Goals and Rationales for Dispersant Use in the 2010 British Petroleum Gulf Coast Oil Spill Response

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ABSTRACT

The response to the 2010 British Petroleum oil spill in the Gulf of Mexico was wrought with controversy because of the uncertainty associated with the use of dispersants to break up concentrated oil on and below the sea surface. Yet the federal emergency response administrators decided to allow the use dispersants to mitigate the effects of the oils spill, citing the efficiency and quickness with which they can be deployed to remove oil from sea surfaces. Key stakeholders in the response effort held different views on the use of dispersants in the response. In this study, I documented these organizations' rationales for policy prescriptions concerning the use of dispersants in response to the oil spill, drawing on reports and congressional testimony. I analyzed the degree to which the rationales were based on scientific research by comparing the stakeholder rationales and the contents of scientific articles on dispersant use in oil spill response. I found that the decision to use dispersants may be due to political pressures to take action to avoid oil saturation of wetlands and beaches that would make bad press. The industry's rationales were based mainly on industry science, yet they were able to influence the EPA's regulatory decision-making while the NGOs were suspicious of dispersant use. This study suggests the need for the use of deliberate review of the scientific bases for arguments put forth by stakeholders, to avoid hasty and disorganized decision making, and possible long-term ecological impacts, in future incidents.

KEYWORDS

Dispersant, British Petroleum, oil spill response, rationale, stakeholder

INTRODUCTION

The impact of disasters on the environment may be heightened because they represent a sudden change from normal events that are difficult to control, plan for, and respond to effectively (Poston & Stewart, 1996). When faced with a disaster, good management can lead to effective damage control. However, with poor management, daily activities are disrupted and the situation may worsen (Weick & Sutcliffe, 2007). The 2010 British Petroleum (BP) oil spill in the Gulf of Mexico was the second largest oil spill incident in history, calling forth the efforts of about 40,000 responders (Real-Time Emergency Response, 2010). On April 20, 2010, the Deepwater Horizon drilling rig exploded, leading to the spilling of millions of liters of oil in the Gulf of Mexico. Response crews were not able to cap the wellhead from which the oil was gushing until July 15, 2010, 87 days later (Blackburn & Muir, 2010). Following the accident, Homeland Security issued a determination that BP was the sole responsible party for all damages and spill cleanup costs (Charles, 2010).

There are many topics of concern associated with the oil spill cleanup, including the remediation efforts that involved spraying the oil dispersant Corexit 9500 A to break up oil slicks on the sea surface and the oil plumes below the surface. Dispersants increase the surface area of oil, allowing for increased rates of decomposition by microorganisms (Peek, 2010), however, the effects of dispersants on the environment and marine life in specific ecosystems are not fully known because of a lack of field-based research (National Research Council, 2005). In response to the BP oil spill, Corexit 9500 A was deployed beneath the water surface at a disaster site for the first time. This was particularly controversial because dispersants had never been used below the sea surface in a disaster response, and there is a lack of research on the effects of using dispersants underwater (msnbc.com, 2010). In May 2010, the Environmental Protection Agency (EPA) sent a directive and a series of addendums to BP requesting monitoring and assessment of dispersant use and an analysis to determine its toxicity to aquatic life. They also required BP to find a less toxic dispersant than Corexit 9500 A, and finally, at the end of May, EPA instructed BP to reduce dispersant use (EPA, 2010). While BP and other stakeholders have sought to justify the use of dispersants, both on and below the surface, some organizations contended that dispersant use is unwarranted.

Government agencies, corporate enterprises, NGOs, and scientists have different opinions on dispersant use. However, there has not been a comparison of the ways in which each stakeholder rationalizes their arguments concerning dispersant use and how those points are grounded in science. In this study, I document these arguments, focusing on the nature of the scientific evidence drawn upon to rationalize perspectives on dispersant use and the language used to justify stakeholders' arguments.

METHODS

I documented stakeholder arguments and associated rationales concerning dispersant use in the BP oil spill response, drawing on materials found on websites, in publications, and in a congressional testimony. The key stakeholders considered in this study were the Environmental Protection Agency, which is responsible for regulating the cleanup; British Petroleum, the main party held responsible for the oil spill and the cleanup costs for the spill; the Joint Industry Task Force, comprised of "industry experts…with the purpose of identifying improvements to deepwater drilling" (Chevron, 2010); and Defenders of Wildlife, the Environmental Working Group, and the Louisiana Bucket Brigade, which are non-governmental organizations. Additionally, I surveyed published research on dispersant use to ascertain the scientific basis of stakeholder rationales.

