i>Oldenlandia corymbosa</i>	Diamond flower	Daman pappar	-	-	-	Herb	✓	✓
141	<i>Peperomia pellucida</i>	Slate Pencil Plant, Silverbush	-	Pononoa	-	-	Herb	✓	✓
142	<i>Persicaria sp.</i>	Asiatic waterpepper	-	Polygonaceae	-	-	Herb	✓	✓
143	<i>Phragmites karka</i>	Tall Reed	Nala dala	Poaceae	-	-	Herb		✓
144	<i>Phyla nudiflora</i>	Frog fruit	Jal pipali	Verbenaceae	-	-	Herb	✓	✓
145	<i>Phyllanthus rotundifolius</i>	-	-	Phyllanthaceae	-	-	Herb		✓
146	<i>Phyllanthus urinaria</i>	Chamber Bitter, Shatterstone	Hajarmani	Bhui Amlakhi	-	-	Herb	✓	✓
147	<i>Piper betle</i>	Betel leaf	Pan	Piperaceae	-	-	Herb	✓	✓
148	<i>Piper betleoides</i>	-	-	Piperaceae	-	-	Herb		✓
149	<i>Pistia stratiotes</i>	Water lettuce, Nile Cabbage	Barpuni	Araceae	LC	-	Herb	✓	✓
150	<i>Polla sp.</i>	-	-	Commelinaceae	-	-	Herb		✓
151	<i>Pontederia cordata</i>	Pickrel Weed	-	Pontederiaceae	-	-	Herb	✓	✓
152	<i>Potamogeton crispus</i>	Curled Pondweed	-	Potamogetonaceae	LC	Yes	Herb		✓
153	<i>Potamogeton natans</i>	Broad leaved Pondweed	-	Potamogetonaceae	LC	-	Herb		✓
154	<i>Potamogeton nodosus</i>	Loddon Pondweed	-	Potamogetonaceae	LC	-	Herb		✓
155	<i>Rhaphidophora decursiva</i>	Creeping Philodendron	-	Araceae	-	-	Herb		✓
156	<i>Rhaphidophora hookeri</i>	-	-	-	-	-	Herb		✓
157	<i>Rotala indica</i>	Indian toothcup	-	Lythraceae	LC	-	Herb		✓
158	<i>Ruppia maritima</i>	Beaked tassleweed	-	Ruppiaceae	LC	-	Herb		✓
159	<i>Sabia lanceolata</i>	-	-	Sabiaceae	-	-	Herb		✓
160	<i>Soccharum ravennae</i>	Ravenna grass	-	Poaceae	-	-	Herb		✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
161	<i>Scophuria dulcis</i>	Sweet broom	Madhumehari, bon chini	Plantaginaceae	-	-	Herb	✓	✓
162	<i>Senna tora</i>	Sickle pod	Medelua	Fabaceae	-	-	Herb	✓	✓
163	<i>Sida acuta</i>	Common wireweed	Boriala	Malvaceae	-	-	Herb	✓	✓
164	<i>Sida rhombifolia</i>	Arrowleaf sida	Boriala	Malvaceae	-	-	Herb	✓	✓
165	<i>Solanum nigrum</i>	Black nightshade	Pichikati	Solanaceae	-	-	Herb	✓	✓
166	<i>Spilanthes acmella</i>	Paracress	Bon narji	Asteraceae	-	-	Herb	✓	✓
167	<i>Spilanthes paniculata</i>	Paracress	-	Compositae	-	-	Herb		✓
168	<i>Spirodela sp.</i>	Duck weed	-	Araceae	-	-	Herb		✓
169	<i>Tropa natans</i>	Water Chestnut	-	Lythraceae	LC	Yes	Herb		✓
170	<i>Trianthema portulacastrum</i>	Water primrose	-	Onagraceae	-	-	Herb		✓
171	<i>Utricularia aurea</i>	Golden Bladder wort	-	Lentibulariaceae	LC	-	Herb		✓
172	<i>Vallisneria spiralis</i>	Vallisneria	-	Hydrocharitaceae	-	-	Herb		✓
173	<i>Acrostichum heterophyllum</i>	-	-	Pteridaceae	-	-	Pteridophytes		✓
174	<i>Adiantum capillus-veneris</i>	Southern Maidenhair Fern	-	Pteridaceae	LC	-	Pteridophytes		✓
175	<i>Amblovenatum opulentum</i>	-	-	Thelypteridaceae	-	-	Pteridophytes		✓
176	<i>Angiopteris evecta</i>	King fern	-	Marattiaceae	-	-	Pteridophytes	✓	✓
177	<i>Araioetgia divaricata</i>	-	-	Davalliaceae	-	-	Pteridophytes		✓
178	<i>Asplenium nidus</i>	See bird's-nest fern	-	Aspleniaceae	-	-	Pteridophytes	✓	✓
179	<i>Azolla sp.</i>	-	-	Azollaceae	-	-	Pteridophytes	✓	
180	<i>Blechnum sp.</i>	Hard fern	-	Blechnaceae	-	-	Pteridophytes		✓
181	<i>Blechnum orientale</i>	Centipede Fern	-	Blechnaceae	-	-	Pteridophytes		✓
182	<i>Bolbitis heteroclita</i>	El Nino Fern	-	Dryopteridaceae	-	-	Pteridophytes		✓
183	<i>Christella parasitica</i>	Parasitic maiden fern	-	Thelypteridaceae	-	-	Pteridophytes		✓

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
184	<i>Cyathea gigantea</i>	-	-	Cyatheaceae	-	-	Pteridophytes	✓	✓
185	<i>Cyathea spinulosa</i>	Tree fern	-	Cyatheaceae	-	-	Pteridophytes		✓
186	<i>Cyclosorus interruptus</i>	Hottentot fern	-	Thelypteridaceae	-	-	Pteridophytes		✓
187	<i>Dicranopteris linearis</i>	Old World forked fern	-	Gleicheniaceae	LC	-	Pteridophytes		✓
188	<i>Diplazium dilatatum</i>	-	-	Athyriaceae	-	-	Pteridophytes		✓
189	<i>Diplazium esculentum</i>	Vegetable fern	Linguda	Athyriaceae	LC	-	Pteridophytes		✓
190	<i>Drymoglossum heterophyllum</i>	Dragon scale	-	Polypodiaceae	-	-	Pteridophytes	✓	
191	<i>Gleichenia sp.</i>	Forked climbing fern	-	Gleicheniaceae	-	-	Pteridophytes	✓	
192	<i>Lygodium flexuosum</i>	Climbing fern	-	Lygodiaceae	-	-	Pteridophytes	✓	✓
193	<i>Lygodium japonicum</i>	Japanese climbing fern	-	Lygodiaceae	-	-	Pteridophytes		✓
194	<i>Marselia sp.</i>	Clover fern	-	Marseliaceae	-	-	Pteridophytes	✓	
195	<i>Microlepia speluncae</i>	-	-	Dennstaedtiaceae	-	-	Pteridophytes		✓
196	<i>Microsorium pteropus</i>	Java fern	-	Polypodiaceae	LC	-	Pteridophytes		✓
197	<i>Microsorium punctatum</i>	Fishtail fern	-	Polypodiaceae	-	-	Pteridophytes		✓
198	<i>Pityrogramma calomelanos</i>	Silverback fern	-	Pteridaceae	-	-	Pteridophytes		✓
199	<i>Pteris vitata</i>	Chinese brake fern	-	Pteridaceae	-	-	Pteridophytes	✓	
200	<i>Pteris biaurita</i>	Thinleaf brake	-	Pteridaceae	-	-	Pteridophytes		✓
201	<i>Pteris ensiformis</i>	Slender brake	-	Pteridaceae	-	-	Pteridophytes		✓
202	<i>Pteris longipinnula</i>	-	-	Pteridaceae	-	-	Pteridophytes		✓
203	<i>Pteris semipinnata</i>	-	-	Pteridaceae	-	-	Pteridophytes		✓
204	<i>Pteris vittata</i>	Chinese brake	-	Pteridaceae	LC	-	Pteridophytes		✓
205	<i>Pyrrosia lanceolata</i>	-	-	Polypodiaceae	-	-	Pteridophytes		✓
206	<i>Pyrrosia piloselloides</i>	Dragonscale fern	-	Polypodiaceae	-	-	Pteridophytes		✓
207	<i>Salvinia sp.</i>	-	-	Salviniaceae	-	-	Pteridophytes	✓	✓
208	<i>Selaginella sp.</i>	Peacock fern	-	Selaginellaceae	-	-	Pteridophytes	✓	

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Sr. No.	Scientific Name	English Common Name	Assamese Name	Family	IUCN Status	GISD	Habit	Presence in Season 1	Presence in Season 2
209	<i>Selaginella monospora</i>	-	-	Selaginellaceae	-	-	Pteridophytes		✓
210	<i>Selaginella semicordata</i>	-	-	Selaginellaceae	-	-	Pteridophytes		✓
211	<i>Sphenomeris chinensis</i>	Lace Fern	-	Lindsaeaceae	-	-	Pteridophytes		✓
212	<i>Stenochlaena palustris</i>	Climbing Swamp Fern	-	Blechnaceae	-	-	Pteridophytes		✓
213	<i>Vittaria elongata</i>	Tape Fern	-	Pteridaceae	-	-	Pteridophytes		✓

Table 20 Inventory of bird species observed in study area - Season 1 (Monsoon) & Season 2 (Winter)

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
1	Acrocephalus	-	Acrocephalidae	-	-	-		✓
2	Ashy drongo	<i>Dicrurus leucophaeus</i>	Dicruridae	LC	R	IV	✓	✓
3	Asian Barred Owlet	<i>Glaucidium cuculoides</i>	Strigidae	LC	R	IV	✓	✓
4	Asian House Martin	<i>Delichon dasypus</i>	Hirundinidae	LC	R	-	✓	
5	Asian Openbill	<i>Anastomus oscitans</i>	Ciconiidae	LC	R	IV	✓	✓
6	Asian palm swift	<i>Cypsiurus balasensis</i>	Apodidae	LC	R	IV	✓	✓
7	Asian Pied Starlings	<i>Gracupica contra</i>	Sturnidae	LC	R	IV	✓	✓
8	Bar-headed Goose	<i>Anser indicus</i>	Anatidae	LC	WV	IV		✓
9	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	LC	WV	-	✓	✓
10	Baya weaver	<i>Ploceus philippinus</i>	Ploceidae	LC	R	IV	✓	
11	Bengal Bushlark	<i>Mirafra assamica</i>	Alaudidae	LC	R	IV		✓
12	Black Bittern	<i>Ixobrychus flavicollis</i>	Ardeidae	LC	R	IV	✓	
13	Black Drongo	<i>Dicrurus macrocerus</i>	Dicruridae	LC	R	IV		✓
14	Black Stork	<i>Ciconia nigra</i>	Ciconiidae	LC	WV	IV		✓
15	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Oriolidae	LC	R	IV	✓	✓
16	Black-naped Monarch	<i>Hypothymis azurea</i>	Monarchidae	LC	R	-		✓
17	Black-tailed Godwit	<i>Limosa limosa</i>	Scolopacidae	NT	WV	-		✓
18	Black-winged Kite	<i>Elanus caeruleus</i>	Accipitridae	LC	R	-		✓
19	Blue-tailed Bee-eater	<i>Merops philippinus</i>	Meropidae	LC	SW	-	✓	

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
20	Bluethroat	<i>Cyanecula svecica</i>	Muscicapidae	LC	WV	-		✓
21	Blue-throated Barbet	<i>Psilopogon asiaticus</i>	Megalaimidae	LC	R	IV	✓	✓
22	Blyth's Leaf-warbler	<i>Phylloscopus reguloides</i>	Phylloscopidae	LC	WV	-		✓
23	Brahminy Starling	<i>Sturnia pagodarum</i>	Sturnidae	LC	R	IV		✓
24	Bronze-winged Jacana	<i>Metopidius indicus</i>	Jacanidae	LC	R	IV	✓	✓
25	Brown Boobook	<i>Ninox scutulata</i>	Strigidae	LC	R	IV		✓
26	Brown Shrike	<i>Lanius cristatus</i>	Laniidae	LC	WV	-		✓
27	Brownish-flanked Bush-warbler	<i>Horornis fortipes</i>	Scotocercidae	LC	WV	-		✓
28	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	LC	R	IV	✓	✓
29	Chestnut tailed Starling	<i>Sturnia malabarica</i>	Sturnidae	LC	R	IV	✓	✓
30	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	Ardeidae	LC	R	IV	✓	
31	Citrine Wagtail	<i>Motacilla citreola</i>	Motacillidae	LC	WV	-		✓
32	Collared Sand Martin	<i>Riparia riparia</i>	Hirundinidae	LC	WV	-		✓
33	Common Greenshank	<i>Tringa nebularia</i>	Scolopacidae	LC	WV	-		✓
34	Common Hill Myna	<i>Gracula religiosa</i>	Sturnidae	LC	R	IV	✓	
35	Common Iora	<i>Aegithina tiphia</i>	Aegithinidae	LC	R	IV		✓
36	Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	LC	R	IV		✓
37	Common Moorhen	<i>Gallinula chloropus</i>	Rallidae	LC	R	-	✓	✓
38	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	LC	R	IV	✓	✓
39	Common Pochard	<i>Aythya ferina</i>	Anatidae	VU	WV	IV		✓
40	Common Redshank	<i>Tringa totanus</i>	Scolopacidae	LC	WV	-	✓	
41	Common Sandpiper	<i>Actitis hypoleucos</i>	Scolopacidae	LC	WV	IV		✓
42	Common Snipe	<i>Gallinago gallinago</i>	Scolopacidae	LC	WV	IV		✓
43	Common Stonechat	<i>Saxicola torquatus</i>	Muscicapidae	LC	WV	-		✓
44	Common tailorbird	<i>Orthotomus sutorius</i>	Cisticolidae	LC	R	-	✓	✓
45	Common Teal	<i>Anas crecca</i>	Anatidae	LC	WV	IV		✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
46	Cotton pygmy goose	<i>Nettion coromandelianus</i>	Anatidae	LC	R	IV	✓	✓
47	Crimson Sunbird	<i>Aethopyga siparaja</i>	Nectariniidae	LC	R	IV		✓
48	Eastern Jungle crow	<i>Corvus macrorhynchos</i>	Corvidae	LC	R	-	✓	✓
49	Eastern Spotted Dove	<i>Spilopelia chinensis</i>	Columbidae	LC	R	IV	✓	✓
50	Eurasian Collared-dove	<i>Streptopelia decaocto</i>	Columbidae	LC	R	IV	✓	✓
51	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	Accipitridae	LC	WV	-		✓
52	Eurasian Tree Sparrow	<i>Passer montanus</i>	Passeridae	LC	R	-	✓	✓
53	Eurasian Wigeon	<i>Mareca penelope</i>	Anatidae	LC	WV	IV		✓
54	Ferruginous Duck	<i>Aythya nyroca</i>	Anatidae	NT	WV	IV		✓
55	Glossy Ibis	<i>Plegadis falcinellus</i>	Threskiornithidae	LC	R	IV		✓
56	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LC	WV	IV		✓
57	Great Crested Grebe	<i>Podiceps cristatus</i>	Podicipedidae	LC	WV	IV		✓
58	Great Myna	<i>Acridotheres grandis</i>	Sturnidae	LC	R	IV		✓
59	Great Tit	<i>Parus major</i>	Paridae	LC	R	IV	✓	✓
60	Great White Egret	<i>Ardea alba</i>	Ardeidae	LC	R	IV		✓
61	Greater Racquet-tailed Drongo	<i>Dicrurus paradiseus</i>	Dicruridae	LC	R	IV		✓
62	Green bee-eater	<i>Merops orientalis</i>	Meropidae	LC	R	-	✓	
63	Green-billed Malkova	<i>Phoenicophaeus tristis</i>	Cuculidae	LC	R	-	✓	✓
64	Grey Wagtail	<i>Motacilla cinerea</i>	Motacillidae	LC	WV	-		✓
65	Grey-bellied Tesia	<i>Tesia cyaniventer</i>	Scotocercidae	LC	WV	-		✓
66	Grey-capped Emerald Dove	<i>Chalcophaps indica</i>	Columbidae	LC	R	IV	✓	
67	Grey-headed Canary-flycatcher	<i>Culicicapa ceylonensis</i>	Stenostiridae	LC	WV	IV		✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence In Season 1	Presence In Season 2
68	Grey-headed Woodpecker	<i>Picus canus</i>	Picidae	LC	R	IV		✓
69	Greylag Goose	<i>Anser anser</i>	Anatidae	LC	WV	IV		✓
70	Griffon Vulture	<i>Gyps fulvus</i>	Accipitridae	LC	WV	IV		✓
71	Hair-crested Drongo	<i>Dicrurus hottentottus</i>	Dicruridae	LC	R	IV	✓	✓
72	Himalayan Griffon	<i>Gyps himalayensis</i>	Accipitridae	NT	WV	IV		✓
73	House Crow	<i>Corvus splendens</i>	Corvidae	LC	R	V	✓	
74	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Phalacrocoracidae	LC	R	IV		✓
75	Indian Cuckoo	<i>Cuculus micropterus</i>	Cuculidae	LC	R	IV	✓	
76	Indian Pond-heron	<i>Ardeola grayii</i>	Ardeidae	LC	R	-	✓	✓
77	Indian Roller	<i>Coracias benghalensis</i>	Coraclidae	LC	R	IV	✓	✓
78	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	Anatidae	LC	R	IV		✓
79	Intermediate Egret	<i>Ardea intermedia</i>	Ardeidae	LC	R	IV	✓	✓
80	Jungle Myna	<i>Acridotheres fuscus</i>	Sturnidae	LC	R	IV	✓	✓
81	Kalij Pheasant	<i>Lophura leucomelanos</i>	Phasianidae	LC	R	I		✓
82	Large Hawk-cuckoo	<i>Hierococcyx sparveriaoides</i>	Cuculidae	LC	WV	IV		✓
83	Large Niltava	<i>Niltava grandis</i>	Muscicapidae	LC	WV	-		✓
84	Laughing Dove	<i>Spilopelia senegalensis</i>	Columbidae	LC	R	IV		✓
85	Lesser Adjutant	<i>Leptoptilos javanicus</i>	Ciconiidae	VU	R	-	✓	✓
86	Lesser Coucal	<i>Centropus bengalensis</i>	Cuculidae	LC	R	-	✓	✓
87	Lesser Fish-eagle	<i>Ichthyophaga humilis</i>	Accipitridae	NT	R	I		✓
88	Lesser Racquet-tailed Drongo	<i>Dicrurus remifer</i>	Dicruridae	LC	R	IV		✓
89	Lesser Shortwing	<i>Brachypteryx leucophris</i>	Muscicapidae	LC	WV	-		✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
90	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	Anatidae	LC	R	IV	✓	✓
91	Lineated Barbet	<i>Psilopogon lineatus</i>	Megalaimidae	LC	R	IV	✓	✓
92	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	LC	R	IV	✓	✓
93	Little Egret	<i>Egretta garzetta</i>	Ardeidae	LC	R	IV	✓	✓
94	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	LC	R	IV		✓
95	Little Heron	<i>Butorides striata</i>	Ardeidae	LC	R	-	✓	
96	Little Pratincole	<i>Glareola lactea</i>	Glareolidae	LC	R	IV		✓
97	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriidae	LC	R	IV		✓
98	Little Spiderhunter	<i>Arachnothera longirostra</i>	Nectariniidae	LC	R	-		✓
99	Long-legged Buzzard	<i>Buteo rufinus</i>	Accipitridae	LC	WV	-		✓
100	Long-tailed Shrike	<i>Lanius schach</i>	Laniidae	LC	WV	-		✓
101	Mallard	<i>Anas platyrhynchos</i>	Anatidae	LC	R	IV		✓
102	Northern Shoveler	<i>Spotula clypeata</i>	Anatidae	LC	R	-		✓
103	Oriental Darter	<i>Anhinga melanogaster</i>	Anhingidae	NT	R	IV		✓
104	Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i>	Accipitridae	LC	R	-	✓	✓
105	Oriental Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae	LC	R	-	✓	✓
106	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	Bucerotidae	LC	R	-	✓	✓
107	Osprey	<i>Pandion haliaetus</i>	Pandionidae	LC	WV	I	✓	
108	Paddyfield Pipit	<i>Anthus rufulus</i>	Motacillidae	LC	R	IV	✓	✓
109	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Jacaniidae	LC	R	IV		✓
110	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae	LC	R	IV	✓	✓
111	Plain Martin	<i>Riparia chinensis</i>	Hirundinidae	LC	R	-	✓	✓
112	Purple heron	<i>Ardea purpurea</i>	Ardeidae	LC	R	-	✓	
113	Purple Swamphen	<i>Porphyrio porphyrio</i>	Rallidae	LC	R	-		✓
114	Red Junglefowl	<i>Gallus gallus</i>	Phasianidae	LC	R	IV		✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
115	Red-breasted Parakeet	<i>Psittacula alexandri</i>	Psittacidae	NT	R	IV	✓	
116	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	LC	R	IV	✓	✓
117	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	LC	R	-	✓	✓
118	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	Pycnonotidae	LC	R	IV		✓
119	Richard's Pipit	<i>Anthus richardi</i>	Motacillidae	LC	WV	IV		✓
120	Rock Dove	<i>Columba livia</i>	Columbidae	LC	R	IV	✓	✓
121	Rose-ringed parakeet	<i>Alexandrinus krameri</i>	Psittacidae	LC	R	IV	✓	✓
122	Rosy Pipit	<i>Anthus roseatus</i>	Motacillidae	LC	WV	IV		✓
123	Ruddy Shelduck	<i>Tadorna ferruginea</i>	Anatidae	LC	WV	IV		✓
124	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	LC	R	-	✓	✓
125	Rusty-bellied Shortwing	<i>Brachypteryx hyperythra</i>	Muscicapidae	NT	WV	-		✓
126	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Estrildidae	LC	R	IV	✓	
127	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Campephagidae	LC	WV	IV		✓
128	Shikra	<i>Accipiter badius</i>	Accipitridae	LC	R	-	✓	✓
129	Small Niltava	<i>Niltava macgrigoriae</i>	Muscicapidae	LC	WV	-		✓
130	Smoky Warbler	<i>Phylloscopus fulgiventis</i>	Phylloscopidae	LC	WV	IV		✓
131	Swamp Francolin	<i>Francolinus gularis</i>	Phasianidae	VU	R	-		✓
132	Temminck's Stint	<i>Calidris temminckii</i>	Scolopacidae	LC	WV	-		✓
133	Tickell's Leaf-warbler	<i>Phylloscopus affinis</i>	Phylloscopidae	LC	WV	-		✓
134	Verditer Flycatcher	<i>Eumyias thalassinus</i>	Muscicapidae	LC	WV	IV		✓
135	Whistler's Warbler	<i>Phylloscopus whistleri</i>	Phylloscopidae	LC	WV	-		✓
136	White Wagtail	<i>Motacilla alba</i>	Motacillidae	LC	WV	-		✓
137	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	LC	R	IV	✓	✓
138	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	LC	R	IV	✓	✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	Migration status	WPA Schedule	Presence in Season 1	Presence in Season 2
139	White-rumped Shama	<i>Kittacincla malabarica</i>	Muscicapidae	LC	R	-		✓
140	White-rumped Vulture	<i>Gyps bengalensis</i>	Accipitridae	CR	R	I		✓
141	White-throated Bulbul	<i>Alphoixus flaveolus</i>	Pycnonotidae	LC	R	IV	✓	✓
142	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	LC	WV	IV		✓
143	Yellow Bittern	<i>Ixobrychus sinensis</i>	Ardeidae	LC	R	IV	✓	
144	Yellow Wagtail	<i>Motacilla flava</i>	Motacillidae	LC	WV	-		✓
145	Yellow-bellied Prinia	<i>Prinia flaviventris</i>	Cisticolidae	LC	R	-		✓
146	Yellow-footed Green Pigeon	<i>Treron phoenicopterus</i>	Columbidae	LC	R	IV	✓	

