Impact and Aftermath of the Deepwater Horizon Oil Spill, 2010

Aastha Agarwal[1], Soham Chakraborty[2]*, Shivangi[3]

Abstract

The 2010 deepwater horizon oil-spill in the Gulf of Mexico is one of the worst ecological disasters in history. The spill of crude oil from the uncapped well for more than two months is believed to have led to death of countless marine organisms including endangered species of birds, turtles, marine mammals, pelagic organisms, corals and many more. Countless other organisms permanently lost their natural habitats. The disaster also led to direct and indirect impacts on human life in terms of deaths, illnesses, loss of livelihood, etc. The effect of some of which persists even after 11 years. This paper looks at the disaster from a development perspective, taking into account all the factors which led to creating the situation which caused the event and all which affected the aftermath. The paper also attempts to start a discussion on industrial ecosystem and offshore drilling and renewable vs. non-renewable energy debate.

Keywords: *Oil-spill, Deepwater Horizon, off-shore drilling, development, environment*

1. Introduction

Off-shore oil drilling has been a steady source of crude oil and natural gas extraction since the late 19thcentury. The 2011 consumption of petroleum and gas amounted to 7362.2 billion tonnes per year (Schröder, 2011). There are1,470 off-shore rigs around the world out of which 213 rigs are in the Gulf of Mexico (Brixey-Williams, 2015). It is now widely acknowledged that off-shore drillings are a threat to the environment. These drillings are major contributors to oil spills witnessed across the world. On 20 April 2010, the Deepwater Horizon explosion, which was responsible for an environmental

[1] **Aastha Agarwal,**Climate Research Analyst, ISS ESG Goregaon, Mumbai
[2] **Soham Chakraborty,** Senior Research Assistant, Public Health Foundation of India, Plot No. 1, A N V Arcade, Amar Co-operative Society, Kavuri Hills, Madhapur, Hyderabad-500033
* Corresponding Author Email: Sohamayan@gmail.com
[3] **Shivangi,** Communication Animator, Centre for Environment Education, Thaltej Tekra, Ahmedabad-380054

disaster and the death of 11 people, is unparalleled in the US history; 4.9 million barrels of crude oil into the Gulf of Mexico was released from the oil spill (Mendelssoh net al., 2012). The effect of this disaster was severe on nature as well as human beings, but its cause was not natural at all. The whole environmental sensitive region of the Gulf of Mexico was contaminated with crude oil affecting deep-ocean communities and over 1,600 kilometres of shoreline. Multiple species of estuarine organism, tidal and pelagic organisms, marine mammals, sea turtles, migratory birds, sea birds were affected. Over 20 million hectares of the Gulf of Mexico was closed for fishing (Barron, 2012). Regulatory and technological failures were widely understood as gaps that led to the disaster. The immediate cause being the Blowout Preventer (BOP) failing to operate properly as it had a faulty design and was not properly checked. The concept of hollow government had influenced the aftermaths of the explosion (Sidney and Shapiro, 2007). This can be seen as one of the best examples of the inefficiency of the industrial ecosystem.

2. The Deepwater Tragedy

The Deepwater Horizon oil well was built in 2010 in the Gulf of Mexico, 50 miles off the Louisiana coast, to drill the first oil well in the newly discovered Macondo Oilfield. It was a semi-submersible rig, sized 400 feet long, 250 feet wide, and stood 14 stories tall built by Hyundai Heavy Industries (Republic of the Marshall Islands, 2011). It was designed to withstand heavy weather and operate in the extreme deep-water environments.

According to reports, on April 20, 2010, the workers at the rig drilled the Macondo Oil well to its final depth at 18,000 ft. Instantly, a dangerous build-up of methane gas rose to the surface from the well. This led to a sudden explosion. Even after several attempts to operate the Blowout Preventer (BOP is a critical safety component designed to shut off the well in the event of any accident or unprecedented event), all efforts failed. At about 10 p.m., a series of explosions ripped through the rig, killing 11 workers and injuring 17 others (Barron M, 2012). Fire raged unabated for almost two days, as emergency teams raced to the site and poured seawater on the blaze. Despite all the efforts, the rig sank to the bottom of the Gulf and plunged to the muddy seafloor 5,000 feet below on April 22, 2010 (Brenner et al., 2010).