I analyzed EPA Administrator Lisa Jackson's testimony in the *Legislative Hearing on Use of Dispersants in BP Oil Spill /Senate Committee on Appropriations: Subcommittee on Commerce, Justice, Science, and Related Agencies* (Jackson, 2010); British Petroleum's publication: *Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned* (British Petroleum, 2010); the JITF's *Draft Industry Recommendations to Improve Oil Spill Preparedness and Response* (Joint Industry Oil Spill Preparedness and Response Task Force [JITF], 2010);), the article, *Gulf of Mexico Disaster: A Month of Failures-And Plans for the Future,* from the Defenders of Wildlife website, and the testimonies of Ken Cook, President of Environmental Working Group and Anne Rolfes, Founding Director of the Louisiana Bucket Brigade. Additionally, I analyzed several scientific articles on the use of dispersants, particularly in the Gulf of Mexico.

In each of these documents, I first identified how dispersants were defined and the criteria for successful use of dispersants. Second, I looked for the actions and measures that would be prevented by the use of dispersants. Third, I looked at the stated relationships between the use of dispersant and the mitigation of ecological effects associated with the spill. Finally, I analyzed the degree to which rhetoric was grounded in scientific literature by examining whether academic, agency-sponsored or industry-sponsored scientific articles supported stakeholder arguments, and how closely the rationales matched the articles' findings.

RESULTS

Environmental Protection Agency rationales

In the Legislative Hearing on Use of Dispersants EPA Administrator Lisa Jackson expressed concern over the potentially detrimental effects associated with dispersant use, but justified the agency's decision to allow their use based on positive outcomes that resulted (Jackson, 2010). The EPA reported that dispersants contained chemicals that can be applied to spilled oil to break it down into smaller drops that sink below the surface, resulting in dispersed oil forming a "cloud" of oil that can be diluted by mixing into the water column. Bacteria and other microorganisms can then degrade the oil droplets more quickly. Jackson justified dispersant use by stating that "surface use of dispersants decreases the environmental risks to shorelines and organisms at the surface and when used this way, dispersants break down over several days to weeks (Jackson, 2010)." The EPA rationale was based on agency-sponsored tests conducted on organisms that were considered common species in the Gulf of Mexico. These tests concluded that neither Corexit 9500 A, nor any of the other seven dispersants specified in the National Contingency Plan (in which the EPA "establishes procedures and standards for responding to releases of hazardous substances (Steincamp, 1992, Introduction)"), showed to have damage to the endocrine activity (Jackson, 2010). In addition, the tests found that all brands of dispersants had similar effects on aquatic life. Through the EPA's monitoring, Jackson also stated that there were no significant effects of toxicity in the aquatic life (Jackson, 2010).

British Petroleum rationales

British Petroleum emphasized the positive effects of dispersants while dismissing the possible negative outcomes. BP's publication, *Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned*, discusses subsea dispersants extensively. In it BP highlighted the standard industry practice of using dispersants on the surface, but used the following to justify under water dispersing: "However, most oils evaporate quickly, leaving a waxy residue which is unresponsive to chemicals and limits the times at which dispersants can be successfully applied at the surface (BP, 2010, p.26)." BP also claimed that "The use of dispersants in open water has been conducted since the 1990s under strict protocols and is backed by solid science (BP 2010, p. 54)." BP considers dispersants in subsea and open water to be the most effective and fastest tools available to minimize shoreline impact. They reported that the use of dispersants had given the "opportunity for ongoing improvement in tests to demonstrate safety and effectiveness, as well as for public education about the benefits of dispersant use" and for learning to improve "supply chain capacity to ensure adequate supply of the most effective dispersant" (BP, 2010, p.55).

Joint Industry Task Force rationales

The Joint Industry Oil Spill Preparedness & Response Task Force report highlights the effectiveness of dispersants, citing a few selected studies. The JITF report stated that biodegradation was more efficient in warm waters like the Gulf of Mexico, and that dispersants were shown to reduce the Volatile Organic Compound levels in the BP spill, making the environment safer for cleanup crew. It stated that dispersants are a great asset because they may be used at any time and under any weather condition (except storms or hurricanes), that less dispersant is required when used with fresh oil, and that dispersants could be better controlled and expelled at precise locations. They also said that the ingredients in Corexit 9500 A were common in "household products such as food, packaging, cosmetics, and household cleaners (JITF, 2010)," and that they are not carcinogenic and do not bioaccumulate. Thus, dispersants do not pose a health danger to spill response workers when the proper uniforms are worn. "the principal ecological benefit of this dispersion is to keep oil from entering near-shore bays and

estuaries, or stranding on shorelines, thereby protecting sensitive coastal habitats and the species that inhabit them (JITF, 2010, The Efficacy and Safety of Dispersants)."