Table 21 Inventory of butterflies observed in study area- Season 1 (Monsoon) & Season 2 (Winter)

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
1	Angled Red Forester	<i>Lethe chandica</i>	Nymphalidae	-	-		✓
2	Bamboo Treebrown	<i>Lethe europa</i>	Nymphalidae	-	-	✓	✓
3	Bispost Banded Ace	<i>Halpe porus</i>	Hesperiidae	-	-	✓	
4	Blackvein Sergeant	<i>Athyma ranga</i>	Nymphalidae	-	II	✓	✓
5	Blue Tiger	<i>Tirumala limniace</i>	Nymphalidae	-	-	✓	✓
6	Chinese Bushbrown	<i>Mycalasis gotama</i>	Nymphalidae	-	II	■	✓
7	Chocolate Albatross	<i>Appias lycida</i>	Pieridae	-	II	✓	✓
8	Chocolate Demon	<i>Ancistroides nigrita</i>	Hesperiidae	-	-		✓
9	Chocolate Pansy	<i>Junonia iphita</i>	Nymphalidae	-	-	✓	✓
10	Chocolate Tiger	<i>Parantica melaneus</i>	Nymphalidae	-	-		✓
11	Clear Sailer	<i>Neptis nota</i>	Nymphalidae	-	II		✓
12	Colour Sergeant	<i>Athyma inara</i>	Nymphalidae	-	-	✓	
13	Commander	<i>Moduza procris</i>	Nymphalidae	-	-		✓
14	Common Batwing	<i>Atrophaneura varuna</i>	Papilionidae	LC	-	✓	✓
15	Common Bluebottle	<i>Graphium sarpedon</i>	Papilionidae	-	-	✓	
16	Common Castor	<i>Ariadne merione</i>	Nymphalidae	-	-	✓	✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
17	Common Crow	<i>Euploea core</i>	Nymphalidae	-	-	✓	
18	Common Duffer	<i>Discophora sondaica</i>	Nymphalidae	-	I	✓	
19	Common Evening Brown	<i>Melanitis leda</i>	Nymphalidae	-	-		✓
20	Common Five-ring	<i>Ypthima baldus</i>	Nymphalidae	-	-		✓
21	Common Forester	<i>Lethe isana</i>	Nymphalidae	-	-		✓
22	Common Four-ring	<i>Ypthima huebneri</i>	Nymphalidae	-	-	✓	✓
23	Common Gem	<i>Paritia hewitsoni</i>	Lycaenidae	-	II		✓
24	Common Grass Yellow	<i>Eurema hecabe</i>	Pieridae	-	-	✓	✓
25	Common Gull	<i>Cepora nerissa</i>	Pieridae	-	II	✓	✓
26	Common Jay	<i>Graphium dason</i>	Papilionidae	-	-	✓	
27	Common Jester	<i>Symbrenthia illaea</i>	Nymphalidae	-	-		✓
28	Common Lascar	<i>Pantoporia hordonia</i>	Nymphalidae	-	-	✓	✓
29	Common Leopard	<i>Phalanta phalantha</i>	Nymphalidae	LC	-	■	✓
30	Common Mormon	<i>Papilio polytes</i>	Papilionidae	-	-	✓	✓
31	Common Palmfly	<i>Elymnias hypermnestra</i>	Nymphalidae	-	-	✓	✓
32	Common Peacock	<i>Papilio bianor</i>	Papilionidae	-	-	✓	
33	Common Pierrot	<i>Castallus rosamon</i>	Lycaenidae	-	I	✓	
34	Common Rose	<i>Pachliopta aristolochiae</i>	Papilionidae	LC	-	✓	✓
35	Common Saller	<i>Neptis hylas</i>	Nymphalidae	-	-		✓
36	Common Sergeant	<i>Athyma perlus</i>	Nymphalidae	-	-	✓	✓
37	Common Snow flat	<i>Tagiades jopetus</i>	Hesperiidae	-	-	✓	
38	Common Tit	<i>Hypolycaena erylus</i>	Lycaenidae	-	-		✓
39	Common Yeoman	<i>Cirrochroa tyche</i>	Nymphalidae	-	-	✓	✓
40	Constable	<i>Dichorragia nesimachus</i>	Nymphalidae	-	-	✓	
41	Donald Eggfly	<i>Hypolimnas misippus</i>	Nymphalidae	LC	I	✓	✓
42	Dark Evening Brown	<i>Melanitis phedima</i>	Nymphalidae	-	-		✓
43	Dark Palm-Dart	<i>Telicota bambusae</i>	Hesperiidae	-	-		✓
44	Dark Velvet Bob	<i>Koruthalalos butleri</i>	Hesperiidae	-	-		✓
45	Dark-branded Bushbrown	<i>Mycalesis mineus</i>	Nymphalidae	-	-	✓	✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
46	Double-branded Bushbrown	<i>Mycalasis adamsonii</i>	Nymphalidae	-	II		✓
47	Eastern Striped Albatross	<i>Appias alferna</i>	Pieridae	-	II	✓	✓
48	Elbowed Pierrot	<i>Caleta elna</i>	Lycaenidae	-	-	✓	✓
49	Extra Lascar	<i>Pantoparia sandaka</i>	Nymphalidae	-	-		✓
50	Fluffy Tit	<i>Zelus amasa</i>	Lycaenidae	-	-	✓	✓
51	Glassy Tiger	<i>Parantica oglea</i>	Nymphalidae	-	-	✓	✓
52	Great Eggfly	<i>Hypolimnas bolina</i>	Nymphalidae	-	-	✓	
53	Great evening brown	<i>Melanitis zitenius</i>	Nymphalidae	-	II	✓	
54	Great Mormon	<i>Papilio memnon</i>	Papilionidae	-	-	✓	
55	Great Orange-tip	<i>Hebomoia glaucippe</i>	Pieridae	-	-	✓	✓
56	Grey Count	<i>Tanaecia lepidea</i>	Nymphalidae	-	II	✓	✓
57	Grey Pansy	<i>Junonia atlites</i>	Nymphalidae	-	-	✓	✓
58	Indian Ace	<i>Halpe hamolea aucma</i>	Hesperiidae	-	-	✓	
59	Indian Cabbage White	<i>Pieris canidia</i>	Pieridae	-	-	✓	
60	Indian Nawab	<i>Choraxes bharata</i>	Nymphalidae	-	-	✓	
61	Indian Wanderer	<i>Parerania hippia</i>	Pieridae	-	-	✓	✓
62	Knight	<i>Lebadea martha</i>	Nymphalidae	-	-	✓	
63	Large Four-Lineblue	<i>Nacaduba pactorus</i>	Lycaenidae	-	-		✓
64	Large Yeoman	<i>Cirrochroa aoris</i>	Nymphalidae	-	-		✓
65	Lemon Emigrant	<i>Catopsilia pomona</i>	Pieridae	-	-	✓	✓
66	Leopard Lacewing	<i>Cethosia cyane</i>	Nymphalidae	-	-	✓	
67	Lesser Batwing	<i>Atrophaneura aidoneus</i>	Papilionidae	LC	-		✓
68	Lesser Grass Blue	<i>Zizina otis</i>	Lycaenidae	-	-	✓	✓
69	Lesser Gull	<i>Cepora nodina</i>	Pieridae	-	II		✓
70	Light Straw Ace	<i>Pithouria stramineipennis</i>	Hesperiidae	-	-	✓	
71	Lime Swallowtail	<i>Papilio demoleus</i>	Papilionidae	NA	-	✓	
72	Long-branded Blue Crow	<i>Euploea algea</i>	Nymphalidae	-	-	✓	
73	Long-branded Bushbrown	<i>Mycalasis visala</i>	Nymphalidae	-	-	✓	✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
74	Map Butterfly	<i>Cyrestis thyodamas</i>	Nymphalidae	-	-		✓
75	Metallic Cerulean	<i>Jamides alecto</i>	Lycaenidae	-	II	✓	
76	Opaque Six-Lineblue	<i>Nacaduba beroe</i>	Lycaenidae	-	-		✓
77	Orchid Tit	<i>Hypolycaena othona</i>	Lycaenidae	-	I	✓	
78	Pale Four-Lineblue	<i>Nacaduba hermus</i>	Lycaenidae	-	II		✓
79	Pale Green Awlet	<i>Burara gomata</i>	Hesperiidae	-	-		✓
80	Pale Wanderer	<i>Parerionia avatar</i>	Pieridae	-	II		✓
81	Parnara Swift spp	<i>Parnara spp.</i>	Hesperiidae	-	-		✓
82	Peacock Pansy	<i>Junonia almana</i>	Nymphalidae	LC	-	✓	✓
83	Pioneer	<i>Belenois aurota</i>	Papilionidae	-	-	✓	
84	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae	LC	-	✓	✓
85	Psyche	<i>Leptosia nina</i>	Pieridae	-	-	✓	✓
86	Punchinello	<i>Zemeros flegyas</i>	Riodinidae	-	-	✓	✓
87	Purple Sapphire	<i>Heliophorus epicles</i>	Lycaenidae	-	-	✓	✓
88	Red Helen	<i>Papilio helenus</i>	Papilionidae	-	-	✓	✓
89	Red Lacewing	<i>Cethosia biblis</i>	Nymphalidae	-	-		✓
90	Red-base Jezebel	<i>Delias pasithae</i>	Pieridae	-	-		✓
91	Rustic	<i>Cupha erymanthis</i>	Nymphalidae	-	-	✓	✓
92	Saronis Sunbeam	<i>Curetis saronis</i>	Lycaenidae	-	-		✓
93	Small Branded Swift	<i>Pelopidas mathias</i>	Hesperiidae	LC	-		✓
94	Small Green Awlet	<i>Burara amara</i>	Hesperiidae	-	-	✓	
95	Smaller Dartlet	<i>Oriens galoides</i>	Hesperiidae	-	-	✓	✓
96	Straight Swift	<i>Parnara guttatus</i>	Hesperiidae	-	-	✓	✓
97	Striped Tiger	<i>Danaus genutia</i>	Nymphalidae	-	-	✓	✓
98	Suffused Snow flat	<i>Tagiades gona</i>	Hesperiidae	-	-	✓	
99	Sylhet Oakblue	<i>Arhopala sylhetensis</i>	Lycaenidae	-	II		✓
100	Tailless Lineblue	<i>Prosotas dubiosa</i>	Lycaenidae	-	-	✓	
101	Tamil Oakblue	<i>Arhopala bazaloides</i>	Lycaenidae	LC	II		✓
102	Tawny Coster	<i>Acraea terpsicore</i>	Nymphalidae	-	-		✓

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Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
103	Tawny Rajah	<i>Charaxes bernardus</i>	Nymphalidae	-	II		✓
104	Three-spot Grass Yellow	<i>Eurema blanda</i>	Pieridae	-	-	✓	
105	Veined Pierrot	<i>Tarucus venosus</i>	Lycaenidae	-	-	✓	
106	Wax Dart	<i>Cupitha purreea</i>	Hesperiidae	-	-		✓
107	Wizard	<i>Rhinopalpa polynice</i>	Nymphalidae	-	II		✓
108	Yamfly	<i>Loxura atymnus</i>	Lycaenidae	-	-	✓	✓
109	Yellow-crested Spangle	<i>Papilio elephenor</i>	Papilionidae	-	II		✓

Table 22 Inventory of Mammals observed in study area- Season 1 (Monsoon) & Season 2 (Winter)

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
1	Western Hoolock Gibbon	<i>Hoolock hoolock</i>	Hyllobatidae	EN	I	✓	✓
2	Rhesus Macaque	<i>Macaca mulatta</i>	Cercopithecidae	LC	II	✓	✓
3	Hoary-bellied Squirrel	<i>Callosciurus pygerythrus</i>	Sciuridae	LC	-	✓	✓
4	Indian Flying Fox	<i>Pteropus giganteus</i>	Pteropodidae	LC	V	✓	✓
5	Assamese Macaque	<i>Macaca assamensis</i>	Cercopithecidae	NT	II		✓
6	Northern Pig-tailed Macaque	<i>Macaca leonina</i>	Cercopithecidae	VU	II		✓
7	Golden Jackal	<i>Canis aureus</i>	Canidae	LC	II		✓
8	Indian Grey Mongoose	<i>Urva edwardsii</i>	Herpestidae	LC	II		✓
9	Asian Elephant	<i>Elephas maximus</i>	Elephantidae	EN	I		✓
10	Ganges River Dolphin	<i>Platanista gangetica gangetica</i>	Platanistidae	EN	I		✓

Table 23 Inventory of Herpetofauna observed in study area- Season 1 (Monsoon) & Season 2 (Winter)

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Schedule	Presence in Season 1	Presence in Season 2
1	Oriental garden lizard	<i>Calotes versicolor</i>	Agamidae	-	-	✓	
2	Skittering frog	<i>Euphlyctis cyanophlyctis</i>	Dicroglossidae	LC	-	✓	
3	Gecko Sp.	-	-	-	-	✓	

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4	Skink Sp.	-	-	-	-	✓	
5	Checkered Keelback	<i>Fowlea piscator</i>	Colubridae	LC	II		✓
6	Keeled Indian Mabuya	<i>Eutropis carinata</i>	Scincidae	LC	-		✓

