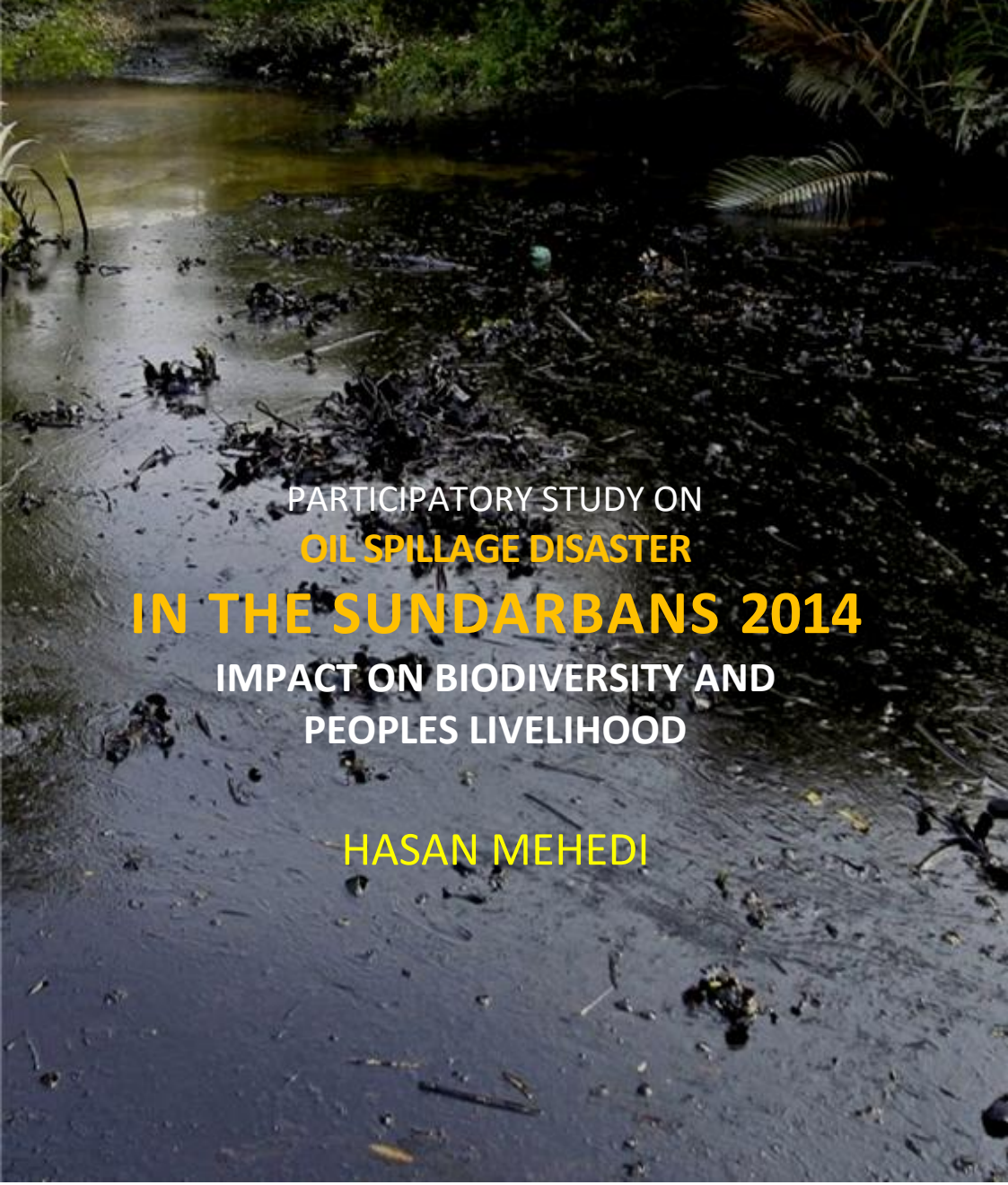

PARTICIPATORY STUDY ON

OIL SPILLAGE DISASTER IN THE SUNDARBANS 2014

IMPACT ON BIODIVERSITY AND PEOPLES LIVELIHOOD

HASAN MEHEDI

Coastal Livelihood and Environmental Action Network
clean

PARTICIPATORY STUDY ON OIL SPILLAGE DISASTER IN THE SUNDARBANS

Impact on Biodiversity And Peoples Livelihood

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A girl is collecting slicked oil from the Shela river

ACRONYMS

ACF	Assistant Conservator of Forest
ADB	Asian Development Bank
BAPA	Bangladesh Poribesh Andolan
BIWTA	Bangladesh Inland Water Transport Authority
BSC	Bangladesh Shipping Corporation
CCF	Chief Conservator of Forests
CF	Conservator of Forest
CLEAN	Coastal Livelihood and Environmental Action Network
DFO	Divisional Forest Officer
DOE	Department of Environment
DOS	Department of Shipping
FD	Forest Department
FGD	Focus Group Discussion
GOB	Government of Bangladesh
MARPOL	Marine Pollution (International Convention for the Prevention of Pollution from Ships)
MECA	Marine Environmental Conservation Act
MPA	Mongla Port Authority
MPCP	Marine Pollution Conservancy Plan
BPC	Bangladesh Petroleum Corporation
SIZ	Sundarbans Impact Zone