In addition, the report stated that there was no scientific evidence of dispersants persisting in large amounts for extended periods of time, nor was there evidence that significant long-term impacts occurred in offshore ecosystems due to dispersant use. It pointed out that the 1979 Ixtoc blowout resulted in "some measureable short-term impacts on phytoplankton and zooplankton populations but both populations recovered in a short time (JITF, 2010, section III, p. 7)." Using the unidentified source of 'Mielke,' it stated that shrimp landing numbers either did not change or increased after dispersant use in that spill. Due to the nature of the environment, JITF stated that they believed that there should be no issues with nutrient or oxygen limitation for the degradation of the oil because of the rich flow of water from the Mississippi River. To back these claims, they referenced a report that "analyze[s] sub-surface oceanographic data being derived from the on-going coordinated sampling efforts by private, federal and academic scientists (Joint Analysis Group, n.d.)," and found that Petroleum Hydrocarbon and Dissolved Oxygen levels remained at non-toxic levels. The LC_{50} test, which represents a certain concentration of dispersant applied that would kill 50% of the population in a given amount of time, was used to test dispersant toxicity. JITF said that in reality, only a few organisms will come into contact with such concentrations. Finally, the report contends that dispersants should be used below the surface because subsurface use results in less human exposure to dispersant chemicals than surface application. Yet they cite no studies of the ecological effects of subsurface use.

Non-governmental Organization rationales

The Non-governmental Organizations argued against the use of dispersants, stating that dispersants posed substantial environmental and human health risks, and that there was insufficient study of their effects on Gulf ecosystems. Defenders of Wildlife found that dispersants "did not effectively tackle oil plumes spreading throughout Gulf waters (Defenders of Wildlife, 2010)." They also pointed out that investigations found that the manufacturer of Corexit 9500 A is connected to BP, which is why BP insists on using only Corexit and that dispersants have "proven less effective and more toxic than alternatives, according to the EPA (Defenders of Wildlife, 2010, point 10)." They emphasized that more research needs to be

conducted on dispersant effects and efficiency, and that stricter regulations on dispersant permitting is needed (Senate Committee Appropriations, 2010). In addition, they emphasized that information on the health of cleanup workers was not being released, supposedly because of the fear of litigation against BP (Senate Committee Appropriations, 2010).

Key scientific findings on dispersant use

The scientists found that some native plants of Louisiana were able to live even in the presence of oil, and in some cases, the oil would help the microbes grow, however, when added with dispersant, degradation was deterred even with fertilizer. Scientists have found that certain plants in coastal Louisiana are able to withstand crude oil, even when completely coated (Pezeshki, DeLaune, Nyman, Lessard, &Canevari, 1995), however, when the oil infiltrates the soil, the effects are much worse (Pezeshki, Hester, Lin, & Nyman, 2000). Research also demonstrated that crude oil could provisionally encourage microbial activity (Nyman, 1999), while there was no biodegradation of crude oil with the dispersant Corexit 9500 (Nyman, Klerks, & Bhattacharyya, 2007). Another finding was that plants that had absorbed Corexit 9500 A displayed less biodegradation and evaporation than plants with fertilizer.

DISCUSSION

The rationales of each stakeholder allowed me to discover the goals of each stakeholder in terms of dispersant use. Knowing the opinions of the stakeholders, I could see which stakeholders' appeals were met and the extent to which the stakeholder based their rationale on scientific backing to make their decisions. Based on those points and how the events progressed for dispersant use, I could then find the basis for the decisions that were made by the EPA. This knowledge can infer who has the power and the extent to their power because there may be disconnection between the scientific support of what should be done and what was actually done. It shows the extent of the power because the stakeholder with more power is able to do what they want in disregard to what science says.