Table 24 Inventory of Fishes observed in study area- Season 1 (Monsoon) & Season 2 (Winter)

Sr.No.	Common Name	Scientific name	Family	IUCN Status	WPA	Presence in Season 1	Presence in Season 2
1	Elongate glassy perchlet	<i>Chanda nama</i>	Ambassidae	LC	-	✓	✓
2	Spotted Snakehead	<i>Channa punctata</i>	Channidae	LC	-	✓	✓
3	Snakehead Murrel	<i>Channa striata</i>	Channidae	LC	-	✓	✓
4	Wagur	<i>Carias magur</i>	Clariidae	LC	-	✓	✓
5	Grass carp	<i>Ctenopharyngodon idella</i>	Cyprinidae	-	-	✓	✓
6	Gangetic leaffish	<i>Nandus nandus</i>	Nandidae	LC	-	✓	✓
7	Catla	<i>Gibelion catla</i>	Cyprinidae	LC	-	✓	✓
8	Indian River Shad	<i>Gudusia chapra</i>	Clupeidae	LC	-	✓	✓
9	Singee	<i>Heteropneustes fossilis</i>	Heteropneustidae	LC	-	✓	✓
10	Spiny Eel	<i>Mastacembelus armatus</i>	Mastacembelidae	LC	-	✓	✓
11	Gangetic mudeel	<i>Monopterus albus</i>	Synbranchidae	LC	-	✓	✓
12	-	<i>Mystus cavasius</i>	Bagridae	LC	-	✓	✓
13	Spotfin Swamp Barb	<i>Puntius sophore</i>	Cyprinidae	LC	-	✓	✓
14	Reba Carp	<i>Cirrhinus reba</i>	Cyprinidae	LC	-	✓	✓
15	Dwarf gourami	<i>Trichogaster lalius</i>	Osphronemidae	LC	-	✓	✓
16	-	<i>Wallago attu</i>	Siluridae	VU	-	✓	✓
17	-	<i>Xenentodon cancila</i>	Belontiidae	LC	-	✓	✓
18	-	<i>Leiodon cutcutia</i>	Tetraodontidae	LC	-		✓
19	Giant Murrel	<i>Channa marulius</i>	Channidae	LC	-		✓

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ASSAM STATE BIO-DIVERSITY BOARD



INTERNATIONAL UNION
FOR CONSERVATION OF NATURE
INDIA COUNTRY OFFICE
H-4, GREEN PARK EXTENSION,
NEW DELHI-110 016, INDIA
TEL. +91 11 2616 7742, 2618 5554
www.iucn.org



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Annexure - 2

F. No. 22-8/2018-1A.III
Government of India
Ministry of Environment, Forest and Climate Change
Impact Assessment Division

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj
New Delhi - 110003
sharath.kr@gov.in

Date: 20th April, 2018

OFFICE MEMORANDUM

Sub: Application for seeking prior environmental clearance for the projects / activities given in the schedule of EIA Notification, 2006 regarding.

The Environmental Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986 mandates the requirement of prior environmental clearance for the projects / activities listed in the schedule to the said Notification. To facilitate the same, the EIA Notification, 2006 read with subsequent amendments, provides for submission of project details in the prescribed Forms (1/1M/1A) seeking Terms of Reference (ToRs) / Environmental Clearance (EC), as applicable, for certain category of projects.

2.0 The Project Proponents (PPs) are required to submit their proposals for ToR/ECs, on the portal of this Ministry/State level Environment Impact Committee (SEIAA), in different forms prescribed, as applicable. However, it has been observed that in cases where the Forms were not prescribed for seeking prior EC, the proposals are incomplete and lack clarity.

3. The matter has been examined in the Ministry, and in order to streamline the process of environmental clearances, it has been decided to follow the procedure as under:

- a. An application seeking Terms of Reference for preparation of an EIA Report in all the cases, as applicable, shall be made by the project proponent in the prescribed Form-1, as given in Appendix II after identification of prospective site(s) for the project and/or activities to which the application relates. The project proponent shall furnish a copy of the pre-feasibility report for the project along with the application in Form-1.
- b. An application seeking prior environmental clearance for the projects/activities listed in the schedule to the EIA Notification, 2006, henceforth, shall be made by the project proponent before commencing any construction activity, or preparation of land, or mining at the site, as given below:
 - i. For building/construction projects (item 8 of the Schedule), in the prescribed Form-1 given in Appendix I, along with Supplementary Form 1A as given in Appendix II, as prescribed in EIA Notification, 2006 and a copy of the detailed conceptual plan;

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- ii. For mining projects of minor minerals up to five hectares under Category 'B2' - In the prescribed Form-1M given in Appendix VIII, as prescribed in EIA Notification, 2006 along with a copy of Feasibility Report and the District Survey Report;
- iii. For all other projects - In the prescribed Form-2 enclosed with this OM along with copy of EIA/EMP report as per the generic structure given at Appendix-III of the EIA Notification, 2006. Summary of the Environmental Impact Assessment given in Appendix-IIIA, Risk Assessment Report, Copy of Feasibility Report or Detailed Project Report or Detailed Engineering Report, certification of compliance of earlier environmental clearance conditions in case of expansion proposals and final layout plant, as the case may be, and as per the requirement contained in the EIA Notification, 2006 and/or the Form-2 enclosed here.

This issues with the approval of Competent Authority.

Shamoo
20/4/18
(Sharath Kumar Pallerla)
Scientist "F" / Director

1. All the officers of IA Division
2. Chairperson/Member Secretaries of all the SEIAAs/SEACs
3. Chairman of all the Expert Appraisal Committees
4. Chairman, CPCB
5. Chairpersons/Member Secretaries of all SPCBs/UTPCCs

Copy for information:

1. PS to Minister for Environment, Forest and Climate Change
2. PS to MoS (EF&CC)
3. PPS to Secretary(EF&CC)
4. PPS to AS(AKJ) / AS (AKM)
5. PPS to JS (GB)/ JS(JT)
6. Website, MoEF&CC
7. Guard file

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Annexure

Form-2

APPLICATION FOR PRIOR ENVIRONMENTAL CLEARANCE

1	Details of Project				
a.	Name of the Project (s)	:			
b.	Name of the Company / Organisation	:			
c.	Registered Address	:			
d.	Legal Status of the Company	:			
e.	Joint Venture (Yes/No)	:			
	If Yes,				
	(i) No. of JV Partners (<i>Multiple Entries Allowed</i>)	:			
	Name of the JV Partner	Share of the JV Partner	Address of the JV Partner	Email Id of JV Partner	Mobile No. of JV Partner
2	Address for the correspondence				
a	Name of the applicant	:			
b	Designation (Owner / Partner / CEO)	:			
c.	Address				
d	Pin code				
e	e-mail				
f.	Telephone No.				
g.	Fax No.				
3	Category of the Project/Activity as per Schedule of EIA Notification, 2006				
a.	Project / Activity [1(a)(i) / 1(a)(ii) / 1(b) / 1(c) / 1(d) / 1 (e) / 2(a) / 2(b) / 3(a) / 3(b) / 4(a) / 4(b)(i) / 4(b) (ii) / 4(c) / 4(d) / 4(e) / 4(f) / 5(a) / 5(b) / 5(c) / 5(d) / 5(e) / 5(f) / 5(g) / 5(h) / 5(i) / 5(j) / 6(a) / 6(b) / 7(a) / 7(b) / 7 (c) / 7 (d) / 7 (da) / 7 (e) / 7 (f) / 7 (g) / 7 (h) / 7 (i) / 8 (a) / 8 (b)				
b.	Category (A/B ₁ /B ₂)	:			
	If B ₁ or B ₂				
	Reason for application at Central Level / State level (in case of B ₂ projects)	:			
	If Others				
c.	Please Specify	:			
d.	EAC concerned (for category A Projects only) (Coal Mining / Non-coal Mining / Thermal / River Valley & Hydro / Industry-I / Industry-II / Infrastructure-I / Infrastructure-II / Nuclear & Defence / CRZ	:			
e.	New / Expansion / Modernization / One Time Capacity expansion (only for Coal Mining) / Expansion under Para 7(ii) / Modernization under Para 7(ii) / Change of Product Mix under Para 7(ii)	:			
4	Location of the Project				
a.	Plot / Survey / Khasra No.	:			

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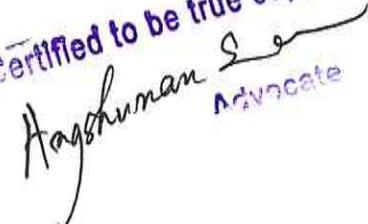
b.	Village	:	
c.	Tehsil	:	
d.	District		
e.	State		
f.	Pin Code		
g.	Bounded Latitudes (North)		
	From	:	
	To	:	
h.	Bounded Longitudes (East)		
	From	:	
	To	:	
i.	Survey of India Topo Sheet No.	:	
j.	Upload Topo Sheet File (<i>Upload pdf only</i>)	:	
k.	Maximum Elevation Above Means Sea Level (AMSL)	:	
l.	Upload (kml) File (<i>Upload kml only</i>)	:	
m.	Distance of Nearest HFL from the project boundary within the study area	:	
n.	Seismic Zone (Zone: 1 / 2 / 3 / 4 / 5)	:	
5	Whether project is executed in multiple States (Yes / No)?		
	If Yes		
a.	Number of States in which Project will be Executed (e.g. 1,2,3,4,5,6)		
b.	Main State of the Project		
c.	Other State (<i>Multiple Entries Allowed</i>) (If the project to be executed, does not belong to any state, then state category could be selected as 'Other')		
	State	District	Tehsil
			Village
6	Details of Terms of Reference (ToR)		
a.	Whether ToR is mandatory for submitting application (Yes / No)?		
	If Yes		
b.	Date of issue of ToR / Standard ToR		
c.	MoEF&CC / SEIAA File No.		
d.	Upload ToR letter (PDF only)		
7	Details of Public Consultation		
a.	Whether the Project Exempted from Public Hearing (Yes/No)?		
	If yes,		
	Reason		
b.	Supporting Document (<i>upload pdf only</i>)		
c.	Whether details of Public Hearing available (Yes/No)?	:	
	If No,		
d.	Reason thereof		
	Supporting Document (<i>upload pdf only</i>)		
	If Yes,		
e.	Date of Advertisement of Public Hearing		

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f.	Copy of advertisement in English (Upload PDF only)			:	
g.	Whether Public hearing was presided over by an officer of the rank of Additional District Magistrate or above (Yes/No)?			:	
	If yes				
h.	Designation of Presiding Officer (District Magistrate / District Collector / Deputy Commissioner / others - please specify)				
i.	Copy of duly signed Proceedings of Public Hearing in English (<i>Upload pdf only</i>)			:	
j.	Date of Public Hearing			:	
k.	Venue of Public Hearing:			:	
	Village				
	Tehsil				
	District				
	State				
l.	Distance of Public Hearing Venue from the Proposed Project (km)			:	
m.	No. of people attended			:	
n.	If the multiple public hearings conducted				
	Pl give the details of each PH as per (e) to (o) above				
8	Details of Project Configuration / Product (Multiple Entries Allowed)				
a.	Whether the project is New (Yes/No?)				
	If yes,				
b.	Project Configuration				
		Plant / Equipment / Facility	Configuration	Remarks if any	
c.	Product			:	
	Product / Activity (Capacity / Area)	Quantity	Unit	Mode of Transport / Transmission of Product	
	<ul style="list-style-type: none"> - Unit:- (Tons per Annum(TPA), Mega Watt(MW), Hectares(ha), Kilo Litre per Day(KLD), Tons Crushed per Day(TCD), Cubic Meter per Day, Kilometers(Km), Million Liters per Day(MLD), Others) - Mode of Transport/Transmission of Product (Road, Rail, Conveyor Belt, Pipe Conveyor, Arial Ropeway, combination of two or three modes, Others) 				
9	If Expansion / Modernisation / One Time Capacity expansion (only for Coal Mining) / Expansion under Clause 7(ii) / Modernisation under Clause 7(ii) / Change of Product Mix under Clause 7(ii))				
a.	Details of environmental clearance granted earlier				
	(i)	Date of issue of environmental clearance		:	

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	(ii)	MoEFCC / SEIAA File Number					
	(iii)	Upload EC Letter					
b.	Details of certified report on compliance of earlier environmental clearance conditions						
	(i)	Details of Regional Office of MoEFCC / Zonal Office of CPCB / SPCB / UTPCC from which certified report on compliance of earlier environmental clearance conditions obtained	:				
	(ii)	Letter No	:				
	(iii)	Status of Compliance	:				
	(iv)	Certified report on compliance of earlier environmental clearance conditions (Including Monitoring Report) (<i>Upload pdf only</i>)	:				
	(v)	Date of site visit	:				
c.	Details of Consent to Operate						
	(i)	Whether Consent to operate obtained (Yes/No)? If yes,					
	(ii)	Upload Copies of all Consent to operate obtained since inception (<i>Upload pdf only</i>)					
	(iii)	Date of issue					
	(iv)	Valid up to					
	(v)	File No.					
	(vi)	Application No.					
	(vii)	Upload Copy of Consent to operate valid as on date (<i>Upload pdf only</i>)					
d.	Details of Capacity Expansion (<i>Multiple Entries Allowed</i>)						
		Product / Activity (Capacity/Area)	Quantity From	Quantity To	Unit	Mode of Transport / Transmission of Product	
		<ul style="list-style-type: none"> - Unit:- (Tons per Annum(TPA), Mega watt(MW), Hectares(ha), Kilo Litre per Day(KLD), Tons Crushed per Day(TCD), Cubic Meter per Day, Kilometers(Km), Million Liters per Day(MLD), Others) - Mode of Transport/Transmission of Product (Road, Rail, Conveyor Belt, Pipe Conveyor, Aerial Ropeway, combination of two or three modes, Others) 					
e.	Details of Configuration (<i>Multiple Entries Allowed</i>)						
		Plant / Equipment / Facility	Existing Configuration	Proposed Configuration	Final configuration after expansion	Remarks if any	
10	Project Cost						
a.	Total Cost of the Project at current price level (in Lakhs)					:	

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	b.	Funds Allocated for Environment Management (Capital) (in Lakhs)	:					
	c.	Funds Allocated Towards ESC (Entrepreneur Social Responsibility) (in Lakhs)	:					
	d.	Funds Allocated for Environment Management Plan (EMP) (Recurring per Annum) (in Lakhs)	:					
11	Whether project attracts the General Condition specified in the Schedule of EIA Notification (Yes/No)? [provide name of WL/CPA/ESA/Inter-state boundary / International boundary and distance from the project			:				
		If Yes						
	a.	Protected Area Notified Under the Wild Life(Protection) Act,1972	:					
	b.	Critically Polluted Areas as identified by the Central Pollution Control Board from Time to Time	:					
	c.	Notified Eco-Sensitive Areas	:					
	d.	Inter-State Boundaries and International Boundaries	:					
12	Whether projects attract the Specific Condition specified in the Schedule of EIA Notification (Yes/No)?			:				
		If Yes						
	a.	If any Industrial Estate / Complex / Export processing Zones / Special Economic Zones / Biotech Parks / Leather Complex with homogeneous type of industries such as Items 4(d), 4(f), 5(e), 5(f), or those Industrial estates with pre-defined set of activities (not necessarily homogeneous, obtains prior environmental clearance, individual industries including proposed industrial housing within such estates / complexes will not be required to take prior environmental clearance, so long as the Terms and Conditions for the industrial estate/complex are complied with (Such estates/complexes must have a clearly identified management with the legal responsibility of ensuring adherence to the Terms and Conditions of prior environmental clearance, who may be held responsible for violation of the same throughout the life of the complex/estate						
13	Raw Material / Fuel Requirement (Multiple Entries Allowed)							
	a.	Details of Raw Material / Fuel Requirement						
		Raw Material / Fuel	Quantity per Annum	Unit	Source (incase of Import, please specify country and Name of the port from which Raw Material / Fuel is received)	Mode of Transport	Distance of Source from Project Site (in Kilo meters) (In case of import, distance from the port from which the raw material / fuel is received	Type of Linkage (Linkage / Fuel Supply Agreement / e-auction / MoU / LOA / Captive / Open market / Others)
In case of expansion proposals, total requirement of raw material / fuel shall be given								

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	<ul style="list-style-type: none"> - Unit:- (Tons per Annum(TPA), Mega Watt(MW), Hectares(ha), Kilo Litre per Day(KLD), Tons Crushed per Day(TCD), Cubic Meter per Day, Kilometers(Km), Million Liters per Day(MLD), Others) - Mode of Transport/Transmission of Product (Road, Rail, Conveyor Belt, Pipe Conveyor, Arial Ropeway, combination of two or three modes, Others) 						
	b.	Upload copy of Linkage / Fuel Supply Agreement / e-auction / Memorandum of Understanding / Letter of Allocation / Captive source / others.	:				
14	Baseline Data (Air / Water / Noise / Soil / Ground water table/ Others)						
	a.	Period of Base Line Data Collection					
		From (DD/MM/YYYY)	:				
		To (DD/MM/YYYY)	:				
	b.	Season (Summer / Pre-monsoon / Post-monsoon / Winter)	:				
	c.	No. of Ambient Air Quality (AAQ) Monitoring Locations	:				
	d.	Details of AAQ Monitoring (<i>Multiple Entries Allowed</i>)					
		Criteria Pollutants	Unit	Maximum Value	Minimum Value	98 Percentile Value	Prescribed Standard
		<ul style="list-style-type: none"> - Criteria Pollutants: - (PM10, PM2.5, SO2, NOx, Others parameters specific to sector) - Unit: - (Micro Gram per Meter Cube, Nano Gram per Meter Cube, Mili Gram per Meter Cube, NA) 					
	e.	No. of Ground Water Monitoring Locations (<i>Multiple Entries Allowed</i>)	:				
	f.	Details of Ground Water Monitoring					
		Criteria Pollutants	Unit	Maximum Value	Minimum Value	98 Percentile Value	Prescribed Standard
		<ul style="list-style-type: none"> Criteria Pollutants: - (pH, TSS, TDS, Total Hardness, Chlorides, Fluoride, Heavy Metals, other parameters specific to the sector) - Unit :- (mg/l, NA) 					
	g.	No. of Surface Water Monitoring Locations	:				
	h.	Details of Ground Water Monitoring (<i>Multiple Entries Allowed</i>)					
		Criteria Pollutants	Unit	Maximum Value	Minimum Value	98 Percentile Value	Prescribed Standard
		<ul style="list-style-type: none"> - Parameter :- (pH, DO, BOD, COD, Others parameters specific to the sector) 					