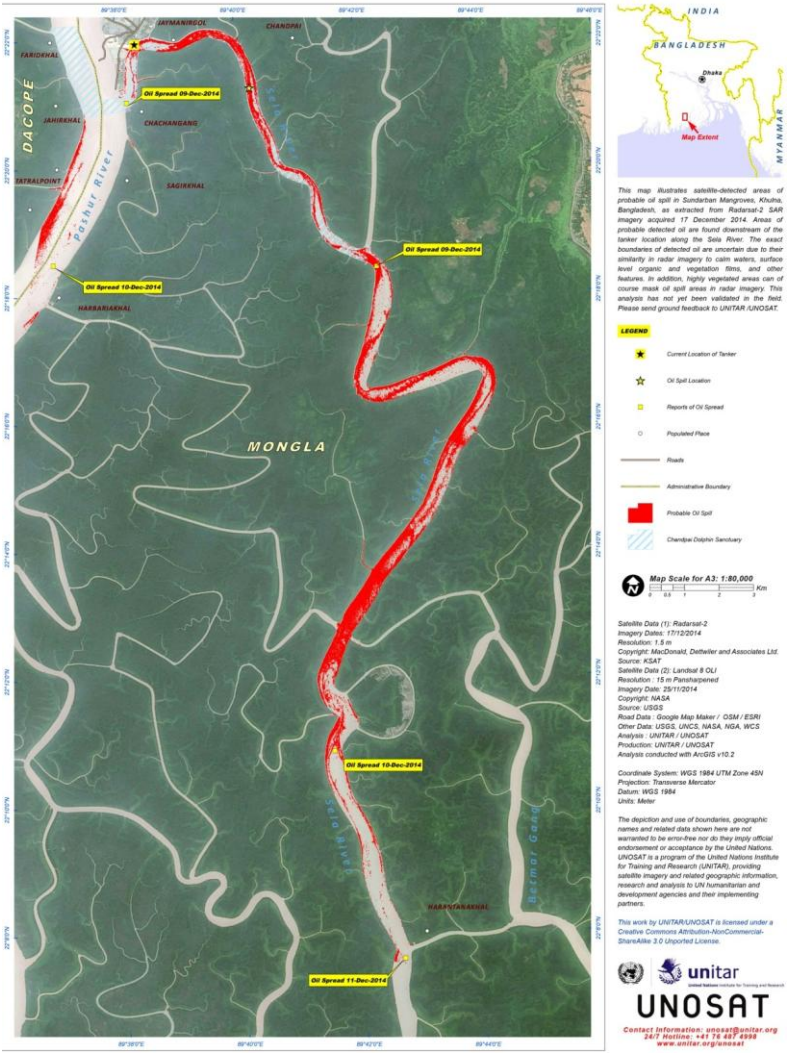
SRF	Sundarbans Reserve Forest
SSI	Semi-Structured Interview
SWG	Sundarbans Watch Group
TRM	Tidal River Management
UNDAC	United Nations Disaster Assessment and Coordination
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
Unesco	United Nations Educational, Scientific and Cultural Organisation
Unitar	United Nations Institute for Training and Research
UNOSAT	United Nations Operational Satellite Programme

GLOSSARY

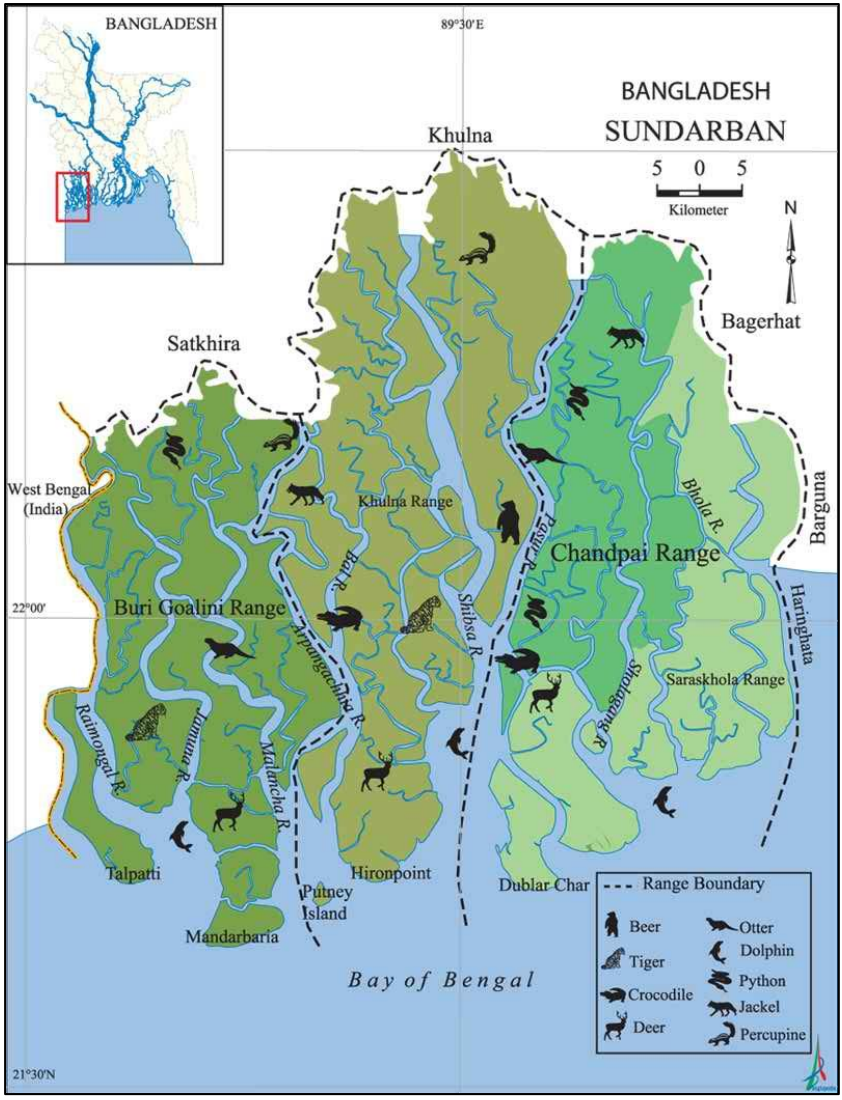
Bengal Tiger (*Panthera tigris tigris*)	Bengal Tiger is the most common tiger subspecies. By 2011, the total population was estimated at 106 individuals with a decreasing trend. Since 2010, it has been classified as Endangered by the IUCN.
Gewa (*Excoecaria agallocha*)	Gewa is one of the distinguished and most populated tree species of the Sundarbans that grows on the riverbanks and tidal flats. Khulna Newsprint Mills and Dada Match Factory in Khulna had been using Gewa as raw materials to produce newsprint paper and match boxes until 2000 when the government posed a ban on use of Gewa.
Golpata (*Nypa fruticans*)	Golpata or Nypa Palm leaves are commonly used by the local inhabitants of the Sundarbans as thatching materials.
Shushuk (*Platinista gangetica*)	Gangetic Dolphin is known as Shushuk. It is one of the endangered species of the world and found only in Bangladesh, India and Pakistan. The most populated areas with these dolphins are estuaries of Ganges-Meghna-Brahmaputra (GBM), Karnaphuli-Sangu River system and Indus river.
Shushuk (*Orcella brevirostris*)	Irrawaddy Dolphin is also known as Shushuk in Bangladesh and it is one of the critically endangered species of the world. Around 7,000 this species is in existence in the world, more than 5,830 of those live in the Sundarbans area.

