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Impact of oil well blow out at Baghjan oil field, Assam and resulting oil spill, on aquatic flora and fauna of surrounding landscape - Preliminary report

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1 Summary

The area affected by the oil spill due to blow out of well in Baghjan, is biodiversity rich, and one of the important remaining refuge for several endangered and range restricted species. A preliminary site survey and review of existing information from the surrounding landscape which includes Dibru-Saikhowa national park and Maguri-Motapung wetlands, indicates that the area harbours around 40 species of mammals, 500 species of birds, 104 species of fish, 11 species of chelonians, 18 species of lizards and 23 species of snakes, 105 species of butterflies and 680 plant species. The wetland and river in the area are also a critical lifeline for community. During the on-site survey a dead dolphin, several carcasses of dead fishes, herpetofauna and many species of plants and insects were encountered. The oil spill has caused mortality and wilting of many plant species, and has severely affected the health of forests and grassland. There is a coating of oil film on the vegetation, the beel, riverfront, as well as on many species of river fauna in the impacted area. There is a leakage of hazardous and toxic chemicals, which is dangerous to life in general, and this toxicity is known to persist in aquatic and soil system for long, leading to prolonged ill effects on all life forms, including humans. Even after a week of the incident, the leakage into the system continues, with no signs of containment. Sampling of water, sediments, dead organisms, vegetation and faunal survey is ongoing. Collected samples are being sent for toxicity analysis. A detailed report will cover assessment of impact on biodiversity and toxicity details. Given the seismic nature of the area, and based on experience of current accident management measures, along with preliminary assessment of extent of damage, it is important that OIL should come up with holistic management mitigation plan of environment damage of existing fields before initiating the approved new wells.

2 Context

A blow out of oil well occurred on the 26th May 2020, at the Baghjan oil field of Oil India Limited in Assam (Figure 1). The area is biodiversity rich having several protected areas and important biodiversity hotspots in its surrounding, Dibru-Saikhowa National Park, Bherjan Wildlife Sanctuary, Padumani Wildlife Sanctuary and Borajan Wildlife Sanctuary. Dibru- Saikhowa National Park comprising an area of 340 km^2 is the core of the larger Dibru-Saikhowa Biosphere reserve (DSBR) which spans over 425 km^2. This is located in the Tinsukia and Dibrugarh districts of Assam. This area has recorded at least 40 mammals, 500 species of birds, 104 fish species (Kalita, 2016), 105 butterfly species and

680plant species (Maduhusudan and Bindra, 2013), 11 species of chelonians, 18 species of lizards and 23 species of snakes (Dibru Saikhowa Management Plan). It harbours tiger, elephant, wild buffalo, leopard, hoolock gibbon, capped langur, slow loris, Gangetic dolphin, besides critically endangered bird species such as the Bengal Florican, White Winged Wood Duck, Greater Adjutant stork, White rumped vulture, slender-billed vultures, white rumped vulture, as well as the very rare and endemic Black-breasted parrotbill (Maduhusudan and Bindra 2013; Bhatta et al 2016). Among herpetofauna, it is home to the critically endangered Black Soft-shell Turtle as well as several endangered species (e.g.Narrow headed Soft-shell Turtle, Assam Roofed Turtle) and Schedule I species (e.g. Indian Flapshell Turtle, Water Monitor lizard, Indian Roofed Turtle, Burmese Rock Python) and several species of range-restricted frogs (Ahmed & Das, 2020 – Annexure 1). During February, 2020, 35 endangered Ganges River Dolphins were estimated to inhabit in this sector. Maguri-Motapung beel is one of the major wetlands in Tinsukia District of Assam, which cover ~ 5 km^2 and is also severely impacted by the oil spill. While the species found in this area largely overlaps with Dibru Saikhowa, until date 294 species of birds have been recorded from this area, and is declared as an Important Bird Area. Thousands of migratory bird visit the wetland in winter. Critically endangered species like Baer's Pochard, White-bellied Heron are also found in this wetland. The first record of species like Baikal Bush Warbler and White-browed Crane are also from this area, highlighting the need to conserve IBA (D Gogoi, pers.comm & eBird -Annexure 3).