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- Unit :- (mg/l, NA)						
i.	No. of Ambient Noise Monitoring Locations				:	
j.	Details of Noise Monitoring (<i>Multiple Entries Allowed</i>)					
	Parameter	Unit	Maximum Value	Minimum Value	98 Percentile Value	Prescribed Standard
	- Parameter:- (Leq(Day), Leq(Night))					
	- Unit :- (A-weighted decibels(dB(A))					
k.	No. of Soil Monitoring Locations (<i>Multiple Entries Allowed</i>)				:	
	Parameter	Unit	Maximum Value	Minimum Value	98 Percentile Value	
	- Parameter :- (pH, N(Nitrogen), P(Phosphorus), K(Potassium), Electric Conductivity)					
	- Unit :- (Millisiemens per Centimeter, Milligram per Litre, Percent, Centimeter per Second, Milliequivalents per 100 Gram, Milligram per Kilogram, Parts per Million, Kilogram per hectare, Others)					
1	Ground Water Table					
i	Range of Water Table Pre-Monsoon Season (Meters Below Ground Level (m bgl)):					
	From				:	
	To				:	
ii	Range of Water Table Post-Monsoon Season (Meters Below Ground Level (m bgl)):					
	From				:	
	To				:	
iii	Whether Ground Water Intersection will be there (Yes / No)?					
	If Yes,					
	(i) Upload Copy of Central Ground Water Authority Letter (<i>Upload pdf only</i>)				:	
	(ii) Letter No.				:	
	(iii) Date of issue				:	
15	Details of Water Requirement (During Operation) (<i>Multiple Entries Allowed</i>)					
a.	Details					
	Source	Quantity in KLD	Method of water withdrawal	Distance from Source	Mode of Transport	
	- Source: Surface / Ground water / Sea / Others					
	- Mode of Transportation: Pipeline / Canal / Others					
	- Method of water withdrawal: Barrage / Weir / Intake well / Jackwell / Tube well / Open well / Others					
b.	Upload Copy of Permission from Competent Authority (<i>Upload pdf only</i>)					

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c.	Letter No.	:	
d.	Date of issue	:	
e.	Permitted quantity	:	
f.	Whether Desalination is proposed (Yes/ No)	:	
	If Yes,		
	(i) Desalination capacity (KLD)	:	
	(ii) Quality of Brine (KLD)	:	
	(iii) Mode of Disposal of brine	:	

16 Waste Water Management (During Operation)

Type / Source	Quantity of Waste Water Generated (Kilo Litre per Day)	Treatment Capacity (Kilo Litre per Day)	Treatment Method	Mode of Disposal	Quantity of Treated Water Used in Recycling / Reuse (Kilo Litre per Day)	Quantity of Discharged Water (Kilo Litre per Day)

a.	Total Waste Water Generation	:	
b.	Total Discharged Water	:	
c.	Total Reused Water	:	

17 Solid Waste Generation Management (Multiple Entries Allowed)

Item	Quantity per Annum	Unit	Distance from Site	Mode of Transport	Mode of Disposal

- Item:- (Industrial waste, Municipal Solid waste, Fly ash, Bottom Ash, Hazardous Waste (as per Hazardous and Other Waste Management Rules 2016), E Waste, Bio-Medical waste, Construction & Demolition waste, Plastic Waste, Others)

- Unit:- (Tons, Kiloliter)

- Mode of Disposal:- (Treatment, Storage and Disposal Facility(TSDF), Authorized Recyclers, Landfills, Sanitary Landfills, Others)

18 Air Quality Impact Prediction (Multiple Entries Allowed)

Criteria Pollutants	Unit	Baseline Concentration	Minimum Value	Incremental Concentration	Total GLC	Prescribed Standard

- Parameter:- (PM10, PM, SO2, NOx, Others parameters specific to the sector)

- Unit :- (Microgram per Meter Cube, NA)

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19	Power Requirement			
a.	Quantity (Kilo Volt Amps (KVA))		:	
b.	Source		:	
c.	Upload Copy of Agreement (<i>Upload pdf only</i>)		:	
d.	Standby Arrangement (Details of DG Sets)		:	
e.	Stack Height (in m)		:	
20	Land Ownership Pattern (Prior to the project proposal) in Ha			
a.	Forest land		:	
b.	Private Land		:	
c.	Government Land		:	
d.	Revenue Land		:	
e.	Other Land		:	
	Total land		:	
21	Present Land Use breakup in Ha			
a.	Agriculture Area		:	
b.	Waste/Barren Area		:	
c.	Grazing / Community Area		:	
d.	Surface Water bodies		:	
e.	Settlements		:	
f.	Industrial		:	
g.	Forest		:	
h.	Mangroves		:	
i.	Marine area		:	
j.	Others (Specify)		:	
	Total		:	
22	Land requirement for various activities (Multiple entries allowed) in Ha			
	Description of Activity / Facility / Plant / Others	Land requirement	Remarks	
	Green belt			
	Total			
	- Activity / Facility / Plant / Others include: Main Plant, Township, Greenbelt, Ash pond, Quarry area, OB dump Area, Safety zone, Tailing pond, Landfill, Water reservoir, De-salination plant, Area for solid waste management, Built-up area, others			
23	Ecological and Environmental Sensitivity (Within 10 Km):- <u>WLS-Wild Life Species; NPA-Notified Protected Area; ESAs-Eco Sensitive Areas; ESZs- Eco Sensitive Zones</u>			
a.	Details of Ecological Sensitivity			
	Details of Ecological Sensitivity	Name	Distance from the Project (Km)	Remarks

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- Details of Ecological Sensitivity:- (Critically Polluted Area, WLS, NPA, ESAs, ESZs, Corridors, Wildlife Corridors)			
b.	Whether NBWL recommendation is required (Yes/No)?		
	If yes		
	Upload NBWL recommendation in PDF		
c.	Details of Environmental Sensitivity		
	Details of Environmental Sensitivity	Name	Distance from the Project (Km)
			Remarks
	- Details of Environmental Sensitivity:- (Forest, Archaeological Sites, Defence Installations, Others)		
d.	Whether NoC / Permission from the competent authority is required (Yes/No)?		
	If yes		
	Upload NoC / Permission from the competent authority in PDF		
24	Forest Land		
1	Whether any Forest Land involved (Yes/No)?		
	If Yes		
a.	Forests Clearance Status (In-Principle(Stage-I) Approval Obtained / Final (Stage-II) Approval Obtained / Forest Clearance Under Process(Stage-I) / Forest Clearance Under Process(Stage-II) / Application for Forest Clearance yet to be Submitted) :		
	If In-Principle (Stage-I) Approval Obtained,		
	(i) MoEFCC file number	:	
	(ii) Date of In Principle (Stage-I) approval	:	
	(iii) Area diverted	:	
	(iv) Upload FC Letter (Upload pdf only and attach it as Annexure-FC letter)	:	
	If Final (Stage-II) Approval Obtained,		
	(i) MoEFCC file number	:	
	(ii) Date of Final Approval	:	
	(iii) Date of In-Principle Approval	:	
	(iv) Area diverted	:	
	(v) Upload FC Letter (Upload pdf only and attach it as Annexure-FC letter)	:	
	If Forest Clearance under process (Stage-I),		
	(i) MoEFCC file number	:	
	(ii) Area applied	:	
	If Forest Clearance under process (Stage-II),		
	(i) MoEFCC file number	:	

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	(ii) Area applied	:	
b.	Legal Status of Forest Land (Reserved, Protected, Private, Village, Others)		
	If Others,		
	Please Specify Others	:	
25	Tree Cutting, if any		
a.	No. of Trees Cut for the Project (if Forestland not involved)	:	
b.	Details of Tree Cutting and Planting of Trees (Upload pdf Only)	:	
26	Land Acquisition Status		
a.	Acquired Land		
b.	Land yet to be acquired		
c.	Status of Land acquisition if not acquired		
27	Rehabilitation and Resettlement (R&R)		
a.	No. of Villages		
b.	No. of Households		
c.	No. of PDFs (Project Displaced Families)		
d.	No. of PAFs (Project Affected Families)		
e.	Funds Allocated for R&R		
f.	Status of R&R (Completed / In-progress / Yet to start)		
28	Whether there is Presence of Schedule-I Species (Yes/No)?	:	
	If yes,		
a.	Details of Schedule-I Species	:	
b.	Whether conservation plan for Schedule-I Species has been prepared (Yes/ No)?	:	
	If Yes,		
	(i) Upload conservation plan (Upload only PDF)		
	(ii) Fund Provision made		
	(iii) Period of Implementation		
c.	Whether conservation plan for Schedule-I Species has been approved by competent authority (Yes/ No)?		
	(i) Upload copy of approval (Upload PDF Only)	:	
	(ii) Letter No.	:	
	(iii) Date of issue	:	
	(iv) Recommendations if any	:	
29	Whether there is Presence of Water Bodies in Core Area (Yes/No)?	:	
	If yes,		
a.	Details of Water Bodies in Core Area	:	
b.	Whether there is Diversion required (Yes/No)?		
	If yes,		

	c.	Details of diversion required				
	d.	Details of study conducted				
	e.	Whether permission has been obtained from competent authority (Yes/No)?				
		(i) Upload copy of permission (Upload PDF Only)				
		(ii) Letter No.				
		(iii) Date of issue				
		(iv) Recommendations if any				
30	Whether there is Presence of Water Bodies in Buffer Area (Yes/No)?				:	
		If Yes				
	a.	Details of Water Bodies in Buffer Area			:	
	b.	Direction of Water Bodies in Buffer Area (North / South / East / West / North East / North West / South East / South west)			:	
	c.	Distance of Water Bodies in Buffer Area (kilo meters)				
31	Manpower Requirement					
	a.	Permanent employment during construction			:	
	b.	Permanent employment during operation			:	
	c.	Temporary employment during construction			:	
	d.	Temporary employment during operation			:	
	e.	No. of working days			:	
	f.	Total manpower			:	
32	Green Belt in Ha					
	a.	In case of new projects			:	
	i.	Total Area of Green Belt				
	ii.	Percentage of Total Project Area			:	
	iii.	No. of Plants to be Planted			:	
	iv.	Funds Allocated for Plantation			:	
	v	Upload Green Belt Plan (Upload PDF Only)				
	b.	Incase of expansion / modernization / change in product mix etc.				
	i.	Description	Existing	Proposed	Total	
		Total Area of Green Belt				
		Percentage of Total Project Area				
		No. of Plants				
		Funds Allocated				
	ii.	Upload Green Belt Plan (Upload PDF Only)				
33	Project Benefit (Multiple entry allowed)					

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Type of Project Benefits		Details of Project Benefit		
(Project benefits shall include environmental, social and others)				
34	Whether the Project / Activity attracts the provisions of CRZ (Yes/No)?			
	If yes,			
1	Project Details			
	a.	CRZ Classification: (CRZ I (A), CRZ I(B), CRZ II, CRZ III, CRZ IV (A), CRZ IV(B))		
	b.	Location type: (Non-Eroding Coast, Low and Medium Eroding Coast, High Eroding Coast)		
	c.	Details of Mangroves Land Involved, if Any		
	d.	Area of Mangroves Land (hectare)		
	e.	EIA (Terrestrial) Studies: (Carried Out, Not Carried Out)		
		<i>If Carried Out,</i>		
		1)	Summary Details of EIA (Terrestrial) Studies	
		2)	Upload Recommendation made in EIAs (Upload pdf only)	
		3)	Period of Study from (EIA Terrestrial)	
		4)	Period of Study to (EIA Terrestrial)	
		<i>If Not Carried out</i>		
			Give Reason	
	f.	EIA (Marine) Studies: (Carried Out, Not Carried Out)		
		<i>If carried out</i>		
		1)	Summary Details of EIA (Marine) Studies	
		2)	Upload Recommendation made in EIAs	
		3)	Period of Study from (EIA Marine)	
		4)	Period of Study to (EIA Marine)	
		<i>If Not Carried out,</i>		
			Give Reason	
	g.	Disaster Management Plan/National Oil Spill Disaster Contingency Plan (if Applicable)		
2.	Description of the Project Under Consideration			
	a.	Type of Project: (Resort/Buildings/civic amenities, Coastal Roads/Roads on Stilt, Pipelines from Thermal power Blow Down, Marine Disposal of Treated Effluent, Facility for Storage of Goods/Chemicals, Offshore structures, Desalination Plant, Mining of Rare Earth/Atomic Minerals, Sewage Treatment Plants, Lighthouse, Wind Mills, Others)		
		<i>If Resort/Buildings/civic amenities,</i>		

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		1)	Agency Name for Preparing CRZ Maps			
		2)	Total Area/Built-up Area (hectare)			
		3)	Height of Structure			
		4)	FSI Ratio			
		5)	The governing Town Planning Rules/Regulations			
		6)	Details of Provision of Car Parking Area			
		<i>If Coastal Roads/Roads on stillt,</i>				
		1)	Agency Name for Preparing CRZ Maps			
		2)	Area of Land Reclamation			
		3)	Estimated Quantity of Muck/Earth for Reclamation			
		4)	Carrying Capacity of Traffic			
		<i>If Pipelines from Thermal Power Blow Down,</i>				
		1)	Agency Name for Preparing CRZ Maps			
		2)	Length of Pipeline			
		3)	Length Traversing CRZ Area			
		4)	Depth of Excavation			
		5)	Width of Excavation			
		6)	Length of Pipeline from Seashore to Deep Sea			
		7)	Depth of Outfall Point from Surface of Sea Water			
		8)	Temperature of effluent above Ambient at Disposal Point			
		<i>If Marine Disposal of Treated Effluent,</i>				
		1)	Agency Name for Preparing CRZ Maps			
		2)	Location of Intake/Outfall			
		3)	Depth of Outfall Point			
		4)	Length of Pipeline			
		5)	Length Traversing CRZ Area			
		6)	Depth of Excavation			
		7)	Width of Excavation			
		8)	Length of Pipeline from Seashore to Deep Sea/Creek			
		9)	Depth of Outfall Point from Surface of Sea Water			
		10)	Depth of Water at Disposal Point			
		11)	Type of Disposal			
		<i>If Facility for Storage of Goods/Chemicals,</i>				
		1)	Agency Name for Preparing CRZ Maps			
		2)	Name and Type of Chemical			
		3)	End use of the Chemical			
		4)	No. of Tanks for Storage			

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	5)	Capacity of tanks		
	If offshore structures,			
	1)	Agency Name for Preparing CRZ Maps		
	2)	Exploration or Development		
	3)	Depth of Sea Bed		
	4)	No. of Rigs/Platform		
	5)	Details of Group Gathering Stations		
	If Desalination Plant,			
	1)	Agency Name for Preparing CRZ Maps		
	2)	Capacity of Desalination		
	3)	Total Brine Generation		
	4)	Temperature of Effluent above Ambient at Disposal Point		
	5)	Ambient Salinity		
	6)	Disposal Point		
	If Mining of Rare Earth/Atomic Minerals,			
	1)	Agency Name for Preparing CRZ Maps		
	2)	Capacity of Mining		
	3)	Volume/Area to be mined		
	4)	Type of Mineral to be Extracted		
	5)	End use of the Mineral		
	If Sewage Treatment Plants,			
	1)	Agency Name for Preparing CRZ Maps		
	2)	Capacity		
	3)	Total Area of Construction		
	4)	Compliance of effluent parameters as laid down by CPCB/SPCB/other authorized agency		
	5)	Whether discharge is in sea water/creek? If yes,		
		Distance of Marine Outfall Point from Shore/from the tidal river bank		
		Depth of Outfall Point from Sea Water Surface		
		Depth of Sea at Outfall Point		
	If Lighthouse,			
	1)	Agency Name for Preparing CRZ Maps		
	2)	Total Area of Construction		
	3)	Height of the Structure		
	If Wind Mills,			

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		1)	Agency Name for Preparing CRZ Maps		
		2)	Capacity (MW)		
		3)	Transmission Lines: (Overhead, Underground)		
		4)	Diameter of Windmill		
		5)	Length of Blade		
		6)	Speed of Rotation		
		7)	Height of the Structure		
			If Others,		
		1)	Agency Name for Preparing CRZ Maps		
		2)	Please Specify with salient features		
		3)	Upload relevant Document (<i>Upload pdf only</i>)		
	3.		Distance of Project (In Meters) from LTL/HTL to be Stated		
	a.		Clause of CRZ Notification Under which the Project is a Permissible/Regulated Activity		
	b.		Whether CRZ Map Indicating HTL, LTL Demarcation in 1:4000 Scales Prepared? (Yes/No)		
			<i>If Yes,</i>		
		1)	Distance of Project (in meters) from HTL to be Stated		
		2)	Upload Maps(<i>kml File</i>)		
		3)	Distance of Project(in meters) from LTL to be Stated		
		4)	Upload Maps (<i>kml File</i>)		
	c.		Whether Project Layout Superimposed on CRZ Map 1:4000 Scales?: (Yes/No)		
			<i>If Yes,</i>		
		1)	Upload Maps (<i>kml File</i>)		
	d.		Whether CRZ Map 1:25000 Covering 7 km Radius Around Project Site Prepared? (Yes/No)		
			<i>If Yes,</i>		
		1)	Upload Maps (<i>kml File</i>)		
	e.		Whether CRZ Map Indicating CRZ-I,II,III and IV Including Other Notified ESAs Prepared?: (Yes/No)		
			<i>If Yes,</i>		
		1)	Upload Maps (<i>kml File</i>)		
	f.		NOC from State Pollution Control Boards Obtained: (Yes/No)		
			<i>If Yes</i>		
		1)	Upload Copy of NOC (<i>Upload pdf only</i>)		
	g.		Details of Rain Water Harvesting System		