Spotted Deer (*Axis axis*)	The Spotted Deer is a deer which commonly inhabits wooded regions of Bangladesh, Bhutan, India, Nepal and Sri Lanka. It is also a flagship species of the Sundarbans.
Sundari (*Heriteria fomes*)	The flagship species Sundari is the most recognized tree species of the Sundarbans. It is said that the name of the Sundarbans actually comes from 'Forest of Sundari Trees'. Sundari is one of the most demanded timber trees in the market. So, it is one of the most denuded trees due to illegal logging and top-dying disease. Khulna Hardboard Mills had been using Sundari as a raw material for producing hardboard until 2000 when a ban was posed.
Estuarine Crocodile (*Crocodylus porosus*)	Estuarine Crocodile is the largest of all living reptiles, as well as the largest terrestrial and riparian predator in the world. The population of estuarine crocodile is only around 150 now and IUCN categorized as Critically Endangered in Bangladesh.
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)	This sea turtle is the largest of four species of turtles and tortoises in Bangladesh. The other four species are Loggerhead turtles, Green turtles, Hawksbill turtles, and Leatherback turtles. It consumes an unusual assortment of prey including fish, jellyfish, crustaceans and other shellfishes, sponges, and tunicates, they also eat sea grasses, and algae It is also categorized by IUCN as Endangered in Bangladesh.

OIL SPILLAGE AND SLICK MAP



The satellite image of oil spillage and slicked areas in the Sundarbans developed by United Nations Operational Satellite (UNOSAT) and United Nations Institute for Training and Research (UNITAR) analysed with Radarsat-2 Data Acquired 17 December 2014 and LANDSAT 8 OLI Data Acquired 25 November 2014.



The Sundarbans is a unique example of rich mangrove biodiversity with ### species of mangrove plants, ## species of mammals, ## species of amphibians, ## species of reptiles, ### species of birds, ### species of fishes and ### species of shrimps. Around 300 thousand people directly and 1.3 million people indirectly depend on the Sundarbans for their lives and livelihoods. Source: Banglapedia

BACKGROUND

The Sundarbans is one of the World's natural Heritage Site and Ramsar site. It is the largest single tract mangrove forest of the world with rich biodiversity resources. A local oil-tanker 'OT Southern Star-7' sank on 9th December 2014 with 367 metric ton furnace oil after a hit by another cargo vessel 'MT Total' in Shela River of the Sundarbans, which is only 6 kilometres from Mongla sea port. It was the fourth incident of oil spillage in the Sundarbans since 1990.

Recent incidents of oil spillage in the Sundarbans

SL #	Year	Quantity of Oil	Category of Oil	Source of the Spillage
1.	2014 (9 Dec)	357,000 (+) litre	Furnace Oil	Bangladeshi flag carrying oil tanker OT Seven Star-5
2.	2001	232,000 (+) litre	Diesel	Bangladeshi flag carrying oil tanker OT Kalindi
3.	1999	352,000 (+) litre	Diesel	Oil tanker Ocean Wave (country unknown)
4.	1994 (13 Aug)	197,000 (+) litre	Lubricant oil	Panama's flag carrying oil tanker MV Pavlina
5.	1992	100,000 (+-) litre	Light oil	DOS, FD and MPA failed to identify the source
6.	1990	150,000 (+-) litre	Light oil	DOS, FD and MPA failed to identify the source

The first incident took place in 1990 in Mongla River with more than 150 metric tons of light oil (petroleum) spilled on the river. The second incident occurred in the same river only after 2 years. Surprisingly, respective departments (i.e. Department of Shipping, Forest Department and Mongla Port Authority) failed to identify the source of oil spillage[1]. As a result, the government could not take any

[1] Karim, M.S. (2009). Implementation of the MARPOL Convention in Bangladesh

measure against the responsible persons or the shipping companies. Again, after only two years of the second incident, another ship of Panama, MV Pavlina, sank in Mongla River (near Banishanta village, only a kilometre from Mongla Port) with 1.97 Metric Tons of Lubricant or heavy oil. Respective departments failed to remove oil or salvage the tanker from riverbed in next ten years. As a result, Mongla River was silted heavily and dried up.

The place where it took place is a wildlife sanctuary for aquatic fauna including rare Irrawaddy and Ganges dolphin along with Bengal tiger, deer, wild boar etc. The concerned institutions which include

Bangladesh Navy, Mongla Port Authority (MPA), Forest Department (FD), Bangladesh Inland Water Transport Authority (BIWTA) or Bangladesh Shipping Corporation (BSC), Department of Environment (DOE) and Bangladesh Petroleum Corporation (BPC) failed to take an immediate and effective decision to reduce vulnerability of world largest single tract mangrove Forest. As a result, several questions were raised from different corners of the society:

a) What is the impact of oil spillage on biodiversity and forest dependant people?
b) Who is (are) responsible for these devastating accidents?
c) What are the possible measures that should be taken to reduce long term impacts?
d) What should be the policy directions to reduce future incidents of Oil Spillage in the Sundarbans?

Answers of these questions are complex and may lie in several cause-effect relationships. This present study seeks these answers based on the most recent oil spill occurrence in the Sundarbans mangrove forest. The objectives of this study include:

Broader Objective of the Study

Portraying Policy direction and possible future actions to reduce vulnerability of the mangrove forest and forest dependant people due to oil spillage in southwest coastal zone focusing damage by the oil spillage in the Shela River in 2014.

Specific Objectives

- To assess immediate loss of biodiversity resources and find-out its consequences;
- To understand the vulnerabilities of livelihood of forest dependant people due to oil slick;
- To address the causes behind the incident of oil spill and suggest policy changes, if required;

LEGAL FRAMEWORK TO CONTROL OIL SPILLAGE

The Constitution of Bangladesh (1972) has recently been amended in 2011 to include protection and improvement of environment and biodiversity under article 18A, which proclaims that 'the State shall endeavour to protect and improve the environment and to preserve and safeguard the natural resources, bio-diversity, wetlands, forests and wild life for the present and future citizens.'[2] This article 18A is placed under Part II of the Constitution titled Fundamental Principles of State Policy. Although this provision and along with twenty other provisions (articles 8-26) are not judicially enforceable, they are fundamental to the governance of Bangladesh and shall be applied in law making, guide to interpret the Constitution and form basis of work of the State and the citizens. Inclusion of such provisions in the black letters of the Constitution reiterates the commitment of the government towards the protection of environment, including the marine environment, from pollutions.