Reports have shown that, initially, the only sign of damage was a thin slick of oil spreading across the water. For the first few days, the U.S. Coast Guard reported that the

Deepwater Horizon was not leaking any oil or gas. Soon, thick, orange-brown crude oil began emerging at the ocean's surface (Jernelov A, 2010).

Over the course of 87 days, the ignored and unattended Macondo oil rig, which was located at 5000 feet depth in the Gulf, kept leaking oil which floated on the surface of the water- making the spill the largest in world history (Smithsonian, 2018). The spread of the oil spill kept expanding pushed by winds. After several efforts from the B.P. to clean the mess, they had created, it took 87 days to finally cover the most disastrous well after it had spewed over 205 million gallons (4.9 million barrels) of crude oil which affected over 600 miles of beaches and wetlands spread across five states of the U.S. (Mendelssohn et al., 2012). On August 5, 2010, the well was contained and plugged with cement.

After numerous investigations, it had been confirmed that the possible causes of the failure were: inadequacy of the design of the rig; lack of backup in the BOP, which was supposed to be installed as a safety measure; and the BOP lacked a remote or trigger to control the device in such cases (BOEMRE, 2011 and Deepwater Horizon Joint Investigation Team Releases Final Report, 2011).

According to several reports, during the oil spill, approximately 180-185 million gallons of crude oil was poured into the Gulf of Mexico (Barron M., 2012). During the EV (Exxon Valdez) accident of 1989 total of 11 million gallons of crude oil was released in less than five hours in Prince Williams Sound (a sound of Gulf of Alaska) (Carson, Mitchell, Hahnemann et al., 1992). In other sense, the oil spill of Gulf of Mexico, 2010, recorded 17 times more destructive than EV.

3. Impacts of the Oil Spill

The oil which was spilled from the oil field was crude oil, which constitutes of hydrocarbons. According to studies, when this oil enters the environment through spill or rupture, it undergoes continuous compositional changes associated with weathering. Weathering of crude oil changes its physical and chemical properties making it more viscous. Spilled oil has the potential to cause environmental damage like ingestion, absorption of the marine biota, coating and layering in the water, which prevents permeability, depletion of oxygen by rendering microbial processes of the flora-fauna (USEPA, 1993). According to reports, when the spilled oil came in contact

with the marshes present at the shoreline, the nutrient cycling of the marshes was altered, resulting in eutrophication. The primary marsh types that were affected in the oil spill were the salt marshes, black mangroves and the common reeds of the shoreline. Even after a year of the disaster, there was minimal recovery observed on the shorelines (Shirley et al., 2010).

Studies and reports have shown that the oil spill caused devastation at all micro and macro-level ecosystems while affecting the sensitive biodiversity of the region. One of the major destructions was observed to the benthic fauna present in the Gulf. Due to the layer of oil spread over the surface of water, the permeability of sunlight was hindered, which is the only source for oxygen for the marine life was compromised due to the coating of oil. Experts had mentioned that an oil spill of such magnitude was bound to cause detrimental effects in the marine life for years. Moreover, the clean-up strategies used to contain the oil spread resulted in creating a greater havoc than oil spill alone. Studies have shown that the addition of dispersants to coagulate the surface oil led to the harming of the marsh benthic community. The oil spill affected large epi-fauna such as fiddler crabs, oysters, periwinkles, mussels, etc. Fiddler crabs are most sensitive to oil toxicity, whose numbers saw a decline after the disaster also affected the economy of fisheries (Mendelssohn, I. A, et al., 2012). In addition, the spill overlapped with the spawning periods of the fishes that were of importance to the coastal fishermen for imports and exports. Large number of eggs and larvae were harmed and killed during this time. In addition, zooplanktons, microscopic marine organisms, showed oil contamination and a majority of the corals showed signs of stress response that were exposed to the spilled crude oil. Almost 86% of the coral colonies had showed signs of the impacts out of which, 45% were severely affected resulting in the bleaching of the corals (White H. et al., 2011). The most vulnerable and severely affected coral species was the Lophelia corals that are found in deep-sea ecosystems (Norse and Amos, 2010). The presence of crude oil around the coral communities was proven with the discoloration of the corals and the impacts could be seen by the visible unhealthy colour of the corals (Gulf Oil Spill, 2018). The spill had covered up to 11 km coverage radius spreading across all the corals present within the mentioned diameter (Norse and Amos, 2010).

