Oceanography & Fisheries
Open access Journal
ISSN: 2476-0536

Juniper Publishers
key to the Researchers

Mini review
Volume 14 Issue 5 - April 2022
DOI: 10.19080/OFOAJ.2022.14.555897

Oceanogr Fish Open Access J

Oil Spill Response Net Environmental Benefit Analysis Dispersant Use

Yuriy Dachev* and Dobrin Milev

Nikola Vaptsarov Naval Academy, Bulgaria

Submission: April 15, 2022; **Published**: April 21, 2022

Corresponding author: Yuriy Dachev, Nikola Vaptsarov Naval Academy, Bulgaria

Abstract

Once oil has been spilled, urgent decisions need to be made about the options available for response and clean-up in order that the environmental and socio- economic impacts are kept to the minimum. Getting the correct balance is always a difficult process and conflicts inevitably arise which need to be resolved in the best practicable manner. The advantages and disadvantages of different response options need to be considered and compared, both with each other and with the advantages and disadvantages of natural recovery. This assessment process is sometimes known as Net Environmental Benefit Analysis (NEBA).

Keywords: Ecology; Oil spill; Dispersant; Seagrasses; Birds; Mammals; Shoreline; Offshore; Marine organisms; Zooplankton; Algae; Saltmarshes; Mangroves; Ecosystem; Shoreline habitats; Biodegradation processes; Coastal areas; Sea surface; Sea Empress

Introduction

The process requires taking into account the circumstances of the spill, the practicalities of clean-up response, scientific understanding of the relative impacts of oil and clean-up options, and some kind of value judgement of the relative importance of social, economic and environmental factors. Common sense and consensus-forming are just as important in this decision making as quantifiable scientific information [1-5]. Decisions are best made if the contingency planning process has included consultations and agreements with all the appropriate organizations and if the relevant environmental and socio-economic information has been assessed in advance through a comprehensive sensitivity mapping process (Table 1).

Table 1: The Advantages and Disadvantages of Dispersant Use.

Advantages	Disadvantages
Treats more oil than other options	Not collecting oil from surface
Not depending from weather condition	Effects on marine life – water column
Speeds up oil removal	Not effective on high viscosity oils and cold seas
Prevents oil drifting to shore	Has a limited time to be applied after oil spill
Reduces oil vapors and harmful effects	Impact on the seafood market confidence
No need of large-scale clean-up	
Avoids the creation of large volumes of waste	

The NEBA evaluation process typically involves the following steps:

a) collecting information on the physical characteristics, ecology and human use of environmental and other resources of the area of interest

b) reviewing previous spill case histories and experimental results which are relevant to the area and to response methods which could possibly be used

c) on the basis of previous experience, predicting the likely environmental outcomes if the proposed response is used, and alternatively if the area is left for natural clean-up

d) comparing and weighing the advantages and disadvantages of possible responses with each other and with natural clean-up.

Much of this evaluation can be done at the contingency planning stage. However, a review of the collected information and the limitations of the response options under the conditions of the actual incident are needed before a response is initiated.

As described above, the first two steps of a NEBA process are common for all oil spill response techniques, including dispersant use.

They involve evaluating data and predicting outcomes, with a focus on:

a) Estimating possible spill scenarios and where the spilled oil would drift under the influence of currents and wind

b) Assessing the ecological and socio-economic resources that may be affected.

The third step addresses trade-offs, and assesses whether the response techniques in the toolkit are:

a) Likely to be effective on the spilled oil in the prevailing conditions

b) Capable of preventing a significant amount of oil from coming ashore within the time available

c) Feasible with the available resources.

When considering dispersant use, the first task of this step is to assess whether dispersant use would be effective on the spilled oil under the prevailing conditions.

The major part of oils that could be spilled at sea will be controllable to dispersant use soon after they have been spilled. Dispersant use is practical in a wide range of prevailing sea conditions. When dispersants are sprayed from aircraft, large areas of spilled oil can be treated more quickly than by other response techniques. As a result, in most of the cases, dispersant use would be effective and justified. The most important factor is the availability of dispersant equipment and trained personnel and it has to be included in the contingency plan. If it is clear that dispersant use will not be successful due to oil type, sea conditions or lack of time, alternative response techniques should be considered. The operational analysis at this stage could have concluded that dispersant use is appropriate. The next task is to consider the consequences, the benefits and the potential risk of dispersant use [6,7].

The Benefits of Dispersant Use

Drifting oil that floats close to shore over sea-grasses or comes ashore in definitely sensitive coastal habitats such as mudflats or wetlands can cause severe and long-lasting damage to these habitats and to the populations and shoreline communities of birds, mammals and other species. Many years to decades will be necessary for some of these shoreline communities to recover from oil. Dispersant use can prevent this damage to happen.