To fulfil the mandate of the constitution, Bangladesh endorsed some acts and policies related with oil spillage, such as:

a) Bangladesh Biological Diversity Act 2012;
b) Bangladesh Environment Protection Rules (Amend) 2002;
c) Bangladesh Merchant Shipping Ordinance 1983;
d) Bangladesh Water Pollution Control Ordinance 1970;
e) Coast Guard Act 1994;
f) Environmental Protection Act (Amendment) 2010;
g) Inland Shipping Ordinance 1976;

[2] GOB (2011). The Constitution of the Peoples Republic of Bangladesh: Fifteenth Amendment

h) Mongla Port Authority Ordinance 1976;

i) Territorial Waters and Maritime Zones Act 1974; and

j) Wildlife Conservation Act 2010.

Bangladesh's compliance and enforcement mechanisms as a port and coastal State are very weak, fragmented and uncoordinated. Bangladesh provides no reception facilities at sea ports. The enforcement, legal, administrative and judicial authority for large scale vessel-source pollution is not very clear. Although there have been a number of large-scale oil pollution incidents in the marine region of Bangladesh, concerned authorities failed to prosecute any foreign ships[3]. Besides, the respective laws are very poor to ensure proper penalty. According to Environmental Protection Act 1995 (Amendment 2010), the Department of Environment can impose a penalty of BDT 100,000.00 or five years imprisonment for pollution of any land or water bodies. While a Magistrate of Marine Court can penalty BDT 100,000 or one year imprisonment for polluting waterways according to article 71(A) of Inland Shipping Ordinance 1976. According to Mongla Port Authority Ordinance 1976, causing pollution of the water or environment of the port area shall be punishable by fine, which may total only BDT 100,000 (BDT 78.00 = USD 1.00)[4]. The Draft Marine Environment Conservation Act, 2004 is an attempt in that direction. The draft law aimed at preserving the marine environment and preventing marine pollution in Bangladesh taking a holistic approach towards the problem. This draft, if passed, will also act as the enabling legislation for MARPOL 73/74[5]. But the act is yet to be endorsed by the parliament even after 11 years of drafting.

[3] Mostafa Kamal Majumder (2001). 'What Has Gone Wrong with the Bay'

[4] The Mongla Port Authority Ordinance 1976

[5] Draft Bangladesh Marine Environment Conservation Act 2004 (Unofficial English Translation)

RESPONSIBLE DEPARTMENTS TO CONTROL OIL SPILLAGE

According to the article 7(e), (h) and (I) of the Coast Guard Act 1994, the Coast Guard is responsible to protect coastal pollution, salvage the vessels and support the Port Authorities. The Coast Guard are capable of arresting the accused persons and handover to the police stations only, while the Forest Department is entitled to file a case against the responsible persons or companies. Bangladesh Inland Water Transport Authority (BIWTA)[6] and Department of Shipping (DOS)[7,8] have been empowered to inspect, try and file cases to control pollution of inland and coastal waterways. Mongla Port Authority is empowered to control coastal shipping by Mongla Port Ordinance 1976. According to the Inland Shipping Ordinance, BIWTA and DOS is responsible for giving any registration or approval to navigate vessels in inland and coastal waterways. So, the responsible departments are:

a) Bangladesh Inland Water Transport Authority (BIWTA
b) Bangladesh Petroleum Corporation
c) Coast Guard
d) Department of Environment
e) Department of Shipping
f) Forest Department and
g) Mongla Port Authority

6 Inland Shipping Ordinance 1976

7 The Bangladesh Marchant Shipping Ordinance 1983

8 Territorial Waters and Maritime Zones Act 1974

MAJOR FINDINGS

It is clear that the oil tankers and its owners are primarily responsible for the catastrophic incident. The tanker was a sand carrying cargo, and they converted it to an oil tanker without any security measure. So, it is clear that they considered nothing but profit to run a marine cargo service. But are they alone at this side? There are several issues lying in this statement. How and under which process a sand-cargo was transformed to an oil tanker? Petro Bangla, a state-owned company for oil and gas exploration, has allowed carrying petroleum in the vessel, instead of Bangladesh Shipping Corporation (BSC) which is the legal authority for inspecting and giving licence to the large vessels.

The oil-tanker was navigating through Shela River which is a wildlife sanctuary because, the regular route, Ghashiakhali Channel, was dried up due to heavy siltation. Bangladesh Inland Water Transport Authority (BIWTA) advised all commercial vessels to use Shela River in 2010 as an alternative. The Government allocated around 300 million Bangladeshi Taka for dredging in 2011 but the re-excavation process was failed due to slow implementation rate and high sedimentation. BIWTA didn't change its advise even after an order from Prime Minister of Bangladesh (24 November 2011) and several concern letters from Ministry of Environment and Forest. The oil tankers (i.e. MT Total and OT Southern Star-7) were commercial vessels and those are not allowed to navigate through Shela River at night and obliged to anchor at Jetty of Forest Department (FD). But the vessel, OT Southern Star-7, was anchored at middle of the river without any prior notification. But FD didn't take any immediate action - seize, financial penalty or court case - against the vessel.

The damage could be reduced by immediate booming or salvaging half-submerged vessel. But the authorities took 3 days to take an

appropriate decision although office of Mongla Port Authority (MPA), Coast Guard, Bangladesh Navy (BN) and FD are situated within 4 kms of the spot. They tried to use dispersants to control oil pollution which was a destructive decision. The implementation was withheld after huge protest from different green groups. After three days, government allowed local people to clean-up oil from rivers without any training or cautionary measures and Bangladesh Petroleum Corporation (BPC) started purchasing the collected oil on a reduced rate. Only 68.2 ton of oil was collected. Meanwhile the oil was spread-out in 70 kms up and downstream of the Sundarbans region. According to the newspapers, at least 360 sq. kms of the Sundarbans is seriously affected by the oil spill and death of fishes, birds, crabs, lizards and Irrawaddy Dolphin has been reported.