Studies have also shown that the large amount of methane gas released in the spill did not escape into the atmosphere; rather it got dissolved with the water molecules, hence consuming the already limited oxygen supply present in the ocean. The presence

of methane gas in water led to the slow degradation of the oil which later formed dead-zones that were devoid of oxygen leading to no fishes or mammals to eat them (White et al., 2012). Moreover, the deliberate effort to disperse the spread oil to wider extents in order to minimize the intensity over one area, left the marine fauna with nowhere to escape the breach. Seabirds were distinctively harmed by the crude oil spread. The US Fish and Wildlife Service (FWS) recorded the number of deaths in the surrounding fauna due to the disaster (Jernelov A., 2010). They presented data representing oil slicked birds- pelicans, northern gannets, laughing gulls; and corpses of oil-coated turtles washed off at the shores. Bottlenose dolphins were also amongst the victims of the disaster. Studies have shown dolphins were found to be underweight along with many other health issues like lung diseases or liver infections, anaemic, deceased level of hormones that regulates their immune system and effected their metabolism too (Cleveland et al., 2011). Neo-tropical birds such as mockingbirds, warbles, orioles, flycatchers and swallows that made a stop at the Gulf of Mexico, were possibly impacted due to the smoke that fumed out the burning oil leading to their deaths and migration declination (Cleveland et al., 2011).

The Deepwater Horizon Oil Spill had also altered the ecosystem services that involved humans. Studies and reports have shown that the communities residing along the coast was also impacted heavily due to the disaster. The impact of oil spill on the coastal marshes rendered the ability of the marshes to carry out the ecological services. Coastal marshes are a very important component of the ecosystem, as they act as storm and flood barriers. They bind soil and promote nutrient cycling, producing a rich biodiversity. They form a major part of the food web, which is beneficial to humans in the form of commercial and recreational fisheries. The loss of coastal marshes mostly affected the local community who were dependent on the mangroves that prevailed all over the shorelines of the Mississippi (Mendelssohn, I. A, et al., 2012). The workers involved in the clean-up of the coastline, were found to be impacted with upper respiratory tract illnesses, throat and eye irritation, headaches, dizziness, nausea, and vomiting (Smithsonian, 2018).

The livelihood of people who were depending on the sea for earning lost it forever. High unemployment was recorded in the four affected states viz. Louisiana, Alabama, Mississippi, Florida. In addition to this, workers like oyster harvesters, crabbers, shrimpers, fishermen, charter-boat operators faced economic crisis too (Clifford, 2010).

Even the Gulf coast vacation rentals and other businesses are influenced because of loss of tourist during their peak season. The revenue was found to drop down by 90 percent when compared to 2009 statistics (Butler and Sayre, 2010) it was a complete down free fall of the economy of the area. Without any significant support or compensation by governmental agencies or BP, many fishermen and boaters were forced to sell their boats and work as clean-up workers (Butler and Sayre, 2010).

4. Aftermath of the Spill

4.1 The Clean-up

For many days, local environmental conditions such as water currents, tides, waves, wind speed and direction, water temperature and air temperature added to the spreading of oil over the water surface. The methods adopted by the clean-up workers were the use of floating brooms, skimmers and boats that skim spilled oil from the water surface. The focus was to clean the shorelines first to prevent the oil from reaching the beaches (Butler S., 2011). Further sorbents and dispersants were used which were added to the water to contain oil. Dispersants were sprayed from above onto the water surface to speed up the degradation of spilled oil (Guarino M., 2010). Reports stated that this clean-up technique had more disadvantages than its merits. The sprayed chemical dispersant entered the food chain, which harmed the marine life eventually (Chapman et al., 2007). Many researchers suggested that the technique of dispersant addition to the sea did not result in lessening the amount of damage caused by the oil spill (Chang et al., 2014). In addition, only some large sized wildlife species were rescued and rehabilitated, but many micro-sized, essential species were left out.