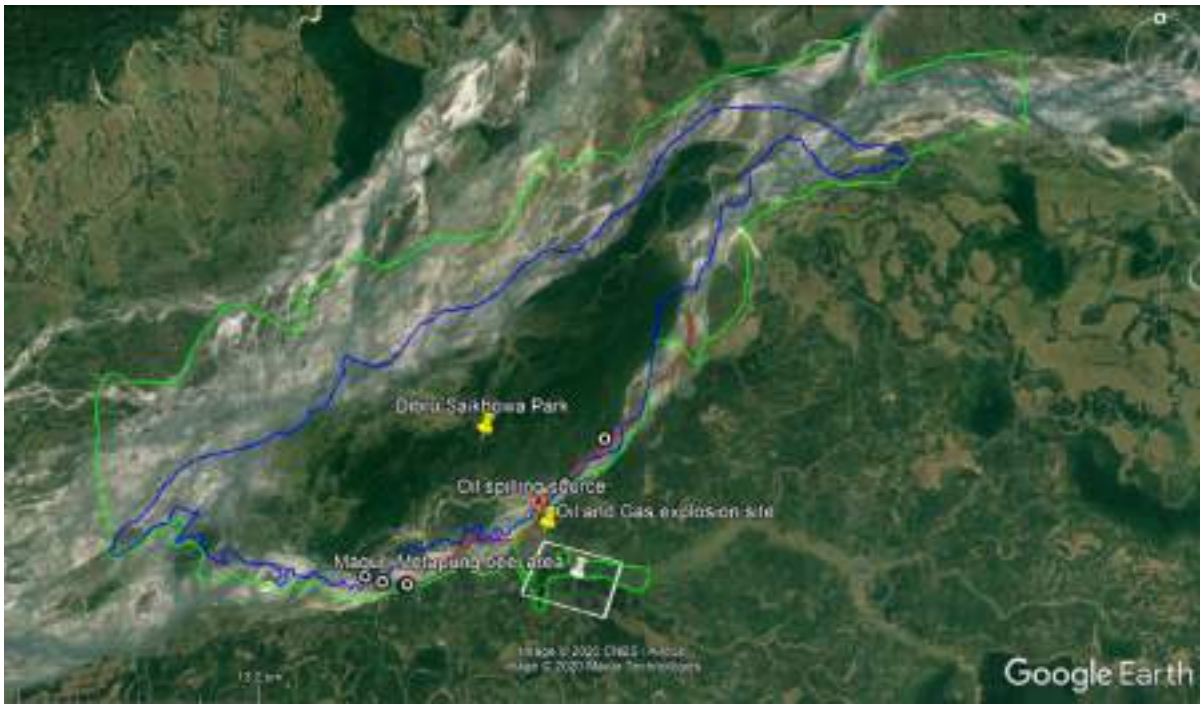

Figure 1: Study Area map with Dibru-Saikhowa National Park and Maguri-Motapung beel

A similar incident occurred at the OIL well in Dikom in 2005, which took almost a month to contain and that too with the help of international agency Boots & Coots Well Control Inc (Naqvi, 2020). The site inspection to NBWL Standing committee report stated "*We are*

deeply distressed that OIL, as a leading public sector company, instead of serving as a beacon for environmental compliance to others in the industry, appears to have evaded environmental norms" (Madhusudhan & Bindra, 2013). The report also highlighted development of mitigation plan in case of incidences such as the one that has just happened. There seems to be no clear information on the mitigation plan as suggested by the site inspection report. DFO Tinsukia has written to OIL seeking clarification on mitigation plan, as there seems to be no clear strategy or mitigation measures taking place at the time of the incident and site inspection (DFO, Tinsukia, pers comm). It is important to note that the present spill has not stopped and is still polluting and contaminating the surrounding areas. A similar incident in the Kalamazoo river, USA took several years and millions of dollars to contain.

The current oil spill occurred in an area that is bordered by protected areas, rivers and important wetlands and Important Bird Area, which are the lifeline of not only biodiversity but also the livelihood of local communities. Having occurred in the monsoon season, the extent of impact due to the spread of toxic hazardous gases and chemicals through air and water has spread far more than the usual area of impact, causing large-scale damage. People in the area have reported severe breathing difficulty, headaches and nausea. Even our survey team has suffered from the same symptoms, and experienced heavy presence of oil and chemicals in the environment. The entire area is also disturbed by the sound that is being generated by gas leakage. The sound can be heard even about 10-12 km away from the place of accident. The smell of oil permeates the entire landscape, with plants covered with layers of oil due to continuous leakage for the last 8 days. There is seepage of oil to the nearby wetland and other water bodies adjacent to Baghjan (D Gogoi, pers comm.).