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4.	Recommendation of State Coastal Zone Management Authority			
	a.	Upload Copy of CZMA (<i>Upload pdf Only</i>)		
	b.	State the Conditions Imposed		
	c.	Social and Environmental Issues and Mitigations Measures Suggested Including but not Limited to R&R, Water, Air, Hazardous Wastes, Ecological aspects, etc. (Brief Details to be Provided)		
35	Sector Specific Details			
I	Whether the proposal is mining of minerals (coal / non-coal) project (Yes/No)?			
	If yes,			
1	No. of Mineral to be Mined (Multiple Entries Allowed)			:
		Minerals To be Mined	Major or Minor Mineral	
2	Mine Capacity in ROM (Run of Mine)			
3	Upload 500 meters Cluster Certificate from State Mines and Geology in case of minor minerals (<i>Upload pdf Only</i>)			
4	Mining Plan			
	a.	Approval Letter No.		
	b.	Date of Approval		
	c.	Upload Approved Letter (<i>Upload pdf only</i>)		
	d.	Approved by State Mines & Geology Department / Indian Bureau of Mines / Ministry of Coal / Ministry of Mines / State Government / Atomic Mineral Directorate / Others)		
	e.	If Others,		
		Please specify		
	f.	Approved Mining Lease Area		
	g.	Approved Capacity		
5	Technical Details			
	a.	Total Geological Reserves (Million Ton)		
	b.	Mineable Reserves (Million Ton)		
	c.	Extractable Reserves (Million Ton)		
	d.	Percent of Extraction (%)		
	e.	Grade of Coal /Ore /Mineral		
	f.	Stripping Ratio		
	g.	Category of Gaseousness (Only for Coal Mining, Others may write Not applicable)		
	h.	Average Gradient(Degree)		
	i.	Maximum Thickness of Seams(meters) (Only for Coal Mining, Others may write Not applicable)		

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	j.	Mining Method (Opencast / Underground / Mixed (Opencast + Underground) / Adit)				
	k.	Life of Mine (Years)				
6	Details of beneficiation (including crushing / screening/others)					
	a.	Whether it is proposed to install crusher within the mining lease area (Yes/No)?				
		If yes,				
	b.	No. of crushers				
	c.	Details of crusher (Multiple entries allowed)				
		Crusher ID	Capacity (in TPH)	Remarks		
	d.	Whether it is proposed to install beneficiation plant / Coal washery within the mining lease area (Yes/No)?				
		If yes,				
	e.	Beneficiation / washing Technology				
	f.	Capacity				
7	Details of Seams if applicable					
	a.	No. of seams				
	b.	Thickness of seams to be worked on				
	c.	Maximum Thickness of Seams(meters) (if not Applicable, may Write NA)				
8	Details of Mining Lease					
	a.	Details of Mining Lease				
	b.	Upload Letter of Intent (Upload pdf only)				
	c.	Date of Execution of Mining Lease with Reference Number				
	d.	Validity of Mining Lease				
	e.	Upload Copy of Executed Lease deed valid as on Date (Upload pdf only)				
	f.	Earlier Renewals (Multiple Entries Allowed)				
		Uploaded Copy of Earlier Lease	Date of Renewal			
9	OB (Over Burden) Management (Only if Mining Method: Opencast)					
	a.	Details of External Dumps				
		i) No. of OB Dumps				
		ii) Total Area (in Hectare)				
		iii) Height (in meter)				
		iv) Quantity (in Million Cubic meter)				

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		v) No. of year back fill up			
	b.	Details of Internal Dump			
		i) No. of Internal Dumps			
		ii) Total Area (in Hectare)			
		iii) Height (in meter)			
		iv) Quantity (in Million Cubic meter)			
10		Details of Topsoil Management			
	a.	Quantity of Topsoil excavated during the entire life of the mine (in Million Cubic meter)			
	b.	Quantity of Topsoil proposed for utilization for reclamation during the entire life of the mine (in Million Cubic meter)			
	c.	Quantity of Topsoil proposed for utilization for other activities during the entire life of the mine (in Million Cubic meter)			
11		Detail of Final Mine Void (Only if Mining Method: Opencast)			
	a.	Area (in Hectare)			
	b.	Depth (in meter)			
	c.	Volume (in Million Cubic meter)			
12		Details of Quarry (Only if Mining Method: Opencast)			
	a.	Final Void of (hectare)			
	b.	At a Depth of (meter which is proposed to be converted into a Water Body.)			
	c.	Total Quarry Area (ha)			
13		Details of Transportation			
	a.	In Pit/Underground to Surface			
	b.	Surface to Siding/Loading			
	c.	Transportation / Conveyor Details			
14		Details of Land Usage (Pre-Mining)			
		Land Use	Within ML Area (Hectare)	Outside ML Area (Hectare)	Total
		Agriculture Land			
		Forest Land			
		Waste Land			
		Grazing Land			
		Surface Water Bodies			
		Settlements			
		Others(Specify)			
15		Details of Transportation			
	a.	In Pit/Underground to Surface			
	b.	Surface to Siding/Loading			

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	c.	Transportation / Conveyor Details				
16	Details of Land Usage (Pre-Mining)					
	Land Use	Within ML Area (Hectare)	Outside ML Area (Hectare)	Total		
	Agriculture Land					
	Forest Land					
	Waste Land					
	Grazing Land					
	Surface Water Bodies					
	Settlements					
	Others(Specify)					
	Others					
17	Details of Land Usage (Post-Mining)					
	Land Use	Plantation	Water Body	Public Use	Others	
	Excavation / quarry					
	Top Soil Storage					
	External OB dumps					
	Internal OB dumps					
	Roads					
	Built Up Area (Colony/Office)					
	Green Belt					
	Virgin Area					
	Other					
	Total					
18	Details of Reclamation (Only if Mining Method: Opencast) Total Afforestation Plan shall be Implemented Covering of Mining. This will include:					
	a.	External OB Dump (in hectare)				
	b.	Internal Dump (in hectare)				
	c.	Quarry (in hectare)				
	d.	Safety Zone (in hectare)			:	
	e.	Final Void of (hectare)			:	
	f.	At a Depth of (meter which is proposed to be converted into a Water Body.)			:	
	g.	Density of Tree Plantation per ha (in no.)			:	
	h.	Others in ha (such as Excavation Area along ML Boundary, along Roads and Infrastructure, Embankment Area and in Township Located outside the Lease etc.)				
	i.	Total afforestation plant (in hectare)				
19	Status of Progressive Mining Closure Plan (For Expansion Projects only)					

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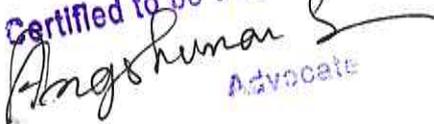
	a.	Implementation of Various Activities as per Approved Progressive Mine Closure Plan (in Bar Chart) (pdf) (Upload pdf only)					
	b.	Any Deviation from the Approved Progressive Mine Closure Plan					
	c.	Total Area Excavated (in hectare)					
	d.	Total Area Backfilled after Excavation (in hectare)					
	e.	Total Area Reclaimed (in hectare)					
20	Actual Coal/Ore Production vis-a-vis sanctioned capacity Since inception (Multiple Entries Allowed)						
	Financial Year	Sanctioned Capacity as per EC (MTPA)	Sanctioned capacity as per CTO	Sanctioned capacity as per approved Mining Plan	Actual Production	Excess Production Beyond the EC / CTO / Mining Plan Sanctioned Capacity (MTPA)	
II	Whether proposal is for Thermal Project (including captive power plant and Waste Heat Recovery Plant) (Yes/No)?						
	If yes,						
1	Specifications of the Plant						
	a.	Technology proposed (Supercritical, Sub-Critical, CFBC, AFBC, PFBC, IGCC, Incineration, Pyrolysis, Gasification, Bio-methanation, Others)				:	
	b.	Plant Load Factor (%)				:	
	c.	Station Heat Rate (Kcal/Kwh)				:	
	d.	Steam Rate/Flow Rate				:	
	e.	Boiler Temperature				:	
	f.	Boiler Pressure				:	
	g.	Type of Stack (Single flue / Bi-flue / Tri-Flue)				:	
	h.	No. of Stacks				:	
		Stack ID	Stack height (m)	Stack Diameter at exit (m)	Exit velocity of stack gas (m/s)	Exit temperature of stack gas (°C)	
2	Details of fuel linkage (please specify if multiple linkages are involved)						
	a.	Type of linkage (Linkage / Fuel Supply Agreement / e-auction / MoU / LOA / Captive / Open market / Others)					
	b.	Quantity of linkage granted					
	c.	Date of Linkage					
	d.	Duration of linkage					
3.	Details of Transportation of fuel						

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	Details / Mode	Distance (km)	Quantity (TPA)	
	Rail			
	Road			
	Pipeline			
	Conveyor			
	Other mode (Please specify)			
4.	Details of Fuel Characteristics			
	a.	Gross Calorific Value (Kcal/Kg)		
	b.	Ash content (%)		
	c.	Sulphur Content (%)		
	d.	Moisture (%)		
	e.	Mercury (mg/kg)		
	f.	Fixed Carbon (%)		
	g.	Volatile Matter (%)		
5.	Details of Cooling system			
	a.	Type of cooling system: Air cooled/Water cooled		
	b.	Type of draft: Natural draft/Forced draft		
	c.	Type of air circulation: Parallel flow/ Counter flow		
	d.	Cycles of Cooling (COC):		
	e.	Water requirement for cooling (m ³ /day):		
	f.	Boiler blow down temperature:		
III	Whether proposal is for River Valley & Hydroelectric Project (Yes/No)?			
	If Yes,			
	1.	Sub Sector: (Multipurpose Project / Hydroelectric Project / Irrigation project)		
	2.	Name of the River	:	
	3.	Whether Cumulative Impact Assessment and Carrying Capacity Study of River Basin Carried Out? (Yes/No)	:	
		If Yes	:	
	a.	Status of Cumulative Impact Assessment and Carrying Capacity Study of River Basin: (Recommended / Not Recommended.)	:	
		If Recommended		
	b.	Details of Cumulative Impact Assessment and Carrying Capacity Study of River Basin	:	
	c.	Upload Relevant Document (<i>Upload pdf only</i>)	:	
	4.	Type of Project: (Construction of Dam Barrage / Run of the River / Lift Irrigation Scheme)	:	
	5.	Dam Height (meter) if applicable	:	
	6.	Dam Length (meter) if applicable		
	7.	Total Submergence Area (hectare)	:	

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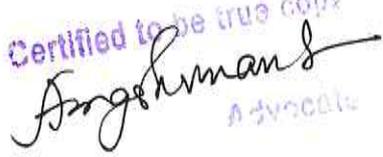
8.	Details of Gross Command Area (GCA) (hectare)			:	
9.	Details of Irrigable Command Area (ICA) (hectare)			:	
10.	Details of Culturable Command Area (CCA) (hectare)			:	
11.	Total Command Area (hectare)			:	
12.	Powerhouse Installed Capacity			:	
	a.	Type of Powerhouse: (Underground / Surface)			
	b.	Capacity (megawatts)			
	c.	No. of Tunnels			
	d.	No. of Units			
	e.	Bank of River: (Left /Right / Both)			
13.	Generation of Electricity Annually				
	a.	Quantity of Generation of Electricity Annually (in Giga Watt Hours (GWh))			
	b.	Water availability at various percentages			
		Percentage	Water availability (Cusecs)	Dependable year	Remarks
		At 50%			
		At 75%			
		At 90%			
	c.	Machine Availability (%)			
	d.	Cost of Electricity Generation (in INR)			:
	e.	Internal Rate of Return (%)			:
	f.	Year of achievement of Internal Rate of Return			:
14.	Catchment Area Treatment Plan (Upload PDF)				
15.	Muck Management Plan				
	a.	Upload Muck Management Plan in PDF			
	b.	Total Excavation Muck (Cubic Meter)			
	c.	Utilized for Construction (Cubic Meter)			
	d.	No. of Muck Disposal sites			
	e.	Total Muck Disposal Area (Ha)			
16.	Fishery Development and Management Plan				
	a.	Upload Fishery Development and Management Plan in PDF			
	b.	No. of Fingerlings			
	c.	No. of Fish Species			
	d.	Name of the umbrella Fish Species (Scientific Name)			
17.	Status of Environmental Flow				

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		Season	Average Inflow (in Million Cubic Meter)	Percent of Flow
		Lean		
		Non-Lean		
		Monsoon		
		Non-Monsoon		
18.	Free Flow Stretch (km)			
19.	Approval of Central Water Commission			
	a.	Approval Reference No.		
	b.	Date of Approval		
	c.	Upload Copy of Approval (<i>Upload pdf only</i>)		
20.	Approval of Central Electricity Authority			
	a.	Approval Reference No.		
	b.	Date of Approval		
	c.	Upload Copy of Approval (<i>Upload pdf only</i>)		
21.	Details of Cofferdam (upstream) if applicable			
	a.	Quantity of the material (m ³)		
	b.	Length of the dam (m)		
	c.	Quantity of muck to be used (m ³)		
	d.	Quantity of borrow material to be used (m ³)		
	e.	Decommissioning plan (upload in PDF)		
22.	Details of Cofferdam (downstream) if applicable			
	a.	Quantity of the material (m ³)		
	b.	Length of the dam (m)		
	c.	Quantity of muck to be used (m ³)		
	d.	Quantity of borrow material to be used (m ³)		
	e.	Decommissioning plan (upload in PDF)		
IV	Whether the proposal is Infrastructure projects (Yes/No)			
	If yes?			
1	Details of Building Construction			
	a.	Maximum Height of the Building (Meters)		
	b.	Total No. of Flats to be Build		
	c.	No. of Buildings		
	d.	Total plot area (sqm)		
	e.	Total built up area (sqm)		
2	Foreshore Facilities And/or Marine Disposal			

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 Advocate

	a.	Whether Project Involves Foreshore Activities and/or marine Disposal : (Yes/No)?		
		If Yes,		
	b.	Upload Shoreline Study (Upload pdf only)		
	c.	Type of Cargo		
	d.	Quantity of Cargo		
	e.	Control Measures of Cargo		
	f.	Dust Control Measures		
	g.	Quantum		
	h.	Quantity of Dredging (Cubic meter per day)		
	i.	Type of Dredging (Capital, Maintenance)		
	j.	Disposal of Dredge Material		
	k.	Details of Outfall Diffusers		
	m.	No. of Dilution Expected		
	n.	Distance at which the outlet will Reach Ambient Parameters		
	o.	Details of Monitoring at outfall		
	p.	Copy of NoC from PCB in case of Marine Disposal (Upload pdf only)		
3	Rain Water Harvesting			
	a.	No. of Storage		
	b.	Capacity		
	c.	No. of Recharge Pits		
	d.	Capacity		
4	Parking			
	a.	Details of 4-Wheeler/ 2-Wheeler Parking		
5.	Energy Saving Measures			
	a.	Source/Mode		
	b.	Percentage		
	c.	Quantity		
6.	Other Details			
	a.	Details of impact on Water Bodies and Drainage patters of catchment area, if any		
	b.	Details of Traffic Density Impact Assessment and Modelling Study (Upload pdf Only)		
	c.	In case of Underground Tunnel projects below the Forest Land – Subsidence Impact Study report (Upload pdf Only)		
7.	Type of Industries to be established with Industrial Estate as per their category A/B			
	Sl. No	Type of Industry	No. of Units	Category A/B

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8.	Length of the alignment in case of highway projects				
9.	Details Bridges/ROB/Interchanges, Flyovers, Vehicle Underpass and Pedestrian Underpass (in case of Highway Projects)				
	a.	Total No. of Bridges			
	b.	Total No. of ROB			
	c.	Total No. of Interchanges			
	d.	Total No. of Flyovers			
	e.	Total No. of Vehicle Underpass			
	f.	Total No of Pedestrian Underpass			
	g.	Details of other utilities rail and road corridors			
36	Details of Court Cases if any				
	a.	Whether there is any Court Cases pending against the project and/or land in which the project is proposed to be set up (Yes/No)?			
		If Yes,			
	b.	Name of the Court (Districts Court / High Court / NGT / Tribunals / Supreme Court of India)			
		If name of Court: (Districts Court, High Court, NGT, Tribunals)			
	c.	Name of the Sub-court			
	d.	Case No.			
	e.	Orders / Directions of the court, if any and its relevance with the proposed project			
	f.	Case Details			
	g.	Upload Court Order if any (Upload pdf Only)			
37	Details of direction issued under Environment (Protection) Act / Air (Prevention & Control of Pollution) Act / Water (Prevention & Control of Pollution) Act				
	a.	Whether any direction issued under Environment (Protection) Act / Air (Prevention & Control of Pollution) Act / Water (Prevention & Control of Pollution) Act (Yes/No)?			
		If yes,			
	b.	Details of directions issued under Environment (Protection) Act / Air (Prevention & Control of Pollution) Act / Water (Prevention & Control of Pollution) Act			
	c.	Upload copy of directions issued under Environment (Protection) Act / Air (Prevention & Control of Pollution) Act / Water (Prevention & Control of Pollution) Act			
	d.	Compliance status of the directions			
38	Details of EIA Consultant				
	a.	Have you hired Consultant for preparing document (Yes/No)?			:

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 02/05/2021

	If No,		
	(i) Reason for not engaging the Consultant	:	
	If Yes,		
	(i) Accreditation No.	:	
	(ii) Name of the EIA Consultant	:	
	(iii) Address		
	(iv) Mobile No.	:	
	(v) Landline No.	:	
	(vi) E-mail Id	:	
	(vii) Category of Accreditation (Eligible for Category A / Eligible for Category B)	:	
	(viii) Sector of Accreditation	:	
	(ix) Validity of Accreditation	:	
	(x) Upload Certificate of Accreditation certified by QCI/NABET (<i>Upload pdf Only</i>)	:	
39	Documents to be attached		
I	<i>If Project Type is New / Expansion / Modernization / one-time capacity expansion for coal mining:</i>		
a.	Upload Copy of EIA/EMP Report		
b.	Upload Copy of Risk Assessment Report		
c.	Upload Copy of Feasibility Report/ Detailed Project Report(DPR) /Detailed Engineering Report /Detailed Conceptual Plan / Approved Mining Plan (in case of Mining proposals) (<i>Upload pdf only</i>)		
d.	Upload Copy of Final Layout Plan (<i>Upload pdf only</i>)		
e.	Upload Cover Letter (<i>Upload pdf only and attach it as Annexure-document of Cover letter</i>)		
f.	Upload a copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency (<i>Upload pdf only and attach it as Annexure-authorization</i>)		
g.	Upload copy of District Survey Report (for mining of minor minerals only)		
	Upload copy of Replenishment Study Report & Baseline Survey data (for river sand mining proposals only)		
g.	Upload Additional File, if any (<i>Upload pdf only</i>)		
II	<i>If Project Type is other than New / Expansion / Modernization / one-time capacity expansion for coal mining: -</i>		
a.	Upload Copy of Feasibility Report / Detailed Project Report(DPR) /Detailed Engineering Report /Detailed Conceptual Plan (<i>Upload pdf only</i>)		
b.	Upload Copy of Final Layout Plan (<i>Upload pdf only</i>)		
c.	Upload Cover Letter (<i>Upload pdf only and attach it as Annexure-document of Cover letter</i>)		

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 Anghuman S

	d.	Upload a copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency <i>(Upload pdf only and attach it as Annexure-authorization)</i>		
	e.	Upload Additional File, if any <i>(Upload pdf only)</i>		
	f.	Upload Updated Form1 <i>(Upload pdf only)</i>		
40	Undertaking			
	a.	I hereby give undertaking that the data and information given in the application and enclosures are true to be best of my knowledge and belief and I am aware that if any part of the data and information found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the project will be revoked at our risk and cost. In addition to above, I hereby give undertaking that no activity / construction / expansion has since been taken up		
	b.	Name	:	
	c.	Designation	:	
	d.	Company	:	
	e.	Address	:	

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Angshuman 

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CGM (Legal)

Annexure-3

Executive Director (HSE)
Oil India Limited
Duliajan-786602
Dibrugarh, Assam

Sir
forwarded the report for
you needful action pls.

regards
R. J. Sutradhar
DGM (HSE)
for ED (HSE)

Dated: 23.02.2023

ERM India Private
Limited
4th Floor, Asyst Park
GN-37/1, Sector-V
Salt Lake City
Kolkata-700091
Tel: 91 33 40450300
Direct lines
Email: india@erm.com

Attention- Mr. Rupam Jyoti Sutradhar, DGM, HSE

27/02/23

Ref: 1. Mail dated 21.12.2020 and subsequent discussion during February 2023.
2. Pending Litigation NGT Court Kolkata (Appeal No. 8/2020).