4.2 Investigation on British Petroleum (BP)

The Deepwater Horizon disaster was not an isolated disaster or accident in the history of Beyond Petroleum. Reports have shown that BP was involved in a lot of accidents from its past with the first being an accident which took place in 1965 where thirteen people from the crew lost their lives when an oil rig called Sea Gem collapsed whilst being moved (Gribben Roland, 2010). Another disaster under the governance of BP took place in 2005, although this was not an offshore accident. 15 people lost their lives and about

170 people were injured in this disaster, which took place in Texas. Because of these and others, around this time, BP came to be known as environmentally unsustainable. BP has also been accused of having the worst safety records when talking about oil companies in the US (Smithsonian, 2010). In the case of Deepwater Horizon Oil spill, a Congress Investigations team criticized BP for ignoring the preliminary signs of trouble and ignoring a series of equipment failures. It was found that BP had cut down its security costs, adding to the dangers of the disaster (Gribben, Roland, 2010). This lack of preparedness has often been linked with the budget cuts of 2009 as mentioned above.

4.3 Changes in Policy Frameworks

Unsustainable oil exploration and oil spillage can affect the environment; it threatens human life and results in violation of various interrelated national, regional and international codes. This event led to the intervention of the US Environmental Protection Agency (EPA) to take several activities in response to the spill and formulate stringent additions to the pre-existing laws (AED, 2016). The global community, post the incident, had learned that there must be stringent policy changes and there should have been more focus on Environmental Impact Assessment (EIA) (EPA, 2010). The existing relevant policies were made stricter with strict laws holding them together. There had been suggestions to create an Ocean Energy Safety Institute within the energy department and which would have had ties to the Navy. The oil spill commission had also proposed the formation of an independent body to take care of such accidents. This independent body would take care of all the governmental regulations and broader administrative and legal reforms (EPA, 2010).

5. Development and 'The' Disaster

The greed of mankind intertwined with unsustainable methods of development has had a cumulative effect, which led to the conditions being so poor. Each year the demand for natural oil and gas has been rising. In 2011, only a year after the disaster, the petroleum consumed by U.S was 814 billion tonnes and the global total was 4044.9 billion tonnes. The global consumption of natural gas was 3317.3 billion tonnes. Most of this was consumed by the industrial sector and power generation sector across the world (Schröder, 2011). Developed countries like the United States and United Kingdom,

which take pride in their low population density and higher use of renewable resources consumed more than 20% of the total fuel extracted (Schröder, 2011). This staggering amount of increase in oil extraction is bound to lead to mishaps happening all the time. As development progresses, it should be kept in mind that proper governance is maintained. Corporates like BP and the government together should be responsible to tackle safety measures in order to attain development.

When looking at it from a development perspective, the blame has to be unburdened from the shoulders of the corporate in-charge and has to be distributed amongst the entire industrial ecosystem. Here the demand of unsustainable development has to be taken into account. The concept of Hollow Government (Sidney A. Shapiro, 2007) where third parties do the work of governments has to be checked too. Law and policymaking should be strictly controlled by a firm government. BP was blamed and it can be seen how the snowballed effect of irregular governance led to the disaster. Instead of only putting the officers on duty in trial, it also has to be ensured that the bosses get the equal blame and conviction. Tremendous pressures by upper-level employees to ensure higher rates of oil extraction should be taken into account. Along with BP, there were several other oil excavations which were taking place on the Macondo site where the disaster took place. Some scientists have also accredited those to be a driver behind the pressure created in the area.