Oil well blow out spews hundreds of chemicals in air, water and ground, contaminating the impact zone and surroundings. The hydrocarbon component comprises of hundreds of organic compounds, many of which are hazardous when released into the environment, for e.g. Polycyclic aromatic hydrocarbons (PAHs) amongst others. The distressing aspect of these compounds is their property of persistence and toxicity (Liu et al. 2020). These carcinogenic compounds get widely distributed in water, soil, sediment and air, and as they do not get photochemically and biologically oxidised or decomposed, their accumulation in these systems is very high (Zhao et al. 2017; Gundlach 2017; Guzzella and De Paolis 1994). Some of the effects of this type of contamination has been reported to be hypothermia, skin and eye irritation, indigestion, dehydration, impaired reproduction and/or pneumonia in many taxa (Environmental Protection Authority, 1993). These toxic particles persist in the environment in particulate matter and sediments, and when environmental condition changes, they are again released into water, leading to secondary pollution and long term toxicity in these areas, which is a worrying scenario for all life forms, including humans.

Adding to the concerns is the high seismic nature of this area, where the oil wells are operating. The whole region has been subjected to frequent changes in morphology

owing to recurrent earthquakes. These earthquakes are known to have caused extensive landslides and ground fissuring, amongst other effects to morphology. The region is known to have experienced several high magnitude earthquakes within a short period. Thrusts, faults and folds are a common characteristic of the region, exacerbating the concerns of oil drilling in the region, where sediments and rocks of the region have been experiencing compressive forces (Borgohain et al. 2016).

3 Reconnaissance Survey to assess damage

Given that the maximum impact area will be Dibru-Saikhowa National Park and Maguri-Motapung Wetland, we started with our preliminary reconnaissance survey to assess the impact on flora and fauna in the surrounding region. The following activities were carried out since 29th May 2020, and we report below our work till 02nd June, 2020.

Figure 2: Dead Ganges river dolphin in Maguri-Motapung Beel due to oil leakage

i.Contaminant survey

a. Presence of contaminants in the dolphin carcass
Samples of tissue and blubber were collected from the carcass of dolphin calf retrieved from the Maguri beel (Figure 2). The samples are preserved and is to be sent for quantifying presence of contaminants.

b. Collection of water and soil sediment samples
The extent of oil spill in the main stream of Lohit River (Borgohain et al., 2016) was assessed. Thirty samples of water and soil sediments from 10 independent sites were collected from a 15 km stretch of the river. Possible source points from where the oil spills into the main stream were identified (Appendix 1a, 1b). Water quality was

measured at each of the sites. The essential water parameters (Temperature, pH, DO, EC, Sp. conductance, TDS and Salinity) were measured in flowing water with the help of YSI Professional Digital Sampling System (ProDSS) and Professional Plus handheld multi-parameter probe (YSI, USA). The probes were set to log every 3 minutes in Brahmaputra and 5 seconds in *beel.* In the present study, we aimed to investigate the presence, concentrations, and ecological risk of PAHs in the natural gas leakage around the rig and the heavy metals present in water and sediment samples collected from the sampling points. The instruments Required for the analysis will be GCMS (Gas Chromatography – Mass Spectroscopy) for identification and GC – FID (Flame ionization detector) for quantification of PAHs. Heavy metals include copper, lead, iron, magnesium, sodium, molybdenum, zinc, cadmium, vanadium, titanium, manganese, chromium, cobalt, antimony, uranium, aluminium, tin, barium, gallium, silver and arsenic by AAS (Atomic Absorption Spectroscopy) or ICP inductively coupled plasma for heavy metals.

ii. Impact on flora and fauna

a. Terrestrial flora and fauna

The impact of the oil and gas spill in the adjoining regions of the Maguri-Motapung wetland was assessed. Surveys for the status of vegetation and birds were conducted in two sites, one 100 m from the oil spill site (affected area) and another a km away from the oil spill site (partly affected area). The two sites were visited on two consecutive days and surveyed. Transects of 100-600 m were laid in each of the site. The length of the surveys were curtailed due to unconducive conditions due to excessive air pollution due to oil and chemicals. A cumulative length of 1 km was surveyed in the affected site and a 3 km was surveyed in the partly affected site. Abundance and species were birds were recorded along with the time of sighting. Species and percent cover of dominant plants were recorded. Status of the leaves (green/shrinking/dry) which is an index of the damage was noted along with supporting photographs. The survey is still ongoing in these sites, with additional sampling in control sites.

b. Aquatic fauna

A 20 km survey close to impact zone was carried out for presence of Ganges river dolphins. Five dolphins were encountered in the stretch.

c. Collection of dead animals

Post oil spill, oxygen in water depletes and the fishes produce mucous on body and the body gets pale in colour. This was found in all the fishes that were captured from the Lohit (n=6) and the Maguri *beel* area (n=20). A large amount of fishes was found dead in Maguri beel. The collected specimens were identified to *Labeo calbasu*, *Labeo bata*, *Mystus cavacius*, *Mystus vittatus*, *Eutropiichthys vacha*, *Channa strata*, *Cirrhinus reba* which are economically important fishes and *Puntius sophore*, *Puntius terio*, *Gudusia chapra* and *Anabus anabus* are ornamental important fishes(Appendix 1c).