Sub: A report providing detailed Response to Queries raised against the Mechaki Block EIA Report.

Dear Sir,

In response to the earlier mail issued by your office on 21. 12. 2020 and following subsequent discussions recently held with Oil India officials, on the queries raised against the Mechaki Block EIA report, we are presenting our further clarifications in Annexure-1 Report.

We trust the answers are correct and adequately justify the questions that were posed.

Thanking you

Bandyop



Debanjan Bandyopadhyay
Associate,
ERM India Private Limited



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Registration number
55-08804 India

A member of the Environmental
Resources Management Group

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Angshuman Samra
Advocate

Annexure 1 to the letter dated 23.02.2023

A Report providing detailed Response to the Queries raised by Oil India Ltd.

Query: That it is alleged in the pending litigation before the National Green Tribunal Kolkata that, the EIA report prepared and submitted by the Project Proponent is deficient as well as faulty in some aspects. The Appellant alleges that the EIA report is faulty in the below noted respects :-

1. Faulty information on monitoring locations.
2. Copy-paste contents in respect of ambient air monitoring from EIA of separate project.
3. Lack of proper impact assessment on terrestrial, avian and aquatic ecology
4. Shoddy and erroneous risk assessment.
5. Noise impact not properly assessed.
6. Complete lack of cumulative impact assessment of already existing projects along with present proposal.
7. No impact assessment of laying down pipelines

It is submitted by the appellants that such deficiencies and faults vitiates the entire EIA Report.

It must be stated that the said allegations are not correct and hence denied. Each of the above highlighted issues have been discussed in detail herein below:-

1. Response: Faulty information on monitoring locations

Environmental monitoring was conducted in the Block as per approved ToR of MoEF&CC during October-December 2017 for the EIA Study.



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At Section 3.3.5 (Page No. 44) of the Mechaki EIA report it is mentioned that;

"Ambient air quality was monitored at eight locations across the study area during October- December 2017. The parameters studied were Particulate Matter (PM₁₀ and PM_{2.5}), Oxides of Nitrogen (NO_x), Sulfur dioxide (SO₂), Carbon Monoxide (CO), Hydrocarbon (Methane and Non-methane) and Volatile Organic Carbons (VOCs). Air quality monitoring locations were selected in residential areas. The monitoring locations were selected upwind, downwind and crosswind directions with respect to the surface locations within the study area to understand the baseline air environment in the study area".

The location wise detailed monitoring results presented in EIA Report and the Annexure to EIA Report. The monitoring locations are accurately depicted on the maps **Figure 3.5 (Page 46)** and **Figure 3.12 (Page 56)** of Mechaki Block EIA report.

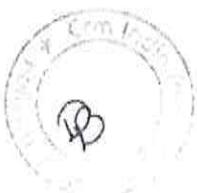
Wherever there is mismatch in coordinates with respect to noise, surface water, groundwater, soil monitoring locations, it is because of a geographic unit related representation error; they are actually in degree-decimals represented in degree-minute-second in the EIA report and where the monitoring locations has been depicted accurately on the georeferenced map figures attached as part of the EIA report (at Figure 3.5 and Figure 3.12).

Despite this issue that has been pointed out here, the overall conclusion about the quality of the baseline environment at each of the monitored location, and when represented in terms of the Block, has been found in conformance to the quality standards. In addition, this data in no way alters the outcome of the impact assessment with respect to these components of the physical environment.

2. Response- Copy-paste contents in respect of ambient air monitoring from EIA of separate project.

As the areas of Mechaki Block and Baghjan PML Study area (10 km around the ERD wells) are overlapping, two air monitoring locations viz. Jokaisukh and Diamuli Tea Estate are common for both the Blocks. Both the stations (Jokaisukh and Diamuli Tea Estate) represent the same location for air quality monitoring, however, there happens to be a minimal shift in the location in the order of 20 m and 55 m respectively because the GPS readings were taken on two separate days and may have involved a very minor change in capture of geographic locations. However, it remains that for all practical considerations the locations are the same and there has been no intention or need to represent them as different locations.

The baseline air quality average values for the parameters PM₁₀, PM_{2.5}, SO₂, NO₂, CO and VOC are mentioned in Section 3.3.5 of the EIA report. The values of air quality parameters mentioned in the Mechaki EIA report are same with the Baghjan PML (ERD wells) EIA.



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Advocate

The detailed air monitoring results presented in Annexure 3.4 and average results represented graphically in the EIA report (Figure 3.6-Figure 3.10) shows that air quality values are different for the Mechaki block compared to the Baghjan PML locations.

Moreover, the average values of air quality parameters depicted in Section 3.3.5 of the EIA report and average values calculated from the detailed monitoring data presented in Annexure 3.4 also reveal slight difference and is not expected to present a wrong baseline for the area

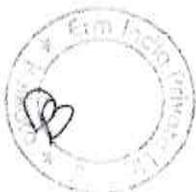
Parameter	Unit	Range of average values as presented in Section 3.3.5 of EIA report	Range of average values as calculated from Annexure 3.4
PM _{2.5}	Microgram per meter cube	39-48	42.6-46.8
SO ₂	Microgram per meter cube	5.4-6.2	5.4-6.3
NOx	Microgram per meter cube	19-21	18.1-21.6
PM ₁₀	Microgram per meter cube	77-89	79.0-87.2
CO	Milligram per meter cube	0.34-0.5	0.32-0.49

The highest and lowest values for air quality parameters as calculated from the detailed air monitoring results presented in Annexure 3.4 of the EIA report are also represented as part of the Form 2 (Point 14.1) as mentioned in the table below.

Parameter	Unit	Maximum value as calculated from Annexure 3.4	Minimum value as calculated from Annexure 3.4	Maximum value presented in Form 2	Minimum value presented in Form 2
PM _{2.5}	Microgram per meter cube	74	25	74	25
SO ₂	Microgram per meter cube	9.3	4.2	9.30	4.20
NOx	Microgram per meter cube	32.4	1.6	32.40	1.60
PM ₁₀	Microgram per meter cube	142	52	142	52
Others- CO	Milligram per meter cube	0.85	0.14	0.85	0.14

The Form 2 is attached as **Attachment-1**

Environmental monitoring conducted at the Mechaki Block during October-December 2017. Day wise detailed air quality monitoring results have been presented in the Mechaki EIA report. There is no deliberate attempt to conceal any data or information.



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ADVOCATE

In an EIA the monitored baseline values are added to the predicted incremental value as an outcome of air quality modelling exercise and Total concentration of pollutants is calculated that could be experienced at a particular station due to the operation of the project.

Air quality impact assessment/modelling exercise has been carried out based on the Mechaki air quality baseline data (Barmura Miripathar station). The average baseline values of air quality parameters of Barmura Miripathar station are added with the incremental values emerged as outcome of modelling studies (refer Table 4.4). The average values of Barmura Miripathar presented in Table 4.4 station correlates with the average values calculated from day wise air quality monitored data presented in Annexure 3.6 and the same is also presented in Point 18.1 of Form 2

Parameter	Unit	Average baseline values presented in Table 4.4 of EIA	Average value as calculated from Annexure 3.4	Average baseline value presented in Form 2
PM (PM ₁₀ value considered for modelling)	Microgram per meter cube	86	86.21	86
SO ₂	Microgram per meter cube	5.9	5.92	5.9
NOx	Microgram per meter cube	19.7	19.65	19.7

The Form 2 is attached as **Attachment-1**.

Based on this impact assessment study the air quality management plan has been prepared and represented in Section 9.2.1.

This minor misrepresentation of data in the baseline chapter of the EIA in no way has altered the representation of the actual baseline air quality of the environment that prevailed at each of these locations and the block as a whole. Consequently, the outcome of the EIA in terms of documentation of the baseline environmental conditions and the evaluated significance of predicted impacts has not got wrongly reflected as a result of any of the data related issues raised in the petition. Hence, this is no way impugns the legitimacy of the EIA process in any manner.

3. Response- Lack of proper impact assessment on terrestrial, avian and aquatic ecology

In light of scientific information available, the blowout of an exploratory oil/gas well is considered as a non-routine or a risk event with extremely low probability of occurrence and hence has been treated through the Risk Assessment and Disaster Management Plan Sections of the EIA report.



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Advocate

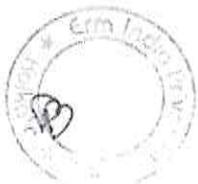
The Hazard Identification Section (7.3.1) of Mechaki EIA Report refers that "a large oil spill in most instances is caused by another hazardous incident like a blowout or process leak. This aspect has been considered while drawing up hazard mitigation measures and such linkages (between hazards) has also been given due importance for managing hazards and associated risks in a composite manner through OIL's Health, Safety & Environmental Management System (HSEMS) and through the Emergency Management Plan, if a contingency situation so arises". Risk due to blowouts presented in Section 7.4.1.

The impact of aquatic ecology (Section 4.2.12 of the Mechaki EIA report) covers that "discharge of oil and grease contaminated runoff water without treatment has the potential to impact water quality of the receiving water body. The degradation of water quality will affect the primary productivity of the river". The Spill Management Plan to control impact of hydrocarbon spills to the surrounding aquatic environment was presented in Section 9.2.8 of the Mechaki EIA report. The spill management plan refers the following

- All chemicals will be stored in designated area and to an extent possible all such areas would be away from drainage channels;
- The flooring of the area would be impervious (paved or HDPE lining) and bunding to be provide on all sides of the chemical storage areas;
- The chemical storage area to be covered to ensure it has the minimum runoff;
- All transfers of chemicals to be done with proper care and under the supervision of the Store Supervisor;
- Once a spill incident has occurred, identify the chemical involved and check hazardous property of the chemical from the Material Safety Datasheet (MSDS);
- Person wearing required PPE will apply necessary absorbent like saw dust for a liquid spill to ensure that the spill does not spread over a wide area or reach any surface water body or drainage channels;
- Thereafter, the substance will be properly collected and stored in a separate labelled container marked "hazardous waste - do not burn"; and dispose in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

Hence, impact from any kind of oil spill from all the potential routine and non-routine activities by OIL as part of exploratory and development activities in Mechaki Block has been covered in the EIA report.

When the Mechaki EIA was conducted, two wells MKD and MKE were proposed within a demarcated forest and the application for forest clearance was submitted separately, as required, by OIL. The terrestrial ecological impact assessment section (Section 4.2.11) of the EIA report separated impact significance for forest and non-forest areas because there was requirement of tree felling and vegetation clearance which could have led to habitat fragmentation for wildlife within the reserve forest areas for the MKD and MKE



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ADMS

wells. The other wells of the Mechaki Block are proposed in non-forest areas viz. agricultural lands, tea garden areas or homestead plantation areas, hence, vegetation clearance will not lead to any habitat fragmentation of wildlife in the area.

Subsequently, the MKD and MKE wells were dropped from OIL's drilling programme with the key intent of reducing the impact footprint of sensitive habitats and the final EC proposal and EC received for the Mechaki Block does not included the MKD and MKE well locations.

However, after receipt of Forest Clearances for MKD and MKE, OIL has applied to the MoEF&CC again and amended the EC with addition of MKD and MKE locations.

A range of measures will be adopted to mitigate potential impacts on the terrestrial flora and fauna including the following.

- The working area which has to be disturbed will be kept minimum at all times;
- Sourcing of timber and fuel wood from forest area will be prohibited;
- Regular maintenance of vehicles and machineries to control noise and air pollutant emission;
- All diesel-powered equipment will be regularly maintained and idling time reduced to minimise emissions;
- Low sulphur diesel (S<0.5%) will be used in diesel powered equipment and best management practices would be adhered to;
- Vehicle / equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/ replaced;
- Fugitive dust will be suppressed with periodic water sprinkling".

4. Response- Shoddy and erroneous risk assessment.

Risk assessment related queries and responses are provided below

Queries related to Risk assessment

Query: That while conducting such a risk assessment, the EIA Consultant has relied on the SINTEF Offshore Blowout Database 2010 Report of Scandpower Risk Management for blowout frequency analysis. It is submitted that the such reliance is highly problematic, for the reason that the frequency probability for an onshore oil and gas project has been calculated based on data from offshore project and that to from blowouts in the North Sea. Furthermore, such data has led to the conclusion that, the blow out frequency for the proposed project for both exploratory and development oil and gas wells have been identified to be as "Not Likely" and probability of ignition of blow out releases of hydrocarbon is computed to be as "Negligible"



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Response: The "Risk Assessment Data Directory" published by the International Association of Oil & Gas Producers (OGP) for Blowout Frequencies mentions that the data presented/derived from offshore statistics may be applied to equivalent onshore operations, depending on the availability of representative and considerable historical data/statistics with respect to onshore operations. The analysis is not restricted to North Sea and considers global blow out incidents that occurred in the UK, Norway, US GoM OCS and experience from Canada's East Continental Shelf. Given the fact that presently there exists no representative historical database/repository of total well drilled and accidents related to the oil and gas operation in India, the offshore failure statistics was referred in line with the aforesaid OGP recommendation in Risk Assessment Data Directory. Furthermore it is to be noted that there is some onshore data which is presented in this report but it specifically applies for sour gas wells and underground gas storage facilities. Even if the onshore data is considered, blowout frequency based on historical data analysis ranges within 10-3 to 10-4, which per the frequency criteria defined in line with the "Guidelines for Developing Quantitative Safety Risk Criteria - Centre for Chemical Process and Safety" falls under "not-likely/remote" category. The same reasoning has been furnished in Section 7.3.2 of the EIA report.

Query: That it is submitted that such lackadaisical approach of the EIA Consultant towards the risk is totally unacceptable given the frequent incidents of oil well blowout of the same proponent in the same region. The recent accidental blow out of OIL at its Baghjan oilfield, called Baghjan 5 on 26th May 2020 during work over operations is worth mentioning here. This is the second such blowout or uncontrolled escape of gas since 2005. According to the news reports' the 2005 blowout took about 45 days to control. It is submitted that in such a situation' the project proponent ought to have maintained a database of its past accidents from well blowouts and other associated hazards' in order to accurately calculate the accident frequency rate'

Response: The EIA consultant has followed the standard country practice for conducting Risk Assessment (RA), fully accounting for the hazard and likelihood aspects that are characteristic of such well drilling activities. The RA approach adopted is aligned to the guidance issued on the subject from time to time by the MoEF&CC and to international best practice, as is applicable (Also refer to response to Query 26).

As regards blowout related database, given India's oil & gas producing prospects and intensity of exploratory/development drilling of wells, the number of wells drilled has historically not been very high, as compared to major oil & gas producing nations. Consequently, the number of blowouts recorded has also been very low and would not be statistically significant to be able to provide for a frequency database that would be scientifically tenable for use in risk assessment studies.

Query: That similarly, with respect to "gas pipeline failure frequency assessment" the EIA consultant has relied on data from the European Gas Pipeline incident



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 Addl. Secy

Data Group (EGIG) database to get data on primary gas pipeline failure frequencies over the entire period of 1970-2013' which may not even be really applicable in the present case' The use of such data' has thus led to a conclusion that the probability of pipeline leak and rupture with respect to the interconnecting hydrocarbon pipeline network is identified to be as "Not Likely"

Response : As earlier stated in the case of blowouts, no representative and extensive database is available in India to record historical information related to gas pipeline failure, which can be referred to establish the gas pipeline failure frequency. In absence of the same EGIG database has been referred, which is a co-operation between a group of seventeen major gas transmission system operators in Europe and is the owner of an extensive gas pipeline-incident database. The information presented in this database has helped the pipeline operators globally to improve safety in their gas pipeline transmission systems as it not only presents failure frequencies data on decadal basis but also with respect to pipeline diameter class and causal factors. Furthermore, the factors such as external interference, construction defects, corrosion related problems, ground movement etc. have been identified and acknowledged globally as potential contributor to gas pipeline failure, and the same has been considered for the project gas pipeline risk assessment as well.

Query: That therefore it is clear that the Risk Assessment study has failed to highlight the actual risk posed from incidents of oil spills and oil well blow out fires, and has been carried out as a mere formality in a mechanical manner. It definitely cannot be said that the risk posed by oil well blow out fires is just of negligible risk which can be managed through the adoption of necessary controls, when the oil well blow out fire that occurred on 27.05.2020 is still raging uncontrolled and international firms have been called in to control the situation. Therefore the impugned environmental clearance has been granted in a cursory manner without appreciating the inadequacy of the Risk Assessment Study that is crucial given the high risk and huge threat posed by accidents such as oil spills and blow out fires considering the nature of the operation.