Now a comprehensive and integrated activity is required to save Sundarbans from permanent damage. The prop roots and pneumatophores are still oil coated since the accident. According to the report of JOEC, birds, turtles, fish and other invertebrates are likely to die within 0-15 days of oil spillage while small mangroves loss their leaves by 15-30 days. Medium sized mangrove trees loss their leaves and face death by 1-12 months and impacts on large mangrove trees can be seen by 1-5 years[9]. Many of the environmentalists and scientists hope that the Sundarbans will be able to heal itself and regenerate the flora and fauna with its high capability of adaptation with adverse situation. But there is an uncertainty of losing one or more species of microorganisms, planktons, invertebrates, molluscs, fishes, birds, amphibians, lizards or mammals from the Sundarbans. That will impact on ecosystem of the mangrove forest and, of course, on the people living in the adjacent areas. As a result, the forest dependent communities especially fisher folks, Golpata (nypa frond), honey and shrimp fry collectors may face some uncertain situation.

Bangladesh imports around 3.5 million tons of crude and refined oil[10], and contributes around 6,000 to 400 thousand tons of annual oil pollution in the Bay of Bengal[11]. As petroleum products for southwest and northwest regions are transported through Mongla sea port, oil spillage has emerged as a concern since independence of Bangladesh. After three incidents in 4 years, Asian Development Bank (ADB) allocated a Technical Assistance (TA) Fund for Bangladesh to conduct a study on possible measures to protect oil spillage incidents in the Sundarbans area. Three institutions (two Japanese and one Bangladeshi) conducted a research in 2002 on behalf of Bangladesh Government. The report warned Bangladesh Government about

[9] JOEC (2002). Oil Spill Impact on Sundarbans Mangrove Forest Report

[10] Begum Rehana Akhter (2005) 'Pollution and its Management Approach'. The Daily Star. 13 October 2005: Dhaka, Bangladesh

[11] Md. Saeedur Rahman (2004). 'Bay Health: Source to Sea'. The Daily Star. 27 February 2004: Dhaka

possibilities and serious consequences of oil spillage in the Sundarbans. The report recommended to (a) train concerned employees to response quickly on oil spill (b) Formulation of National Marine Pollution Contingency Plan and National Oil Spillage Response Plan (c) Coordination between FD, Coast Guard, MPA, BSC and DOE (d) Regular monitoring, collecting machineries and (e) Readiness of communities with locally available booming and clean-up materials. Bangladesh also signed SAARC Oil Spillage Response Plan in 2003. More than a decade has been passed but the preparation is at the lowest level even now.

There is a lack of coordination between the Coast Guard, maritime administration and port authorities. Even if the Coast Guard were to arrest a ship for major oil pollution in territorial waters, it is not clear which authority would prosecute it or in which court this would go. The whole maritime sector has been struggling with age-old unenforced laws which are inherently vague.

According to the discussion in FGDs and Semi Structured Interviews, the Assistant Conservator of Forest (ACF) of Chandpai[12] was informed about the oil spillage at around 10:00 AM in the morning. He informed the Divisional Forest Officer (DFO) and consequently information passed to Conservator of Forest (CF) for the Sundarbans Circle and Chief Conservator of Forest (CCF) of Forest Department. It took at least 6 hours which proved either negligence of FD officials or ineffectiveness of internal communication system of the department. "I was in bed and heard the big `boom' of clash between two big vessels at around 5:00 AM at the morning. I wake up with my neighbours and started searching the source, but couldn't find out", said a fisherman of Joymonir Ghol village. Another young fisherman said, "I went to river bank for a wash and suddenly experienced something like lubricants on my leg"[13]. The information spread out very fast and thousands of people gathered at nearby river ghat. So the question is why the FD came to know the information at 10:00 AM while they have patrol team to watch forest frequently.

According to Bangladesh Merchant Shipping Ordinance 1983, Bangladesh, Inland Shipping Ordinance 1976, Coast Guard Act 1994, Environmental Protection Act (Amendment) 2010, Mongla Port Authority Ordinance 1976, and Territorial Waters and Maritime Zones Act 1974, Bangladesh Inland Water Transport Authority (BIWTA), Department of Shipping (DOS), Forest Department (FD), Coast Guard (CG), Department of Environment (DOE) and Mongla Port Authority is solely responsible to work together to protect oil pollution in the Sundarbans and adjacent coastal areas. But the laws and policies have been followed poorly without any proper monitoring and evaluation process. "We don't have any power to arrest a big polluter

[12] Interview of Mr. Belayet Hossain, Assistant Conservator of Forest to Chandpai Range Office taken on 30 December 2014

[13] Information given by Ziadul Islam (Age 23), fisherman of Joymonir Ghol in the Focus Group Discussion (FGD) held at courtyard of Nur Islam, Joymoni Village, Mongla, Bagerhat on 7 January 2015

and we are bound to file a case to regular police stations and can take their support for next actions", said Mr. Jahir Uddin Ahmed, Divisional Forest Officer, Sundarbans West Forest Division[14]. But according to the Director of Department of Environment, Forest Department and BIWTA is solely responsible for charging penalty or filing court cases, as per the law. "But we can take actions if they requested us to supersede the previous laws", said Dr. Mallick Anwar Hossain, Director of DOE. The cause of misunderstanding and poor coordination experienced due to absence of a supra-law or policy which could bind all of the respective departments together in action.

Analyzing the respective laws related with coastal water bodies, forest governance, controlling port areas and maintaining environmental equilibrium, it is clear that several laws are overlapping in case of any incident in the water bodies of Sundarbans and in the territory of Coast Guard and Mongla Port Authority. So, without a proper communication and coordination between BIWTA,

[14] Interview taken on 13 February 2015

MPA, DOS, DOE, FD and CG, no devastating activities can be protected. A research report commissioned by the government and funded by ADB[15] suggested to form a Joint Task Force to control and emergency response in oil pollution in the Sundarbans area. The report published in 2002 and also suggested to endorse a Oil Pollution Contingency Plan. The plan was drafted under the said project too. But that draft contingency plan is yet to be passed by the government. So, in absence of any contingency plan and a joint committee or task force, none of the responsible authorities could take proper decision at the time of the accident.