Apart from these, dead specimens of 4 species of beetles belonging to the Family Coleoptera and a Checkered keelback snake (*Xenochrophis piscator*) was also encountered and collected.

Figure 3: (Clockwise from top left) Oil and natural gas leakage site; Oil spill in Maguri-Motapung beel; Affected grasslands near the oil and gas explosion site; Field photographs (4); Dead fish in the oil spilled water

4 Inference

While sampling and survey is still ongoing, and analysis of samples for toxicity is still in process, some preliminary observations are as follows. The area around the spill over is of high biodiversity value. The spill has resulted in mass mortality and severely impacting the environmental condition resulting in debilitating conditions for species to survive. The toxic fumes and oil coating has universally affected flora and fauna. The contaminants and oil is continues to be released in surrounding areas and immediate steps are needed to contain this spill over. The toxins released are known to have long-term persistence in soils and sediments, which will not only affect current life conditions, but due to sustained release over a long period, pose a serious health risk for a longer term. The current observations and communications with locals lead us to believe that there is no mitigation plan in place, let alone a comprehensive one. There is a need to do comprehensive impact assessment of the current accident and the entire OIL field operation in biodiversity rich area for this region. This is even more important for this region, given the high seismic activity in the area. Given the current situation, and based on the impact observed, it would be not only prudent but also essential for the well-being of all life forms that the approved new wells, should be initiated only after a thorough investigation of potential impact, as well as evaluating disaster handling capabilities in place, with appropriate technology and trained man power.

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Appendix 1 – List of sampled sites and dead specimens collected

Appendix 1a: Water and sediment sampling sites in Brahmaputra River

Date	Site	Water sample	Sediment Sample
30-05-2020	Raidang	1 l	100 g
30-05-2020	Rangiadustam	1 l	100 g
30-05-2020	Naloniwathoi gaon	1 l	100 g
30-05-2020	Diholong Kohale Banni	1 l	100 g
30-05-2020	Dighaltarang	1 l	100 g
30-05-2020	Baghjan	1 l	100 g
30-05-2020	Guijan	1 l	100 g
31-05-2020	Kothalbam	1 l	
31-05-2020	Shindi-habi	1 l	100 g
31-05-2020	Rangagora tea estate	1 l	100 g

Appedix 1b: Water and sediment sampling sites in Maguri-Motapung *beel*

Date	Site	Water sample	Sediment Sample
01-06-2020	Maguri beel site 1	1 l	50 g
01-06-2020	Maguri beel site 2	1 l	50 g
01-06-2020	Maguri beel site 3	1 l	50 g
01-06-2020	Maguri beel site 4	1 l	50 g
01-06-2020	Maguri beel site 5	1 l	50 g
01-06-2020	Maguri beel site 6	1 l	50 g
01-06-2020	Affected area near rig	1 l	50 g
01-06-2020	Affected area near rig	1 l	50 g
01-06-2020	Affected area near rig	200 ml	
02-06-2020	Replicate (Maguri beel site 1)	1 l	50 g
02-06-2020	Replicate (Maguri beel site 2)	2 l	50 g
02-06-2020	Replicate (Maguri beel site 3)	3 l	50 g
02-06-2020	Replicate (Maguri Beel site 4)	4 l	50 g

Appemdix 1c: Fish species that were found dead in the affected area in Maguri-Motapung *beel*

Family	Species	IUCN Status
Cyprinidae	Labeo calbasu	LC
	Labeo bata	LC

	Mystus cavacius	LC
	Mystus vittatus	LC
	Channa strita	LC
	Cirrhinus reba	LC
	Puntius sophore	LC
	Puntius terio	LC
Clupeidae	Gudusia chapra	LC
Channidae	Channa striata	LC
Bagridae	Mystus cavacius	LC
	Mystus vittatus	LC
Anabantidae	Anabus testudineus	LC
Schillbeidae	Eutropiichthys vacha	LC