Response: The statement made in the aforesaid query with respect to "negligible risk being assigned to oil well blow outs" is "incorrect" as the term "negligible" has been used to qualify the probability of ignition of blowouts with respect to the project. The blowout risk significance has been assigned to be "Medium" based on the frequency and consequence ranking established through the risk assessment, with the management of blowout risks requiring adoption of necessary preventive and control measures. Furthermore the query above has categorically and purposefully failed to mention the mitigation measures which has been specifically outlined in the Section 7.5.3 of the EIA report for managing blowout risks. The excerpt of the Section 7.5.3 of the EIA report is provided below for kind reference:



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“Preventive and Mitigation Measures for Blow Outs

Blowouts being events which may be catastrophic to any well operation, it is essential to take up as much a preventive measures as feasible. This includes:

- *Necessary active barriers (eg. Well-designed Blowout Preventer) be installed to control or contain a potential blowout.*
- *Weekly blow out drills be carried out to test reliability of BOP and preparedness of drilling team.*
- *Close monitoring of drilling activity be done to check for signs of increasing pressure, like from shallow gas formations.*
- *Installation of hydrocarbon detectors.*
- *Periodic monitoring and preventive maintenance be undertaken for primary and secondary barriers installed for blow out prevention, including third party inspection & testing*
- *An appropriate Emergency Response Plan be finalized and implemented by OIL.*
- *Marking of hazardous zone (500 meters) around the well site and monitoring of human movements in the zone.*
- *Training and capacity building exercises/programs be carried out for onsite drilling crew on potential risks associated with exploratory drilling and their possible mitigation measures.*
- *Installation of mass communication and public address equipment.*
- *Good layout of well site and escape routes.*

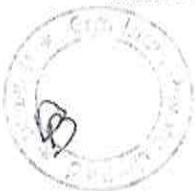
Additionally, OIL will be adopting and implementing the following Safe Operating Procedures (SOPs) developed as part of its Onsite Emergency Response Plan to prevent and address any blow out risks that may result during drilling and work over activities:

- *Blow Out Control Equipment*
- *Choke lines and Choke Manifold Installation with Surface BOP*
- *Kill Lines and Kill Manifold Installation with Surface BOP*
- *Control System for Surface BOP stacks.”*

5. Response- Noise impact not properly assessed.

Noise impacts from drill sites have been dealt with in sufficient detail in the EIA report (Refer Section 4.2.6)

“Operation of construction machinery/equipment: The construction activities such as transportation of raw materials for civil works, operation of heavy equipment and construction machinery are likely to cause increase in the ambient noise levels in and around the drill sites. The noise generated from the above mentioned activities likely to be attenuated within 500m from the drill sites. The noise generated from drill sites may cause discomfort for the villagers who are within 500m.



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Noise from Vehicular Traffic: As vehicles supplying, material and manpower to the site will pass through site access and approach road, it will result in increase in traffic density (compared to existing traffic) in the approach road and resultant significant increases in noise levels in the settlements immediate adjacent to the road. The impact will be more significant for residents living adjacent to the approach road where houses are located very close to the road. The noise pressure level caused by movement of a heavy truck, at a distance of about 5 m from the road, has been measured to be as high as 75- 80 dB(A) though it gets averaged out when expressed in Leq terms. This may cause considerable incremental noise disturbances to residents near site approach roads.

Operation of drilling rig and ancillary equipment: Operational phase noise impacts are anticipated from operation of drilling rig and ancillary equipment viz. shale shakers, mud pumps and diesel generators. Studies indicate that noise generated from operation of drilling rig generally varies in the range of 88-103 dB(A). Other contributors of high noise level at the well site include shale shakers, mud pumps and diesel generators. The average equivalent noise levels of drilling rig and ancillary equipment is estimated to 95 dB(A).

Further, considering drilling to be a continuous operation, noise generated from aforesaid equipment has the potential to cause discomfort to the local communities residing in proximity (within 500m) of the rig facility. Occupational health and safety impacts viz. Noise Induced Hearing Loss (NIHL) is also anticipated for personnel working close to such noise generating equipment until they are wearing appropriate personnel protective equipment.

Noise Level Prediction

A noise modelling exercise has been undertaken based on standard noise attenuation equations to predict noise levels from drilling rig near sensitive receptors. A noise attenuation plot has been developed considering natural attenuation by distance with noise level predictions only expected to help in planning and decision-making.

The cumulative noise generated from rig, mud pump, DG sets and shale shakers was calculated to be 95.0 dB(A). Noise attenuation equations (without any noise barrier) show that the normal attenuated noise at any receptor points located at a distance of about 100 m and 200 m from the fence-line of the rig, will be in the range of about 75.0 dB(A) and 69.0 dB(A) respectively. In the absence of an acoustic barrier, the predicted noise levels were found to exceed the daytime noise standard of i.e. 55dB (A) which may lead to discomfort to neighbouring communities of villages such as Keserguri Gaon, Darjigaon No.2, Hatihal Gaon No.1, Sitalpur Gaon, Kumchang Tea Estate 1/48, Doania Mathong No.3, Dangari Tea Estate 130 and Doania Mathong No.6 that are present within 250m of the proposed locations”.



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Noise impacts has been rated as "major" due to the presence of sensitive wildlife habitats and species and also habitations in the Mechaki Block. Appropriate mitigation measures have been integrated as a part of OIL's project design and appropriate mitigation measures also specified as a part of the EMP to mitigate such noise related impacts/disturbances to the minimum.

OIL's embedded control measures (as a part of project design) and mitigations proposed for noise monitoring included in the EIA report as below;

- All vehicle and equipment involved in site development and drilling activity will be provided with noise control measures;
- Well maintained equipment and vehicles will be used;
- All DG sets would be provided with acoustic enclosures;
- Appropriate PPEs (e.g. ear plugs) will be used for by workers while working near high noise generating equipment.
- Maintenance of vehicles and machineries;
- Restrict all noise generating operations, except drilling, to daytime;
- Provide Personnel Protective Equipment (PPE) like ear plugs/muffs to workers at site;
- Restriction of unnecessary use of horns by trucks and vehicles near settlement areas;
- Provide noise barrier in sensitive locations.

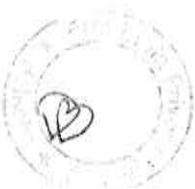
Noise generated from drilling activities, operating of DG sets, pumps are the major sources of noise from a drill site. Use of silence DG sets as per norms; utilization of noise barriers at source will aid in reduction of noise levels at receptor points. Noise generation data accounted for in the EIA report specifies that using a fence line barrier of 4m will reduce the noise levels to a level which would not cause any major disturbances to receptors located at a distance of 500 m from the drill site. In addition, as part of the revised EC proposal OIL dropped two wells MKD and MKE that were within forest areas to prevent any direct noise and other associated impact to wildlife.

OIL will also conduct regular noise monitoring during all phases of project life cycle (Table 6.1) to check compliance to CPCB guidelines for DG sets and compliance to Noise Rules, 2000 for receptor locations. Environmental Management Matrix (Table 9.1) also provide clear reference to noise management measures for activities conducted by OIL.

6. Response- Complete lack of cumulative impact assessment of already existing projects along with present proposal.

Exploratory drilling in Mechaki Block has not been taken place for the past 3 years.

OIL has limited number of rigs for drilling operation in the entire Upper Assam Area. As per general drilling practice of OIL, one well is drilled at a time in a Block the duration of drilling activity at each location is expected to take 1.5-2.0 months, hence, maximum



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6 wells can be drilled in a year in the Mechaki Block. At any given time, it is unlikely that drilling of two wells are done simultaneously. There exists other oil and gas areas of OIL in Mechaki Area, which are located more than 2 km from the wells of Mechaki Block. Hence cumulative impacts of drilling of wells in Mechaki area were not anticipated.

Moreover, after the drilling either the drilled well is put to production or abandoned. For wells put in production with mitigation measures and pollution treatment facilities in place environmental impacts of the operational activities comply with the prescribed norms of MoEF&CC and State Pollution Control Board. So, it is unlikely that there would be any significant cumulative impacts caused because of the drilling activities being planned in the Mechaki Block and other Oil and Gas exploration and development Blocks of OIL in Mechaki Area.

7. Response- No impact assessment of laying down pipelines

Impact assessment of laying of pipeline has been carried out in the EIA report as per the following description

Section 4.2.1: Potential Impact Aesthetic and Visual Source of Impact: Aesthetics and visual impacts from different phases of the project activities can result from

- *Pre-drilling Phase and Construction of Associated Facilities and laying of pipeline:*
 - o *Removal of vegetation from the additional land required for the drilling of development wells and associated facilities;*
 - o *Emission of fugitive dust and deposition on vegetation and property;*
 - o *Storage of construction materials;*
 - o *Storage and disposal of construction waste, municipal waste etc.*

*Removal of vegetation: ...the area proposed for establishing the production facilities such as TY, MKE and **pipeline** will be cleared of any existing vegetation. The clearance of vegetation is likely to cause visual and aesthetic impacts at surrounding localities such as Hatihal Gaon No1, Badal Pathar No1, Dangari Hahkhati Pather No.1, Tengapani N.C., Haluapthar No.1, etc.,. It has been estimated that approximately 3 ha of land will be required for the sites, 4 to 7 ha for the proposed facilities and **100m RoU for pipelines**. As the area is low and not contiguous (except for pipelines), the affected area will less and hence the impact will be low.*

Laying of interconnected pipelines: The route of the pipeline will be close to RoU of existing road for minimum disturbance. To avoid, densely populated area, the pipeline will be routed through agricultural land. The trenching activity, the storage of soil on the ROW (10m) of the pipeline and the temporary storage of pipelines will create visual disturbance and will be aesthetically displeasing.

Mitigation for pipeline includes: The pipelines once laid will be covered with burrowed soil and levelled as per the surrounding land.



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Section 4.2.3 Potential Impact on Soil covers "The soil dug during trenching will be reused for covering after laying the pipelines. Care will be taken to restore the location of the concealed pipelines to its earlier state. The process will be completed within a very short period of time. Primary monitoring results of soil quality results shows that there is no contamination of heavy metals in the nearby agricultural land, homestead plantation or tea garden areas (Refer Section 4.5.5) hence the resource sensitivity is termed as medium.

Section 4.2.11 Potential Impact on Terrestrial Ecology covers "...Clearance of vegetation would happen in small area (approximately 3 ha. For each well, 4 to 7 ha for associated facilities and 100 m RoU for interconnected pipelines). Extent of impact will be within the project site; hence, extent of impact will be local."

Section 4.2.11 Potential Impact on Terrestrial Fauna covers..." Vegetation clearance from the drill sites, access roads and pipeline RoU and production facilities will cause loss of habitat for the terrestrial fauna. The impact would be more pronounced at the forest areas as Schedule I and IUCN Threatened species like (Hoolock Gibbon, Capped Langur, Assamese Macaque, Slow Loris, Common Leopard etc.) could get impacted due to the vegetation clearance. Vegetation clearance could also cause habitat fragmentation for the arboreal species like Hoolock Gibbon, Slow loris etc. In the non-forest areas most of the wells and production facilities are located in agricultural lands and tea garden areas with very scattered vegetation hence vegetation clearance is not expected to cause habitat fragmentation for the faunal species. Moreover, only IUCN threatened species found particularly at the non-forest area is Common Leopard. Clearance of vegetation would not disturb the species composition of the area and clearance would happen in small area (approximately 3 ha. for each well; 4-7 ha for production facilities and 10 m RoU for interconnected pipelines). The scale of impact can be considered as small for non-forest areas and the habitat can be easily regenerated through plantation. The scale of the impact would be high for forest areas as it may create habitat loss and fragmentation of IUCN threatened species that could not be easily regenerated through plantation."

Section 4.2.12 Potential Impact on Socioeconomic Environment covers" Loss of Livelihood and Fragmentation of Land Due to Pipeline Laying Maximum 10 meter RoU will be required for laying of oil pipeline and as per planning majority of the pipeline will be routed through agricultural land and tea garden areas. However, the land required for RoU of the pipeline will not be purchased and it will remain with the land owner for future agricultural use. The land will also be compensated for the standing crop on the land hence the resource sensitivity will be low. Parcels of land along the proposed RoU for laying of oil pipeline may get fragmented due to the linear nature of the oil/gas pipeline. This may either lead to partial loss of



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cultivable land or even creation of orphan lands which may be rendered too small or unviable for cultivation for agriculture. However, all the agricultural land in this area are mono cropped in nature i.e. the agricultural activity is limited to three to four month in a year. Moreover, laying of pipeline would take 3-4 months only and land could be used for agriculture after the laying of the pipeline. Hence, the receptor sensitivity will be low. The above detailed report shows that the EIA report adequately covers impact of pipeline laying.

The EIA report has been prepared in full conformance to the Terms of Reference (ToR) provided by the MoEF&CC. Standard methodology has been followed for collection of one season primary baseline data on physical environmental dimensions as per the ToR and the baseline values obtained have been found to be representative of the environmental quality of the area. Potential environmental impacts from the well drilling, production installations and pipelines have been evaluated in the report and captures both adverse and positive impacts. Existence of certain minor mismatch (as stated by the appellant), is only in the text of the EIA report, which can be attributed to editorial mistakes/errors and in no way influence the scientific outcome of the environmental impacts assessed. Risk assessment has been undertaken following standard methodology for oil drilling operations to estimate potential risk to communities from any potential accident that may occur during the drilling process and have recommended robust risk mitigation measures to ensure that population in the surrounding of the drill site is not affected. The Environmental Management Plan included in the EIA addresses all major environmental impacts and stipulates appropriate mitigation measures. Hence it is to be noted here that the allegations raised against the EIA report are not correct.



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Form-2
APPLICATION FOR PRIOR ENVIRONMENTAL CLEARANCE

S. No.	Item	Details		
1.	<p>Whether it is a violation case and application is being submitted under Notification No. S.O.804(E) dated 14.03.2017 ?</p> <p>Details of Project:</p> <p>(a)Name of the project(s)</p> <p>(b)Name of the Company / Organisation</p> <p>(c)Registered Address</p> <p>(d)Legal Status of the Company</p> <p>(e)Joint Venture</p>	<p>No</p> <p>Onshore Oil & Gas Development Drilling and Production in Mechaki Area covering Mechaki, Mechaki Extension, Baghjan and Tinsukia Extension PMLs in Tinsukia District of Assam.</p> <p>OIL INDIA LIMITED</p> <p>OIL INDIA LIMITED DULIAJAN District : Dibrugarh ,,Dibrugarh,Assam-786602</p> <p>Central PSU</p> <p>No</p>		
2.	<p>Address for the correspondence:</p> <p>(a)Name of the Applicant</p> <p>(b)Designation (Owner/ Partner/ CEO)</p> <p>(c)Address</p> <p>(d)Pin code</p> <p>(e)E-mail</p> <p>(f)STD Code.</p> <p>(g)Fax No.</p> <p>(h)Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency .</p>	<p>Ajaya Kumar Acharya</p> <p>Head (S&E)</p> <p>Safety & Environment Department , Oil India Limited, Duliajan,, Naharkathiya,Dibrugarh,Assam-786602</p> <p>786602</p> <p>safety@oilindia.in</p> <p>0(f)Telephone No.</p> <p>2801796</p> <p>2800542</p> <p><u>Annexure-Uploaded Copy of documents in support of the competence/authority</u></p>		
3.	<p>Category of the Project/Activity as per Schedule of EIA Notification,2006:</p> <p>(a)Project/Activity</p> <p>(b)Category</p> <p>(c)Proposal Number</p> <p>(d)Master Proposal Number(Single Window)</p> <p>(e)EAC concerned (for category A Projects only)</p> <p>(f)Project Type</p>	<p>1 (b) Offshore and onshore oil and gas exploration, development & production A</p> <p>IA/AS/IND2/97724/2007</p> <p>SW/97717/2019</p> <p>Industrial Projects - 2</p> <p>Expansion</p>		
4.	<p>Location of the Project:</p> <p>(a)Plot/Survey/Khasra No.</p> <p>(b)Pincode</p> <p>(c)Bounded Latitudes (North)</p> <p>(d)Bounded Longitudes (East)</p> <p>(e)Survey of India Topo Sheet No.</p> <p>(f)Uploaded Topo Sheet File</p> <p>(g)Maximum Elevation Above Means Sea Level(AMSL)</p> <p>(h)Uploaded (kml) File</p> <p>(i)Distance of Nearest HFL from the project boundary within the study area</p> <p>(j)Seismic Zone</p>	<p>Doomdooma</p> <p>786151</p> <p>FROM 27.583335 To 27.766670</p> <p>FROM 95.433345 To 95.70000</p> <p>83M/6, 83M/10</p> <p><u>Copy of Topo Sheet File</u></p> <p>156</p> <p><u>Copy of Kml File</u> </p> <p>0</p> <p>5</p>		
5.	<p>(a)Number of States in which Project will be Executed</p> <p>(b)Main State of the project</p>	<p>1</p> <p>Assam</p>		
Details of State of the project				
S. No.	State Name	District Name	Tehsil Name	Village Name
NIL				
6.	<p>Details of Terms of Reference (ToR)/EC:</p> <p>(a)MoEF&CC / SEIAA File Number</p> <p>(c)Date of Issue of TOR</p> <p>(f)Previous TOR Letter</p> <p>(b)Date of Apply of EC</p> <p>(c)Date of Issue of EC</p> <p>(d)Previous EC Letter</p>	<p>J-11011/1260/2007-IA II(I)</p> <p>29 Feb 2008</p> <p><u>Copy of Previous TOR letter</u></p> <p>24 Sep 2019</p> <p>02 Nov 2011</p> <p><u>Copy of Previous EC letter</u></p>		
7.	<p>Details of Public Consultation:</p> <p>(a)Whether the Project Exempted from Public Hearing?</p>	<p>Yes</p>		

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(b)Reason	Public Hearing Happened in the block for earlier E
(c)Supporting Document	Copy of Supporting Document

8.	Details of Project Configuration/Product:	Details Not Applicable
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In case of Expansion / Modernisation / One Time Capacity Expansion (only for Coal Mining) / Expansion under Clause 7(ii) / Modernisation under Clause 7(ii) / Change of Product Mix under Clause 7(ii):	
(a)Details of certified report on compliance of earlier environmental clearance condition	
(i)Certified Compliance By	Regional
(ii)Details of Regional Office of MoEFCC / Zonal Office of CPCB / SPCB / UTPCC from which certified report on	Shilong
(iii)Letter No.	RO-NE/E/IA/AA/MI/59/169-71
(iv)Status of Compliance	Compiled
(v)Certified report on compliance of earlier environmental clearance conditions (Including Monitoring Report)	Copy of Certified Compliance Report
(vi)Date of site visit	Jun 7 2016 12:00AM
(b)Details of Capacity Expansion	

S. No.	Product/Activity (Capacity/Area)	Quantity From	Quantity To	Total	Unit	Other Unit	Mode of Transport / Transmission of Product	Other Mode of Transport / Transmission of Product
(1.)	18 wells and 4 production installations	6	18	24	Others	No of wells	Others	Well drilling

(c)Details of Configuration

S. No.	Plant / Equipment / Facility	Existing Configuration	Proposed Configuration	Final configuration after expansion	Remarks
(1.)	18 wells and 4 production installations	6	18	24	

