Oil spill: Impact on marine environment

An oil spill can have a number of direct and indirect adverse effects on coastal industries, fisheries, aquaculture, tourism, recreational activities. All of those areas may be closed for shorter or longer periods of time due to oil spill and clean up operation.

MD. ABU SAYED

On the 20th of December, 2010 an oil spill was detected in the Bay off Sitakunda in Chittagong. It was over 3 kilometers long and 300-400 feet wide with a reddish- black layer. It is suspected that, the cause of the oil spill was the unauthorised transfer or intentional dump of oil into the sea to salvage the grounded Indian flag carrier Ocean Pearl. It was a huge spill but still it is unknown how much oil they actually released into the sea. We have yet to know to what extent the area was affected. The DoE has served a notice to Sygma Shipping Line, the parent company of Ocean Pearl, to answer why the company would not be prosecuted for causing oil spill in the Bay. But we have yet to know what necessary action has been taken. So far we only know that the port authority has not taken any legal action against the Ocean Pearl.

More than three million metric tons of oil contaminates the sea every year. Operational or accidental release of oil into the sea has caused detrimental effects on marine environment and marine life, making oil spills a matter of international concern and global issue.

An oil spill is a release of a liquid petroleum hydrocarbon into the environment due to human activity, and is a form of pollution. Accidental or deliberate, operational discharges and spills of oil from ships, especially tankers, offshore platforms and pipelines, are the most obvious and visible causes of oil pollution of the marine environment.

In the average total worldwide annual release of petroleum (oils) from all known sources to the sea has been estimated at 1.3 million tonnes. However, the range is wide, from a possible 470,000 tonnes to a possible 8.4 million tonnes per year.

According to a report published in 2002 by the National Research Council (NRC) of the U.S. National Academy of Sciences, the main categories of sources contributing to the total spill input are: natural seeps: 46%, discharges from consumption of oils (operational discharges from ships and discharges from land-based sources): 37%, accidental spills from ships: 12% and extraction of oil: 5%.

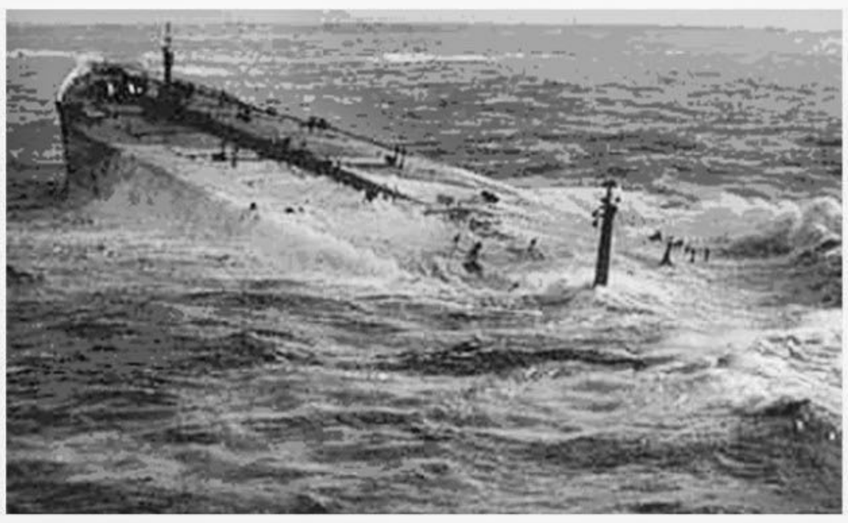
As the density of oil is less than water, it floats on the top, forming a thick impermissible membrane. This thick layer prevents marine organisms to come to the surface for sunlight and oxygen, and eventually kills them. As the layer is black and opaque, the sunlight cannot pass through the surface. This prevents the marine plants from photosynthesizing sunlight into energy. If the constituents of the oil are heavier, then they might sink to the sea floor, blanketing it and thus hindering the marine life over there.

Oil can kill a plant or animal outright or cause injury to the extent that it has less chance of surviving in the wild. The effects of oil spills can be far reaching, posing environmental, political, cultural and socio-economic threats. Marine and coastal habitats, wildlife species, recreational activities, local industry and fisheries, are among the resources and sectors that can be negatively affected by oil spills.

Characteristics: The way in which an oil slick breaks up and dissipates depends largely on how persistent the oil is. Non-persistent oils are generally composed of lighter hydrocarbon fractions such as kerosene, petrol, light diesel etc. and tend to evaporate and dissipate quickly and naturally through evaporation and rarely need cleaning-up. Impacts from non-persistent oils may include, for example, effects on paint coatings in marinas and harbours and -- at high concentrations -- acute toxicity to marine organisms.

In contrast, persistent oils, such as many crude oils (lubricants, waxes, bitumen etc) break up and dissipate more slowly and usually require a clean-up response and therefore pose a potential threat to natural resources when released to the environment.