As far as future development is concerned, the Deepwater horizon disaster has posed serious challenges to the proponents of development. The first and foremost is the identification of early warnings before a disaster. As the systems approach states, ecological, social and built environment has to be in sync to prevent a disaster from happening (Simonovic S., 2015). When any of these three gives a warning, it should be taken into consideration. Flournoy has stated that risk is not uniform in its perception (Flournoy, 2011). In this context, while thinking about development, the amount of risk, which can be allowed, has to be fixated. While thinking about development, it should also be noted that Deepwater horizon could have been avoided if there were adequate resources, proper infrastructure and safety measures. The proponents of development should look at building proper physical infrastructure to withstand all kinds of hazards.

6. Discussion and Recommendations

Instances of anthropogenic disasters, like the Deepwater horizon oil spill, force us to look at the development from a different lens. The lens of those who have suffered and have borne the whole cost of such disaster/accidents whilst losing all sources of livelihoods; their home and forced to live somewhere else leaving their identities behind rather than of those whose greed increase day by day.

This oil spill raises several questions about the prospects of further heavy amounts of drilling. Whether this should be continued or should there be more investments on renewable and sustainable energy is a huge concern. The debate here is that can huge investments in renewable energy instantly bring significant changes. The answer is always a maybe. Bringing such huge amounts of change can even yield catastrophic results. The first reason is that the investments that have to be done will have to be humongous. It is evident that renewable energy generators like solar cells and windmills need a high number of resources to properly function and function efficiently. There will also be an issue of acceptance by communities and industries that will be sceptical towards renewable sources of energy. Therefore, one can rule out the possibility of instant change. Instant change will also put millions of people out of work. Therefore, while debating about more investment, one should also consider the negative impacts of it. The gradual shift to sustainable energy, on the other hand, can prove to be quite important. The gradual change can ensure safe shift towards sustainability. This will also decrease the risk of such disasters to lower amounts. Malfunctions and hazards can stay persistent, especially in high power generation areas like hydropower projects, but these will not have an enormous impact on the environment. Furthermore, these accidents can also be avoided with proper governance structures and safety measures in action. Increasing amounts of disasters like the Deepwater horizon does bring up serious questions on drilling and extraction of oil. However, if the concepts of sustainable development are to be followed, these increased amounts of energy extraction from Earth can be divided into two parts, one for immediate development and one part to develop for the future. For the second part, the energy can be used to bring up more and more harnesses of renewable energy and new ideas on how to make renewable energy more efficient. The investments on sustainable energy thus should gradually build up the potential of sustainable energy rather than pouring itself on existing technologies of renewable energy. Here, governance plays an important role in control and the building

up of potential. If both the things are balanced properly, there can be a steady shift to renewable energy and this will take some heat off the extraction of non-renewable energy. This will release the pressure and might prevent such further catastrophes (Waghorn T., 2018).

7. Conclusion

In the contemporary scenario, the offshore drilling is much more frequent and is done to even greater depth of the seabed. Since the Deepwater horizon oil spill, 2010, the federal government has approved more than 20 ultra-deep water drilling expeditions. According to Eileen P. Angelico, the Bureau of Safety and Environmental Enforcement (BSEE), a lot has been done to make off-shore drilling safer in the Atlantic and the Arctic Ocean but the Environmental activist argues that not enough has changed in the way the federal government sees the drilling (Worland J., 2015). The offshore incidents include fires, oil spills and explosions has remained high over the past few years. There have been approximately 3,200 incidents and 32 deaths in the last five years and in addition to this, many spills also go unreported (BSEE, 2019).

What the authors and scholar and safety professionals have suggested post the disaster is that this disaster should be taken as a lesson to inculcate proper laws in the society that promotes change in terms of how risk should be perceived and how such disasters shall be avoided. Several experts had earlier suggested strict policy changes after major disasters like 9/11 WTC terror attacks and Hurricane Katrina. In this case, policy changes gave several US organisations funding and power to act on the prevention of such disasters. This learning can be applied to developing countries like India where such a major disaster could heavily impact the environment and the economy. Rather than waiting for a disaster to strike, prevention, mitigation and resilience can be focused upon to ensure damages of such major scales be avoided. Focus should also be made upon shifting to renewable energies so that the exploitation of resources at this level can be reduced and has exploited the resources for the sake of development.

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