Without proactive and voluntary involvement of local people, it is difficult to manage such a big accident in the Sundarbans, the largest single tract mangrove forest. As a distinguished reserve forest protected by law and also an ecologically critical zone, nobody is allowed to enter the forest without proper permission or entitlement. So, people felt that it might be illegal to collect the slicked oil from rivers by the Sundarbans. But due to absence of experienced and trained human resource, it was not easy to collect floating oil from riverbeds very swiftly. The authorities tried to use different types of chemicals but those were cancelled in response to protest from environmental activist groups. At last, the authorities involved local people after long three days of the accident. If the authorities were able to suggest local people to collect slicked oil immediately, it could not spread out to other remote areas of the forest

Under a support from Asian Development Bank, it is to note that, a group of more than 150 FD staffs took training on oil spill contingency in 2002 and 2003. Two international institutions i.e. Japan Oil Engineering Company Limited and Fuyo Ocean Development & Engineering Company Limited conducted the training for forest department staffs. But after the incident of oil spillage, no related documents found in FD archives. Concerned citizens came to know

[15] JOEC (2002). Oil Spill Impact on Sundarbans Mangrove Forest Report

about the training, inter alia, other policy initiatives through only final report of the project. DFO of Sundarbans West Division said that, all trained staffs had been transferred to different areas and could not contribute a single suggestion during the disaster.

Involvement of experts from different higher educational and research institutions could also support respective departments in emergency management of slicked oil. But there is no mechanism in existing laws or policies to involve non-government actors in such type of emergencies. The Sundarbans is the largest forest of Bangladesh (40% of total forest resources) and highly important nationally and globally. But there is no involvement of experts from different sectors in management of the forest and its adjacent areas. So, Forest Department, and others also, left alone to take emergency decisions during a disaster.

IMPACTS ON BIODIVERSITY AND FOREST DEPENDANT PEOPLE

According to IPIECA Reports[16], oil spills have a serious impact on the biodiversity of mangrove forests as it survives in such an ecosystem which is already vulnerable for any species. The observations are:

a) Mangrove plant species are very sensitive to oil, partly because oil films on the breathing roots inhibit the supply of oxygen to the underground root systems. Sundari and other tree species of prop roots may be more vulnerable than Gewa or other non-prop root trees.

b) Perennials with robust underground stems and rootstocks tend to be more resistant than annuals and shallow rooted plants. Oil does not always stick to the larger algae because their mucilaginous coating. Inter-tidal areas denuded of algae are usually readily re-populated once the oil has been substantially removed.

c) Serious effects on plankton have not been observed in other areas in the open sea. This is probably because high reproductive rates and immigration from outside the affected areas counteract short-term reductions in numbers caused by the oil.

d) Molluscs, crustaceans, worms, sea urchins and corals may suffer heavy casualties if coated with fresh oil. In contrast, it is quite common to see barnacles, winkles and limpets living on rocks in the presence of residual weathered oil.

e) Eggs and larvae of fish species in shallow waters may suffer heavy moralities under slicks, particularly if dispersants are used. Adult fish tend to swim away from oil.

[16] IPIECA (2013). Oil spill risk assessment and response planning for offshore installations

f) Birds using the water-air interface are at risk, particularly auks and divers. Badly oiled birds usually die. Seabird populations with very local distributions could be at risk in exceptional circumstances; and

g) It is rare for deer, tigers, whales, dolphins, cows, goats, otters and other mammals to be affected following an oil spill, although death of dolphins recorded in the Sundarbans after this incident of oil spillage.

Around 180,000 people depend on the Sundarbans for their lives and livelihoods. Among them 20,000 community members of fisher folk live in adjacent areas of the oil-spillage spot. Most of them live in makeshifts on the embankments and big roads besides the rivers of Shela and Mongla. Since common fishing grounds in disaster affected regions now lack availability of fish, the fisher folks are facing inhumane situation now. According to the findings of FGDs, fish collection reduced about 30-40% after oil spillage. Such trend demonstrates that fish availability will be diminished from affected areas in future. Therefore, the fisher folk, who are already facing the vulnerabilities of diminishing ecosystem as whole, will experience in more severe problem.

PEOPLE'S RECOMMENDATIONS

1. Exemplary Punishment of the accused vessel company and government officials who are responsible for the accident and delaying clean-up process;
2. Endorsing Marine Pollution Contingency Plan (MPCP) for Bay of Bengal and coastal rivers covering all types of pollution including oil spillage, waste dumping, poisoning coastal canals and rivers, contamination of chemicals (fertilizer and raw materials) and excessive heat;
3. A comprehensive Marine Environment Conservation Act (MECA) is a must to build better coordination and rapid action with provisions of financial and imprisoning punishment for respective individuals, companies and authorities responsible for serious water pollution in coastal zone, especially in environmentally critical areas;
4. Formation of a permanent taskforce for rapid response on any marine pollution in the Sundarbans, SIZ and coastal region. The participating departments of the taskforce should be BIWTA, BPC, Coast Guard, DOE, DOS, FD, MPA and representatives from related higher education and research institutes.
5. Providing enough instrumental support to the Taskforce for regular patrolling, investigation and quick action to protect and remove oil spillage from any part of the Sundarbans and coastal zone;
6. Banning all commercial vessel to navigate through the rivers, especially in Shela river of the Sundarbans and stop trespassing motorized boats in the small distributaries, especially in the wildlife sanctuaries;

7. Immediate restoration of Mongla-Ghashiakhali international navigation channel by dredging and initiating Tidal River Management (TRM) in different wetlands related with the tributaries and distributaries of the channel;

8. Providing long term humanitarian support to the affected fisher groups through social safety net services including Vulnerable Group Feeding (VGF), Vulnerable Group Development (VGD), Food or Cash for Work and other employment schemes.

METHODOLOGY & PROCESS

To conduct the study, the researchers followed a comprehensive process including (a) Literature Review and Secondary Data Collection including reviewing respective policies and acts (b) Direct information collection through field observation, Focus Group Discussion (FGD) and Semi structured interview of key informants. All information have been critically analyzed and comparatively checked with the reality. The processes are:

a) LITERATURE REVIEW

- On oil spillage in mangrove forests of different countries including Mexico, Brazil, Philippines, Thailand and India. Research Reports of Asakawa *et. al.* (2010), Balena (2015), Hoff and Michel (2014), ICG (2005), IPIECA (2005, 2013, 2014), ITOPF (2010), Lewis (1983), Proffitt (1995), Santos *et. al* (2012), Smith et. al. (2002) and UCG (2013).

- There are a very few researches and studies done on oil spillage in Bangladesh. The important researches including history and measures on oil spillage in Bangladesh studied by Arif *et. al.* (2013), Islam (2014), JOEC (2002), Karim (2009), MS Karim (2009), Rahman (1994), UNEP/OCHA (2015) and UNOSAT (2014) have been collected and information taken from their reports.