Effects on marine wildlife: Sea birds and sea mammals are quite vulnerable to oil spills because they are the most likely of all sea life to run into oil floating on the water. Birds die from oil spills when their feathers get covered in oil. The bird will then be poisoned because it will try to clean itself. Animals may die because they get hypothermia, causing their body temperature to be low. Oil may also cause death of an animal by entering into its lungs or liver. Sea turtles could also be affected by oil through contamination of food supply or by absorption through the skin. Fish are highly affected by oil spills. They may end up getting oil in their gills, eat plankton that has been damaged by oil, and their eggs and larvae may end up being harmed by the oil.



Oil pollution by accident of tanker ship.

Effects on coastal habitat: A large array of sea species, from marine mammals to sea birds, turtles, fish, crustaceans, and mollusks lose their habitat. Spilled oil and certain cleanup operations can threaten different types of marine habitats in different ways.

• Coral reefs are important nurseries for shrimp, fish, and other animals as well as recreational attractions for divers. Reefs are important ecosystems and have a high biodiversity that serves as a storage of rich genetic resources. They are a source of food and medicine, and protect the coast from wave erosion. Coral Reefs are home to over 25 percent of all marine life and are among the world's most fragile and endangered ecosystems. Coral reef itself and the marine organisms that live within and around it are at risk from exposure to the toxic substances within oil.

• Exposed sandy, gravel or cobbled beaches are usually cleaned by manual techniques. Although oil can soak into sand and gravel, few organisms live full-time in this habitat disrupting the animal life and the food chain.

• Tidal flats are broad, low-tide zones, usually containing rich plant, animal, and bird communities. Deposited oil may seep into the muddy bottoms of these flats, creating potentially harmful effects on the ecology of the area. Long-term depletion of sediment life could have an adverse effect on birds or fish that use tidal flats as feeding grounds.

• Salt marshes are found in sheltered waters in cold and temperate areas. They host a variety of plant, bird, and mammal life. Marsh vegetation, especially root system, is easily damaged by fresh light oils.

• Mangrove forests are home to a diversity of plant and animal life. Mangrove trees have long roots, called prop roots that stick out well above the water level and help to hold the mangrove tree in place. A coating of oil on these prop roots can be fatal to the mangrove tree, and because they grow so slowly, replacing a mangrove tree can take decades. A mangrove swamp that has trapped crude oil, leading to death of the mangrove trees and associated fauna, presents a particularly serious scenario.

Affected sea heron after an oil spill.

Effects on socio-economic and health conditions: An oil spill can have a number of direct and indirect adverse effects on coastal industries (nuclear, other power plants, desalination plants, fishing industry, shipyards, ports and harbours etc,) fisheries, aquaculture, tourism, recreational activities (bathing, boating, angling and diving etc.). All of those areas may be closed for shorter or longer periods of time due to oil spill and clean up operation.

People's health could be adversely affected by oils either when inhaling or touching or when eating contaminated seafood. The workers who are engaged in clean up operation reportedly suffer from deleterious health effects ranging from respiratory trouble to skin irritation due to the oil pollution.

Exxon Valdez oil spill (A major disaster): The Exxon Valdez Oil Spill caused by the tanker ship Exxon Valdez in March 1989 in the Prince William Sound region of Alaska is one of the biggest known oil spill to have occurred in the last two decades. It spilled 11 million gallons of oil. About 2,800 sea otters and 250,000 seabirds were killed. The spill impacted 1,300 miles. It took 10,000 workers, 1,000 boats, 100 airplanes, and the Navy, Army, and Air Force to clean up. Some oil may still remain on the beaches. Exxon spent about $2.1 billion for the clean up. There was a total financial loss up to $ 580 million because of reduction and in some areas, complete absence of recreational and fishing activities. Clean-up operation took around three years from 1989 to 1992 and even now, monitoring is done.

Preventives: There are many things being done to prevent more spills. The US Congress passed OPA (Ocean Pollution Act)- 90 (in 1990). The OPA 90's major laws are:

i. Emergency Response Plans- This law says that the owners of tankers must have a detailed plan on what they will do if there was a spill. They must have this plan written before any spill.

ii. Double Hulls- The law says that all ships in the U.S are required to have a double hull by 2015.

iii. Liability- The law says that the owners of a boat that spills oil will have to pay $1,200 for every ton they spill.

iv. Spill Fund-The law says that the government has money from companies that transport oil so that when a spill occurs, the government can pay for the clean up.

v. Navigation- The law says that the Coast Guard must know where the oil tankers can drive without an oil spill occurring.

Md. Abu Sayed is an agriculturalist and environmentalist
email-asayedmas@yahoo.com

Water crisis to rice crisis in coming decades?

Unless creating alternative demand for non-rice crops, any endeavour for reduction of rice and expansion of non-rice farming will not be effective. Now vegetables offer higher financial return compared to winter rice because of its higher price from higher demand.