Environmental Protection Agency

EPA reports that dispersants were not significantly harmful to the environment. In summary of the results, I found that the EPA did not know the full effects of using dispersants and eventually asked for less to be used, however, dispersants still seemed to be favored by EPA because of the positive effects that resulted from its use (Jackson, 2010). The EPA rationalized the use of dispersants, highlighting that dispersants functioned to allow microorganisms to degrade the oil more readily. This is reflected in research on dispersants that contends that they "may reduce the area exposed to high concentrations of oil but increase the areas exposed to low concentrations of oil (Nyman & McGinnis, 1999)." Thus, they conclude that the oil will become more spread out, which leads to a larger area of exposure. In addition, the EPA said dispersants were used to decrease the risk to shoreline and surface organisms. Though it is true that risk of oil contact with these organisms might decrease with dispersant use, they also found that dispersants may increase toxicity levels in microcosms (Bhattacharyya, Klerks, &Nyman, 2003). The microbe population is important to the ecosystem because they regulate the flow of energy from plants to food webs (Pezeshki et al., 1995). Microbe exposure to dispersants could generate long-term effects that are not taken into account. The EPA also determined that dispersants were less toxic than the oil and that there was no severe damage to the endocrine activity. Scientific articles also mention that dispersants are becoming less toxic (Cunnigham, Sahatjian, Meyers, Yoshioka, & Jordan, 1991), however there are still many unknown factors. The EPA has worked, as Jackson stated, "on the fly" to make quick decisions (Jackson, 2010) without much scientific input of testing specific to the Gulf conditions. In her testimony, she refers to many results that were found while dispersants were already being used in the BP spill. These results only report the effects that have already happened, not those which can be changed. EPA often relied on studies conducted by their own scientists, mainly because there were no existing studies that could be applied to the situation in the Gulf. These studies were conducted while many gallons of dispersants were already being used, instead of before its permission to use. There was a disparity between what Administrator Jackson spoke of during the testimony and what her opinion on dispersants was when she spoke during the question and comment section of the hearing. Even as the Administrator, Jackson was not able to do what she felt was right, rather, she was forced to follow protocol and allow dispersant use.

British Petroleum

BP explained that sub-surface dispersant use was a "novel" approach that potentially saved the shores of the Gulf (BP, 2010). BP highly favored the use of dispersants because it was a method that effectively showed the public that the oil was no longer on the sea surfaces. BP states that use of dispersants in open water is supported by "solid" science, but they referred to no peer-reviewed articles on sub surface dispersants use and I found that there were only a few select articles that highly support surface dispersant use. BP also talks about dispersants being the most effective and fastest tool to minimize shoreline impact (BP, 2010). Yet, although dispersants are one way to minimize shoreline impact, there are other options as well, including cleaning the oil from the marshes, or fertilizing the soil (Pezeshki et al., 1995). This option has been shown to have positive effects when fertilizer is applied as soon as possible (Pezeshki et al., 1995). There is also the option of taking no action because it avoids physical damage and toxicity problems associated with other forms of wetland protection (Mearns, 1993). BP's language was often stated with an unclear stance on the topic. For example, when speaking of subsurface use of dispersants, the objective was "reducing the environmental and safety impact of the release of oil from the Deepwater Horizon well (BP, 2010, Subsea Dispersants)." There was no indication of the details of environmental or safety impacts, nor were there any points made of possible side effects of dispersants. They spoke of dispersants as if it had to be used because there were no other viable options to deal with the spilled oil effectively. They approached the situation without identifying any negative features or statements of uncertainty as if there were no argument or any other sides of their rationale. There was also no mention of outside sources. They only spoke of the results of their response.

Joint Industry Task Force

The JITF explained why dispersant use in the Gulf was the best and most effective method of response. JITF also seemed to highly favor dispersants, rationalized by the claim that there were no other means of cleanup that could have the same widespread results as dispersants (JITF, 2010). The JITF rationalized using dispersants by stating that they work well in the Gulf conditions, and the dispersants are not toxic (JITF, 2010). No articles mentioned best conditions

for dispersant use, however, I found that there were many articles on the different options and effects of other oil spill responses on coastal Louisiana. These studies are researched by scientists who are familiar with the aspects of the different methods of cleanup response. Also, JITF says dispersants are the safest method of cleaning and protecting the wildlife and coast (JITF, 2010). JITF mentions that dispersants do not persist for extended times and effects on life will recover (JITF, 2010). These points do not specify how long dispersants stay in the environment and which organisms will suffer in the mean time. There has been evidence that dispersants do affect certain organisms, however, due to the ambiguity of the JITF report, it is difficult to understand the specifics. For example, Corexit 9500 has been tested with LC50 tests (Mayer, 1977), and the concentration levels have a resulted in death in part of the population. JITF based their rationale on a few studies with specific results that may be difficult to find from any other sources. They also relied on government agencies for their selected data. The rationales were written in a report form without mention of any negative issues with dispersants. Though they stated that the issue with dispersants was that the technology needed improvement: "more work is needed […] to refine the technology to improve the regulatory approval process for dispersant types and use during a response (JITF, 2010, Dispersants Subgroup Findings, p. 1)," they state this because of the need for dispersants to be more readily used, unobstructed by government regulation. They often do not provide the complete findings from a study, only the parts favoring dispersant use.