- Respective Acts and policies published by Bangladesh Environment Protection Rules (Amendment) (2002), Bangladesh Bio-safety Rules (2012), Territorial Waters and Maritime Zones Act (1974), The Mongla Port Authority Ordinance (1976), Bangladesh Water Pollution Control Ordinance (1970), The Bangladesh Marchant Shipping Ordinance (1983), Marine Fisheries Ordinance (1983), Coast Guard Act (1994), Environmental Protection Act

(Amendment) (2010), Bangladesh Biological Diversity Act (2012) and The Inland Shipping Ordinance (1976) have been collected and analyzed.

- Investigative and updated reports from different newspapers including Daily Dhaka Tribune, Kaler Kantho, PHYS.ORG, Prothom Alo, Samakal, Star and Daily Sun have been collected and analyzed with the reports of Government Probing Committees.
- Investigative reports of different investigators including Government Committees (Committee formed by the FD and Committee formed by the MOEF) and University based researchers like Chowdhury et. al (2014) on Sundarbans oil slick has been collected and analyzed.

b) FIELD OBSERVATION

The researchers employed a panel study approach (i.e., monitoring areas over time) in the area of oil spillage. Photos and satellite images over time were also analyse to get deeper insight to the incident.

c) FOCUS GROUP DISCUSSION (FGD)

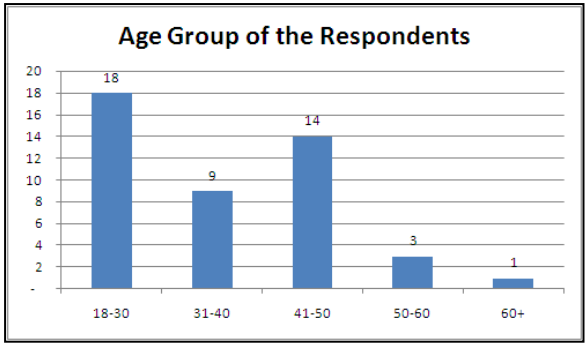
Four FGDs were organized with active participation of forest dependent communities including women and fisher folks at the site of incident, environmental activists of southwest coastal region and academicians. A total of 38 persons participated in the FGDs in which 28 participants are male and 10 are female.

d) DETAILED SEMI STRUCTURED INTERVIEW

Seven persons participated in the Semi Structured Interview. The persons are from Academia, Forest Department, Department of Environment, Journalists, Member of Probing Committee formed by MOEF and elected representative of local government institute.

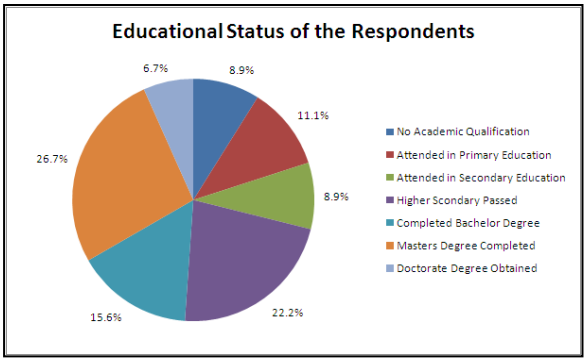
STUDY PARTICIPANTS

A total of 45 citizens participated in the study, of which 38 persons participated in the FGDs and the rest in the Interviews. Among the participants 73.3% are male and 26.7% female. Participation of the females is lesser than that of the males. However the effect of this imbalance is supposed to be insignificant on this study since the females were involved neither in cleaning up slicked oil from the rivers nor in fishing from nearby water bodies. A very few number of female members of the community are involved in shrimp fry collection. Considering this contribution, their opinions are given due importance in the FGDs.



More than 40% (n=18) of study respondents are from age between 18-30 years while 31.1% of the respondents are from age between 31-40 years. Only 1 respondent from elder citizens (60+ Years) participated in the Focal Group Discussions while 20% participants were from the age between 31-40 years and 6.7% from the ages between 50-60 years.

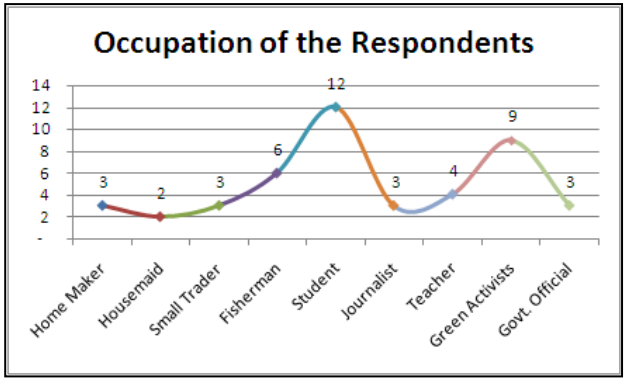
Major portion (n=12, 26.7%) of the participants completed their master's degree while second largest group of participants (#10, 22.2%) completed their higher secondary education. On the other hand, 8.9% of the participants have no academic qualification and 11.1% have attended in primary education only. Students from



Khulna University, Teachers, Green activists and Government Officials are selected because they are environmentally aware.

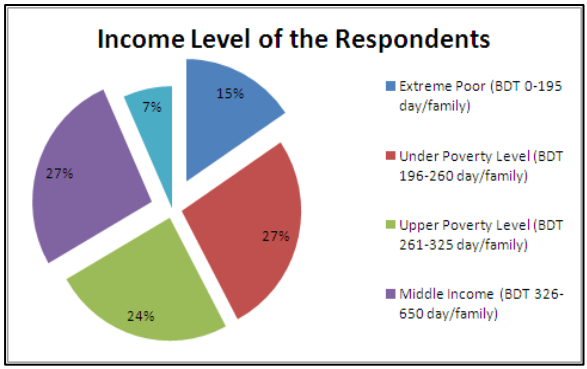
More than one fourth of the participants are students (26.4%) while second majority contributed by the green or environmental activists (20.0%). Other major participants are: Fisher folk (13.3%), School and university teacher (8.9%), Government Officials, Home Makers (housewives) and Small Traders. Each of the groups contributed 6.7% of total participants.