Details of Consent to Operate	
(i)Whether Consent to operate obtained ?	NA
(ii)Copies of all Consent to operate obtained since inception	NA
(iii)Date of Issue	12 Jul 2018
(iv)Valid Upto	31 Mar 2019
(v)File No.	S&E/E/20/1126
(vi)Application No.	S&E/E/20/1126
(vii)Copy of Consent to operate valid as on date	Copy of Consent to Operate

Project Cost:	
(a)Total Cost of the Project at current price level (in Crores)	4.16
(b) Funds Allocated for Environment Management (Capital) (in Crores)	0
(c) Funds Allocated Towards CER (Corporate Environment Responsibility) (in Crores)	0
(d) Funds Allocated for Environment Management Plan (EMP) (Recurring per Annum) (in Crores)	0.7

11.	Whether project attracts the General Condition specified in the Schedule of EIA Notification ?	No
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12.	Whether project attract the Specific Condition specified in the Schedule of EIA Notification ?	No
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Raw Material / Fuel Requirement:	
(a)Proposed quantity of raw material/fuel	3.5
(b)Existing quantity of raw material/fuel	0
(c)Total quantity of raw material/fuel	3.5

13.1. Raw Material / Fuel Profile

S. No.	Raw Material / Fuel	Quantity	Unit	Other Unit	Source (In case of Import, please specify country and Name of the port from which Raw	Mode of Transport	Other Mode of Transport	Distance of Source from Project Site (in Kilometres) (In case of import, distance from the port from which the	Type of Linkage	Other Type of Linkage	Uploaded Copy of Linkage
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				Material / Fuel is received)			raw material / fuel is received)			
(1.)	diesel	3.5	Kilo Litre per Day	Local supplier	Road		50	Others	through supplier	Copy of Linkage
Baseline Data : 14. (a) Period of Base Line Data Collection FROM 05 Oct 2017 To 31 Dec 2017 (b) Season Post-Monsoon										
14.1. No. of ambient Air Quality (AAQ) monitoring locations : 8										
S. No.	Criteria Pollutants	Other Criteria Pollutants	Unit	Maximum Value	Minimum Value	98 Percentile Value	Prescribed Standard			
(1.)	PM2.5		Micro Gram per Meter Cube	74	25	46.76	60			
(2.)	SO2		Micro Gram per Meter Cube	9.30	4.20	6.26	80			
(3.)	NOx		Micro Gram per Meter Cube	32.40	1.60	21.50	80			
(4.)	PM10		Micro Gram per Meter Cube	142	52	87.21	100			
(5.)	Others	CO	Milli Gram per Meter Cube	0.85	0.14	0.49	2			
14.2. No. of Ground Water monitoring locations : 4										
S. No.	Criteria Pollutants	Other Criteria Pollutants	Heavy Metal	Unit	Other Unit	Maximum Value	Minimum Value	Desirable Limit	Maximum Permissible Limit	
(1.)	pH			Others	no unit	7.1	6.5	6.5	8.5	
(2.)	TDS			mg/l		130	82	500	2000	
(3.)	Fluoride			mg/l		0.1	0.1	1	1.5	
(4.)	Heavy Metals		Cadmium	mg/l		0.001	0.001	0.003	0.003	
(5.)	TSS			Others	Not analyzed	0	0	0	0	
(6.)	Others	Total chromium		mg/l		0.01	0.01	0.05	0.05	
(7.)	Total Hardness			mg/l		108	48	300	600	
(8.)	Chlorides			mg/l		48	12	250	1000	
14.3. No. of Surface Water monitoring locations : 4										
S. No.	Criteria Pollutants	Other Criteria Pollutants	Unit	Other Unit	Maximum Value	Minimum Value	Classification of inland water body			
(1.)	COD		mg/l		12	4	A			
(2.)	Others	Total coliform	Others	MPN/100ml	110	23	B			
(3.)	BOD		mg/l		2	2	A			
(4.)	pH		Others	No unit	7.17	6.73	A			
(5.)	DO		mg/l		8.8	7.7	A			
14.4. No. of Ambient Noise monitoring locations : 10										
S. No.	Parameter	Unit	Maximum Value	Minimum Value	Prescribed Standard					
(1.)	Leq(Day)	A-weighted decibels(dB(A))	56.5	52.4	55					
(2.)	Leq(Night)	A-weighted decibels(dB(A))	45.3	40.5	45					
14.5. No. of Soil Sample Monitored locations : 5										
S. No.	Parameter	Unit	Other Unit	Maximum Value	Minimum Value					
(1.)	N(Nitrogen)	Milligram per Kilogram		425	230					
(2.)	P(Phosphorus)	Milligram per Kilogram		3.5	3					
(3.)	K(Potassium)	Milligram per Kilogram		50	14					
(4.)	Electric Conductivity	Millisiemens per Centimetre		53	33					

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(5.)	pH	Others	no unit	5.42	4.75
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Details of Ground Water Table:	
14.6. (a) Range of Water Table Pre-Monsoon Season (Meters Below Ground Level (m bgl))	From 2 To 5
(b) Range of Water Table Post-Monsoon Season (Meters Below Ground Level (m bgl))	From 1.68 To 4.5
(c) Whether Ground Water Intersection will be there ?	No

15. Details of Water Requirement (During Operation)

S. No.	Source	Source Other	Required Quantity (Kilolitre per Day (Kld))	Distance from Source	Copy of Permission from Competent Authority	Mode of Transport	Other Mode of Transport	Method of Water Withdrawal	Other Method of Water Withdrawal	Letter No.	Date of Issue	Permitted Quantity
(1.)	GroundWater		50	0	<u>Copy of Permission Letter</u>	modeOthers	well at site	Tube Well		S&E/E/93/281	25 Feb 2019	0

15.1.	(a) Whether Desalination is proposed	No
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16. Waste Water Management(During Operation)

S. No.	Type/Source	Quantity of Waste Water Generated (Kilolitre per Day)	Treatment Capacity (Kilolitre per Day)	Treatment Method	Mode of Disposal	Other Mode of Disposal	Quantity of Treated Water Used in Recycling/Reuse (Kilolitre per Day)	Quantity of Discharged Water (Kilolitre per Day)
(1.)	Domestic Wastewater	8	8	Septic tank and soak pit	Others	Soak Pit	0	8
(2.)	Drilling and Wash wastewater	16.8	150	Effluent Treatment Plant	Discharge into Surface Water Body,Reuse within the Plant & Recycling		10	6.8

16.1.	(a) Total Waste Water Generation (Kilolitre per Day)	24.8
	(b) Total Discharged Water (Kilolitre per Day)	14.8
	(c) Total Reused Water (Kilolitre per Day)	10

17. Solid Waste Generation/Management

S. No.	Name of Waste	Item	Other Item	Quantity per Annum	Unit	Distance from Site(KM)	Mode of Transport	Other Mode of Transport	Mode of Disposal	Other Mode of Disposal
(1.)	Waste Drilling Mud	Industrial Waste		3072	Tons	0	Others	Disposed at HDPE lined pits within site	Others	Disposed at HDPE lined pits within site
(2.)	Drill cutting	Industrial Waste		1840	Tons	0	Others	Disposed at HDPE lined pits within site	Others	Disposed at HDPE lined pits within site

18. Air Quality Impact Prediction

S. No.	Criteria Pollutants	Other Criteria Pollutants	Unit	Baseline Concentration	Distance GLC	Incremental Concentration	Total GLC	Prescribed Standard
(1.)	PM10		Microgram per Meter Cube	86	1.9	0.010	86.01031	100
(2.)	SO2		Microgram per Meter Cube	5.9	1.9	0.7685	6.66851	80
(3.)	NOx		Microgram per Meter Cube	19.7	1.9	2.02417	21.724171	80
(4.)	Others(Specify)	Total Hydrocarbon	Microgram per Meter Cube	327	1.9	1.01	328.211	0
(5.)	PM2.5		Microgram per Meter Cube	47	0	0	47.00001	60

18.2. Stack Details

S. No.	Source	Fuel	Stack Height(m)	Stack Diameter(m)	Pollutants	Other Pollutants	Emission (GLS)
(1.)	DG set	Diesel	7	0.3	PM10		0.07

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(2.)	DG set	Diesel	7	0.3	SO2	0.374
(3.)	Dg set	Diesel	7	0.3	NOx	1.836
19.	Power Requirement:					
	(a)Quantity (Kilo Volt Amps (kVA))			2500		
	(b)Source			Diesel Generator sets		
	(c)Uploaded Copy of Agreement			Not Applicable		
	(d)Standby Arrangement (Details of DG Sets)			one additional 1250 KVA		
	(e)Stack Height (in m)			7		
20.	Land Ownership Pattern:					
	(a)Forest Land (ha.)			2.923		
	(b)Private Land (ha.)			0		
	(c)Government Land (ha.)			0		
	(d)Revenue Land (ha.)			0		
	(e)Other Land (ha.)			0		
	Total Land (ha.)			2.923		
21.	Present Land Use Breakup of the Study Area in Ha:					
	(a)Agriculture Area (ha.)			17495		
	(b)Waste/Barren Land (ha.)			0		
	(c)Grazing/ Community Land (ha.)			0		
	(d)Surface Water Bodies (ha.)			5743		
	(e)Settlements (ha.)			6480		
	(f)Industrial (ha.)			7		
	(g)Forest (ha.)			6803		
	(h)Mangroves (ha.)			0		
	(i)Marine Area (ha.)			0		
	(j)Others (ha.) : Tea garden, road, railway			16934		
	Total (ha.)			53462		
22.	Land requirement for various activities					
S. No.	Description of Activity / Facility / Plant / Others	Others	Land Requirement (ha.)	Remarks		
(1.)	Others	drill area	2.923			
	Total (ha.)		2.923			
23.	Ecological and Environmental Sensitivity (Within 10 Km):- WLS-Wild Life Species; NPA-Notified Protected Area; ESAs-Eco Sensitive Areas; ESZs-Eco Sensitive Zones :					
23.1.	Details of Ecological Sensitivity :					
S. No.	Details of Ecological Sensitivity	Name	Distance from the Project (Km)	Remarks		
(1.)	WLS	Bherjan Borjan Podumoni WLS	14	No WLS within 10 km		
(2.)	NPA	Dibru Saikhowa National Park	1.70	Wildlife clearance application for the wells and production facilities will be submitted		
(3.)	ESAs	None	10	No ESA within 10 km		
(4.)	Corridors	None	10	No corridors within 10 km		
(5.)	Wildlife Corridors	None	10	No wildlife corridors within 10 km		
(6.)	Critically Polluted Area	None	10	No critically polluted area within 10 km		
(7.)	ESZs	ESZ of Dibru Saikhowa National Paek	0	Some wells and production facilities within the ESZ of Dibru Saikhowa National Park		
23.2.	Details of Environmental Sensitivity :					
S. No.	Details of Environmental Sensitivity	Other Details of Environmental Sensitivity	Name	Distance from the Project (Km)	Remarks	
(1.)	Forest		Mechaki Reserve Forest	0	two wells in forest land	
(2.)	Archaeological Sites		None	10	No archaeological sites within 10 km	
(3.)	Defence Installations		None	10	No major defense installations within 10 km	
23.3.	(a)Whether Noc / Permission from the competent authority is required?		Yes			
	(i)Uploaded Noc / Permission from the competent authority		Copy of Noc / Permission from the competent authority			

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	(b)Whether NBWL recommendation is required? (i)Status of NBWL	Yes NIL		
24.	Forest Land: Whether any Forest Land Involved? (a)Forests Clearance Status (i)MoEFCC file number (ii)Area applied Forests Clearance Application Pending with (b)Legal Status of Forest Land	Yes Forest Clearance Under Process(Stage-1) FP/AS/MIN/23331/2016 2.253 -1 Reserved		
25.	Tree Cutting: (a)No. of Trees Cut for the Project (If Forest Land not Involved) (b)Details of Tree Cutting and Planting of Trees	Not Applicable Not Applicable		
26.	Land Acquisition Status: (a)Acquired Land(Ha) (b)Land yet to be acquired(Ha) (c)Status of Land acquisition if not acquired	0 82 In process		
27.	Rehabilitation and Resettlement (R&R): (a)No. of Villages (b)No. of Households (c)No. of PDFs (Project Displaced Families) (d)No. of PAFs (Project Affected Families) (e)Funds Allocated for R&R(In INR) (In Lacs) (f)Status of R&R	0 0 0 0 0 Yet To Start		
28.	Details of Presence of Schedule-I Species: (a)Whether there is Presence of Schedule-I Species ? (i)Details of Schedule-I Species (b)Whether conservation plan for Schedule-I Species has been prepared ? (i)Uploaded copy of conservation plan (ii)Fund Provision made (iii)Period of Implementation (c)Whether conservation plan for Schedule-I Species has been approved by competent authority ?	Yes 13 Schedule I species Yes <u>Copy of conservation plan</u> 0 Within the drilling and production period No		
29.	Details of Presence of Water Bodies in Core Area: (a)Whether there is Presence of Water Bodies in Core Area ? (b)Whether there is Diversion Required ? (c)Whether permission has been obtained from competent authority ?	No No No		
30.	Details of Presence of Water Bodies in Buffer Area: (a)Whether there is Presence of Water Bodies in Buffer Area ? (i)Details of Water Bodies in Buffer Area (ii)Direction of Water Bodies in Buffer Area (iii)Distance of Water Bodies in Buffer Area	Yes Dangori River North West 0.7		
31.	Manpower Requirement: (a)Permanent Employment-During Construction (b)Permanent Employment-During Operation (c)Temporary Employment- During Construction (d)Temporary Employment- During Operation (e)No. of working days (f)Total Manpower	0 0 0 0 120 0		
32.	Green Belt in Ha: (a)Uploaded Green Belt plan	<u>Copy of Green Belt Plan</u>		
S. No.	Description	Existing	Proposed	Total
(1.)	Total Area of Green Belt	0	0	0
(2.)	Percentage of Total Project Area	0	0	0
(3.)	No. of Plants	0	0	0
(4.)	Funds Allocated	0	0	0
33.	Project Benefits			
S.	Type of Project Benefits		Details of Project Benefits	

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Advocate

No.		
(1.)	Financial	Provision of more royalty to Assam Government and more cess to Govt. of India Energy security for the country
(2.)	Social	Provision of more employment opportunity to local people Development of infrastructure (roads, culverts, bridges, schools etc.) in the area Increase in business opportunity for the local people Programs related to livelihood generation, health improvement as per OIL's Corporate Social Responsibility (CSR) programmes.

34. CRZ Specific Details : Not Applicable

35. Sector Specific Details : NOT APPLICABLE

35. Sector Specific Details For Industrial Projects - 2

S. No.	Item	Details
36.	Details of Court Cases: (a) Whether there is any Court Cases pending against the project and/or land in which the project is proposed to be set up ?	No
37.	Details of Direction Issued under Environment (Protection) Act / Air (Prevention & Control of Pollution) Act / Water (Prevention & Control of Pollution) Act: (a) Whether any Direction issued under EPA Act/Air Act/Water Act ?	No
38.	Details of EIA Consultant: (a) Have you hired Consultant for preparing document? (i) Accreditation No. (ii) Name of the EIA Consultant (iii) Address (iv) Mobile No. (v) Landline No. (vi) Email Id (vii) Category of Accreditation (viii) Sector of Accreditation (ix) Validity of Accreditation (x) Uploaded Certificate of Accreditation certified by QCI/NABET	Yes NABET/EIA/1618/RA 0055 ERM India Pvt. Ltd. Building 10, Tower A, 4th Floor, DLF Cyber City Gurgaon 122002 981006161 0124417030 subir.gupta@erm.com A Industrial Projects - 2 31 Oct 2019 Copy of Certificate of Accreditation
39.	Documents to be Attached: (a) Uploaded Copy of EIA/EMP Report (b) Uploaded Copy of Risk Assessment Report (c) Uploaded Copy of Feasibility Report/ Detailed Project Report(DPR) /Detailed Engineering Report /Detailed Conceptual Plan /Approved Mining Plan (d) Uploaded Copy of Final Layout Plan (e) Uploaded Cover Letter (f) Uploaded Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency (g) Uploaded Additional File	Copy of EIA/EMP Copy of EIA/EMP(Annexures) Copy of EIA/EMP(Plans/Figures) Copy of Risk Assessment Copy of Feasibility Report/ Detailed Project Report(DPR) /Detailed Engineering Report /Detailed Conceptual Plan /Approved Mining Plan Copy of Final Layout Plan Copy of Cover Letter Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency Copy of Additional File

Essential Detail Sought:

Sno.	EDS Letter	EDS Reply Letter	Remarks	Date of EDS
1.	NA	NA	The correction have been made as per the instruction received	10 Apr 2019
2.	NA	NA	On examination of your reply dated 28/3/2019, following are the observations:- - Proposal for Wildlife clearance and ground water withdrawal has not been submitted so far. - Entry at column 24 of Form-2 still shows 'Proposal for forest clearance yet to be submitted'. - Total land required of 82 ha is yet to be acquired. - Ministry's Regional Office vide letter dated 5/7/2016, has asked for action taken report on their observations during site visit on 7-14 June, 2016. Follow up action in this regard.	19 Apr 2019

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Advocate

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12/30/2020

Report Part 1

3.	NA	NA	The correction have been made as per the instruction received	08 May 2019
4.	NA	NA	It is to inform that our observations relate to the project envisaged for the present and the details mentioned in Form-2. Neither total land of 82 ha has been acquired, nor application has been submitted to CGWB/CGWA for ground water withdrawal of 50 cum/day. Please confirm whether drilling of wells is permitted in the ESZ of DS National Park. For clarification, if any, matter may be discussed with us in the Ministry along with the project layout to facilitate further consideration of the proposal.	18 May 2019
5.	NA	NA	- Please inform about EC status for the existing exploration/development of drilling wells (6 nos) and the compliance status thereof. Details in this regard need to be mentioned in column 6 of Form-2. - Proposal for Forest and Wildlife Clearance. - Proposal to be submitted for ground water withdrawal of 50 cum/day.	23 Mar 2019
6.	NA	NA	The correction have been made as per the instruction received	24 Sep 2019

Additional Detail Sought : NIL

Undertaking

I hereby give undertaking that the data and information given in the application and enclosures are true to be best of my knowledge and belief. And I am aware that if any part of the data and information found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the project will be revoked at our risk and cost. In addition to above, I hereby give undertaking that no activity/ construction/ expansion has since been taken up.

Name of Applicant	Ajaya Kumar Acharya
Designation	Head (S&E)
Name of Company (Applicant Name should not be given here)	OIL INDIA LIMITED
Address	OIL INDIA LIMITED DULIAJAN District : Dibrugarh

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 Ajaya Kumar Acharya