Non-Governmental Organizations

The three NGOs studied pointed to uncertainty about the risks associated with dispersant use. They disfavor dispersants because there are many potentially harmful effects on people and the environment. NGOs argued that more research needed to be conducted, and that BP did not publicize the issues with dispersant use. The scientists as well as the EPA supported the point of needing more research, particularly about the long-term effects of dispersants on the ecosystem, the potential to affect wildlife, the seafood industry, and coastal lands. The NGOs drew on information from news articles, quoting scientists from organizations and universities. The news articles come from reputable publications including The New York Times and The New Orleans Times-Picayune. The scientific research to which they pointed was conducted at academic

institutions such as the University of Georgia and the University of Mississippi, as well as the National Oceanic and Atmospheric Administration and the National Institute for Undersea Science and Technology. Their main concerns were the issues that happened resulting from dispersants such as dispersants not being effective to "tackle" the plumes of oil and the main brand of dispersant used being "less effective and more toxic" (Defenders of Wildlife, 2010). The basic message was that there needed to be more studies conducted.

There was a general lack of scientific research and information on dispersants, particularly in terms of long-term effects on marine life and whether their overall effect on the environment was for the better or worse. Yet they were still used. The EPA felt the dispersants still needed more research, however, they were forced to act quickly and allowed dispersants to be used (Jackson, 2010). For the stakeholders who favored dispersant use, the rationales had, for the majority of the time, ignored the environment and organisms at the subsurface or the water column, which might have been strategically done to promote dispersant use. The NGOs were specific about the points they made that needed more scientific studies, while the industries were ambiguous about their points, the industry stakeholders' points were not grounded in solid non-industry science and events. For example, the NGOs explained how there was insufficient monitoring of certain native marine life in the Gulf (Defenders of Wildlife, 2010), while industry stated points without specifying names, time frames, or sources.

The EPA's decision to allow use of dispersants reflects the interests and goals of BP and the JITF, showing the power of the industry stakeholders and the influence they have over the agency's decision-making process. Nevertheless, the science used to rationalize the perspectives of those who drove the decision is funded by the corporate enterprises that used it to justify their goal of dispersant use. This demonstrates the power of industry and displays the phenomenon of agency capture in which "regulated industry [is able to] control an entire agency. Yet, programs within agencies are subject to extrinsic control or influence (Mank, 1993)". Even though the EPA has the power, industry was able to take over. This was a situation in which rationale of industry overshadowed the need for scientific research. Even though there was uncertainty, the stakeholders pushed forward for dispersant use. This is problematic as a basis for policy, as peer reviewed science was disregarded in favor of non-peer reviewed corporate science, as the basis of the decision.

Limitations

The limitations of this project emerge from the small sample of articles and interpretation of information in the articles, as well as consideration of the context of the situation and stakeholders. I focused mainly on the information found in a few selected articles, which limits the extent of concluding on the institution as a whole. The study does not look at what the institutions have done beyond what they state in the articles. The publication times of the articles also limits the extent of the project. Some information may be false because the institution may not always do as they state. The project's circumstances can be different from other situations because it applies to dispersant use, which may not be similar to other emergency environmental disaster mitigation strategies. For example, this situation was characterized by unpreparedness and being forced to act, which other situations may not be. It is also specific to the United States' EPA and how they dealt with the issue. Other countries may not deal it as EPA had.

Future directions

Additional studies can be done to further investigate the discourse of institutions in dispersant use. More sources could be used to find more rationales from each stakeholder, as well as having more scientific articles based on dispersant use in the sea. A future step could include conducting interviews with representatives from each stakeholder to see how they choose to present certain information. Another is to look at the degree to which the information presented in their articles relates to the information utilized for media. Limited by time, I was not able to include these features in this study, however, they are feasible with proper planning and resources.

Broader implications

This study suggests that EPA decision-making did not acknowledge the rationales of all major stakeholders, instead drawed primarily on the rationales of industry stakeholders. We see the power of industry to obscure scientific uncertainty and do what they want, which tends to be best for the company, but not necessarily for the people and the environment. These findings

point to an alarming process of industries establishing power over governance. There was a disconnection between the protocol used and the knowledge on dispersant impacts on the environment. The EPA administrator felt constrained by the guidelines, which shows the rigidity of the protocols that tied decision making options in the situation. This shows that the system may need more reorganizing so it is prepared for situations in which scientific uncertainty may suggest limits on the use of disaster mitigation technologies.

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