Among the study participants, Most of the people (26.7%) live under poverty level which means their income is less than 2 PPP[17] Dollar a day. As a result their family income (average 5 persons per family) is less than BDT 260.00 a day. These peoples are mainly involved with small trading and fishing, while 15.6% are living in extreme



[17] PPP: Purchasing Power Parity

poverty which means their daily per capita income is less than a PPP Dollar (BDT 37.00[18]). It can be translated otherwise that their family income is less than BDT 195.00 per family and mostly involved with odd jobs like housemaid and fishing assistance. Participants from middle income (BDT 261-325 day/family) contribute 26.7% participation also in the study (who are majorly students and environmental activists) while 24.4% participants were from just upper the Poverty level or with daily family income ranges between BDT 261.00 and 325.00. Only 6.7% participants, who were Government Officials or University Teachers, came from Upper Middle Income group (BDT 650.00-1,300.00 per day per family).



[18] Purchasing power parity conversion factor is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as U.S. dollar would buy in the United States. This conversion factor is for GDP. For most economies PPP figures are extrapolated from the 2011 International Comparison Program (ICP) benchmark estimates or imputed using a statistical model based on the 2011 ICP. For 47 high- and upper middle-income economies conversion factors are provided by Eurostat and the Organisation for Economic Co-operation and Development (OECD). According to World Bank Data, 1 PPP Dollar = BDT 25.97 in 2013(Source: http://data.worldbank.org/indicator/PA.NUS.PPP)

Annex-1

DETAILS OF THE PARTICIPANTS

1.1 PARTICIPANTS OF FOCUS GROUP DISCUSSION

FGD 1: DISCUSSION WITH THE AFFECTED COMMUNITIES

(30 Dec 2014, Joymonir Ghol, Mongla, Bagerhat)

SL #	NAME	GENDER	AGE	OCCUPATION
1.	Nazrul Mallick	Male	50	Fisherman
2.	Mahfuza Begum	Female	38	Home Maker
3.	Sekendar Sardar	Male	65	Fisherman
4.	Aklima Khatun	Female	42	Housemaid
5.	Johora Khatun	Female	32	Home Maker
6.	Tania Akter Lima	Female	37	Teacher
7.	Ferdousi Khatun Jharna	Female	29	NGO Worker
8.	Salma Khatun	Female	20	Home Maker

FGD 2: DISCUSSION WITH THE OIL SPILL CLEAN UP WORKERS

(7 Jan 2015, Joymonir Ghol Bazar, Mongla, Bagerhat)

SL #	NAME	GENDER	AGE	OCCUPATION
1.	Kamal Sardar	Male	43	Fisherman
2.	Khadiza Khatun		31	Home Maker
3.	Mostafa Sheikh	Male	45	Fisherman
4.	Taher Mallick	Male	50	Fisherman
5.	Shefali Rani Sarkar		37	Small Trader
6.	Ziadul Islam	Male	23	Fisherman
7.	Shefali Begum	Female	48	Small Trader
8.	Noor Alam Sheikh	Male	43	Journalist

FGD 3: DISCUSSION WITH THE STUDENTS OF KHULNA UNIVERSITY

(8 Jan 2015, Khulna)

SL #	NAME	GENDER	AGE	OCCUPATION
1.	Al Amin	Male	19	Student, 1st Semester
2.	Persia Nargis	Female	24	Student, 4th Semester
3.	Golam Faruk	Male	19	Student, 1st Semester
4.	Asif Newaz	Male	21	Student, 1st Semester
5.	Satyendra Barman	Male	19	Student, 1st Semester
6.	Surajit Sana	Male	19	Student, 1st Semester
7.	Shahriar Parvez	Male	19	Student, 1st Semester
8.	Alamgir Hossain	Male	24	Student, 4th Semester
9.	Golam Azam	Male	23	Student, 4th Semester
10.	Abid-Bin-Nayeem	Male	20	Student, 2nd Semester
11.	Ashik-Ur-Rahman	Male	22	Student, 3rd Semester
12.	Farjana Akter	Female	25	Student, Masters
13.	Parvez Kabir	Male	24	Student, 4th Semester
14.	Inzamam-Ul-Hoque	Male	20	Student 2nd Semester

FGD 4: DISCUSSION WITH ENVIRONMENTAL ACTIVISTS

(9 Jan 2014, Khulna)

SL #	NAME	GENDER	AGE	OCCUPATION
1.	Babul Hawlader	Male	35	Coordinator, BAPA
2.	Akbar Hossain	Male	36	Environmental Activist
3.	Mahfuzur Rahman	Male	46	Div. Coordinator, BELA
4.	Utsargo Roy	Male	28	Environmental Activist
5.	Palash Das	Male	40	Environmental Activist
6.	Shuborna Islam Disa	Female	31	NGO Worker
7.	Nazmul Huda Palash	Male	38	Electrical Engineer
8.	Mahbub Alam	Male	44	ED, Chhayabrikkho

1.2 RESPONDENTS OF SEMI STRUCTURED INTERVIEW

SL #	NAME	POSITION
1.	Dilip Kumar Datta *Ph.D*	Professor, Environmental Science Discipline and Member of Damage Assessment Committee formed by the Forest Department
2.	Dr. Abdullah Harun Chowdhury	Professor, Environmental Science Discipline, Khulna University
3.	Dr. Mallick Anwar Hossain	Director, Department of Environment, Khulna Division
4.	Jahir Uddin Ahmed	Divisional Forest Officer, Sundarbans West Division, Forest Department
5.	Gouranga Nandy	Khulna Bureau Chief, Daily Kaler Kantho and Contributor, BBC-Bangla
6.	Belayet Hossain	Assistant Conservator of Forest (ACF), Chandpai Range, Forest Department, Sundarbans East Division
7.	Noor Alam Sheikh	Former Vice Chairman, Mongla Upazila Parishad, Mongla, Bagerhat

Annex-2

SAMPLE QUESTIONNAIRE

1. Would you please say your name, address, occupation, age and educational qualification? Please add your position if you are working in any government or non-government institution.

2. When you have heard about the incident of oil spillage in the Sundarbans? Where are you at that time? How far is the incident place from the place where you were at that time?

3. What do you know about the incident? How it is happened, as you experienced? Please describe.

4. Who were responsible for this incident? As you understand which government departments were responsible for protecting this incident?

5. What were the immediate actions should be taken after the incident? Who were responsible for negligence?

6. As you understand, what are the immediate impacts on the species of the Sundarbans? Fish? Mammal? Trees? Others?

7. According to your understanding, what are the activities should be done immediately now?

8. What are your suggestions to protect this type of incidents in the long run? Who shall implement those activities?

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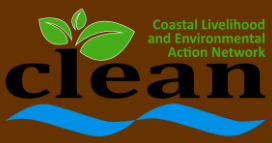

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