DR. AMINUL ISLAM AKANDA

Bangladesh is blessed with suitable soil and climate for growing rice in all three crop seasons in a year. Rice grown during summer is locally known as Aus, during monsoon as Aman and during winter as Boro. The Boro is really the improved rice variety that is cultivated in almost all rice fields during winter. Winter rice is typically called Boro but is now cultivated in other seasons too. Gradual expansion of improved rice farming contributed much to total rice production increasing more than three times over the last three decades. The winter rice farming was a demand-led adoption by all types of farmers because of its higher productivity and it being produced in dry season almost in risk-free environment.

The development of mechanised irrigation system is considered as a key driving force for the development of this irrigated rice farming. In its early stage of adoption, winter rice occupied relatively more fertile soils relocating many winter crops to less fertile soils. Subsequently, it removed pulses, oilseeds and many other winter crops from many areas. Meanwhile, winter rice spread to three-forth of cultivated area in the winter, making up 54 percent of total rice production in the country.

Rice farming will remain occupying almost 75 percent of total crop area in 20 years ahead, as estimated from a trend analysis. Total crop area here is the sum of cultivated area in different crop seasons within a year. The cultivated area will continue to decrease because it being used for urbanisation and due to land-loss from river and coastal erosions.

Rice farming occupies 75 percent of total crop area

There is no room of increasing the total crop area because of natural barriers in multiple uses of many cultivated areas. In the year 2030, the rice farming will occupy 9.7 million hectares, which is lower than 11.2 million hectares at present. Even with a decrease in total crop area, a higher production is expected to be achieved because of technological improvement over time.

Rice yield is estimated at 4.5 metric tons (milled-rice) per hectare for the year 2030, which is 2.5 metric tons at present and this higher yield is achievable even under probable threats from climate change. Meanwhile, rice researchers have released disaster and salinity tolerant varieties yielding up to 4.5 metric tons per hectare. Moreover, Bangladesh Climate Change Strategy and Action Plan 2008 put emphasis on development of climate resilient cropping system. It is calculated that the country will produce 44 million metric tons rice in year 2030, against its requirement of 41 million metric tons to maintain current intake of 205 kilogram per person. It is to point out that current intake of rice is much higher than body requirement of 185 kilogram cereals that include rice, wheat and other grains.

The country uses 38 billion cubic meters water for producing winter rice at the rate of 1.9 cubic meters per kilogram. Recently, about 15 billion cubic meters is withdrawn from groundwater and the rest comes from surface water, soil moistures and atmospheres. If the same trend of rice farming continues, the winter rice production will reach 24 million metric tons and require 46 billion cubic meters water to produce in year 2030.

Meanwhile, the winter rice farming created huge pressure on groundwater, contributing 70 percent of total irrigation requirement which will reach at 91 percent in year 2030. The withdrawal of groundwater will relatively be higher under gradual lower contribution of surface water as water bodies would get dried. Winter rice farming will require 24 billion cubic meters of groundwater notifying an excess withdrawal of 9 billion cubic meters in 20 years hence. Incessant withdrawal of groundwater has appeared as threat visible from cracks on surface in northern region and from arsenic contamination in south-central part of the country. The groundwater stock is limited to only 23 billion cubic meters. Notwithstanding the fact that under-stream downward flow also contributes to groundwater stock, it would not contribute in future because of lifting groundwater almost everywhere.

Yet 44 percent of groundwater is economically non-viable for irrigation as reported by WARPO. Under this situation, required withdrawal will be higher than its withdrawable stock during winter or dry season.

On-going concentration of rice farming will produce 44 metric tons in year 2030, but will require 37 million metric tons to produce for a balanced intake in the same year. Rather achieving an over-production at the cost of scarce water, some areas can be saved from rice farming over the next 20 years. In this journey, no excess water will be required for winter rice production and 8 billion cubic meters water can be saved from changing food habit. Moreover, gradual spread of Boro rice varieties during monsoon season can yield water-intensive rice in water abundant condition. The areas saved from winter rice faming can be brought back to other less water-intensive and diversified crops farming.

Earlier crop diversification efforts were not successful because the government incentives on irrigation, research and extension services were devoted to rice farming. However, it is necessary to reduce concentration on winter rice and to diversify crops with low water-intensive farming of oilseed, spices, potato and vegetables. Meanwhile, agricultural policies introduced demand-led extension service inspiring farmers to go for commercially important farming. It is a good news that vegetables grown earlier in winter has spread over all crop seasons and production also increased sharply.

Unless creating alternative demand for non-rice crops, any endeavour for reduction of rice and expansion of non-rice farming will not be effective. Now vegetables offer higher financial return compared to winter rice because of its higher price from higher demand. In the process of shifting toward non-rice crop farming, effective measures are necessary (i) to persuade people towards a balanced food habit, (ii) to diversify dishes from existing rice-curry based ones, (iii) to motivate children in primary education towards non-rice food, and (iv) to facilitate farmers with incentive for farming non-rice crops. A journey towards a balanced food basket thus can contribute to reduce concentration on rice farming, to expand non-rice crop farming and to achieve a water-efficient food production system in Bangladesh.

Dr. Aminul Islam Akanda is Assistant Professor, Department of Economics, American International University-Bangladesh, Dhaka