Furthermore, removing floating oil will reduce the threat to surface-dwelling animals. Industrial seawater intakes, touristic beaches and other coastal and shoreline industry and amenity feature are also protected if oil is dispersed offshore.

The Potential Risk of Dispersant Use

The experience gained during several major oil spill incidents has shown that negative effects on marine organisms caused by the high concentrations of dispersed oil in water of 10m depth or more due to dispersant use were localized and a short duration. Evidences form past toxicity studies indicates that any effects of realistic exposures to oil dispersed into appropriate water depth will be relatively slight and localized. Ecological studies and monitoring following major oil spills have repeatedly shown that the populations and communities of water column organisms, such as algae and zooplankton, recover much more quickly from brief exposure to dispersed oil in the water than the populations and communities of birds, mammals, seagrasses, saltmarshes or mangroves that may be exposed to oil that stays afloat as a slick or comes ashore.

The dispersant use can prevent an amount of severe and long-lasting damage to oil-sensitive coastal habitats and socio-economic resources but in the same time it can cause highly localized and short-lived effects on the marine environment. The NEBA case justifying the use of dispersant on spilled oil in waters of depths greater than 10 or 20 m is generally clear: the potential benefits are large, and the potential risks are very small. A retrospective NEBA has been conducted for dispersant use at the Sea Empress oil spill, confirming that dispersant use achieved overall environmental benefit [8]. The U.S. Coast Guard has undertaken a number of Ecological Risk Assessment Workshops in conjunction with various Federal and State Agencies. These workshops have considered the impacts and ecosystem recovery rates from various oil spill response options at possible open water spills in the Gulf of Mexico and beyond.

The benefits and potential risks of dispersant use can be summarized in the following way:

How to cite this article: Yuriy D, Dobrin M. Oil Spill Response Net Environmental Benefit Analysis Dispersant Use. Oceanogr Fish Open Access J. 2022; 14(5): 555897. DOI: 10.19080/OFOAJ.2022.14.555897

a) The benefit of dispersant use is to minimize ecological and socio-economic damage by removing oil from the sea surface, preventing it from reaching sensitive coastal and shoreline habitats and enhancing the natural biodegradation processes.

b) The potential disadvantage of dispersant use is that marine organisms inhabiting the upper water column will be briefly exposed to diffuse clouds of dispersed oil droplets and water-soluble oil compounds in the water column, compared to the situation if dispersants were not used. This exposure to dispersed oil can potentially have toxic effects on the marine organisms.

Conclusion

The compromised decision to use or not dispersants is sometimes described as "trade-off". This is to accept damage to the coastal resources if dispersant is not used or cause damage to marine organisms if dispersant is used. The meaning of "trade-off" is a choice between a certain amount of damage being caused on the coast by drifting oil and the same amount of damage being caused by dispersed oil in the water column. However, this is not the case and is one of the most-often misunderstood aspects of dispersant use. When spilled oil is transferred from the sea surface and into the water column by dispersant use, the potential for damage in the two ecological compartments is not equivalent. The damage in the offshore water column from dispersed oil can be much less than the damage that undispersed oil may cause to shorelines and coastal areas.

References

1. Baca B, Ward GA, Lane CH, Schuler PA (2005) Net environmental benefit analysis (NEBA) of dispersed oil on nearshore tropical ecosystems derived from the 20 year "TROPICS" field study. In International Oil Spill Conference Proceedings 2005(1): 453-456.
2. Baker JM, Cruthers JH, Little DI, Oldham JH, Wilson CM (1984) Comparison of the fate and ecological effects of dispersed and non-dispersed oil in a variety of marine habitats. In Oil Spill Chemical Dispersants: Research, Experience and Recommendations. American Society for Testing and Materials, Philadelphia, Pennsylvania pp. 239-279.
3. (2003) IMO/UNEP Guidelines on Oil Spill Dispersant Application including Environmental Considerations.
4. (1994) IPIECA. Dispersants and their Role in Oil Spill Response. Report Series p. 5.
5. (2000) IPIECA. Choosing Spill Response Options to Minimize Damage: Net Environmental Benefit Analysis. Report Series 10.
6. (1986) ITOPF Technical Information Paper No.4 Use of oil Spill Dispersants.
7. Kucklick JH, Walker AH, Pond R, Auarand D (1997) Dispersant Use: Considerations of Ecological Concern in the Upper 10 Meters of Marine Waters and in Shallow Coastal Waters: Proceedings from a Workshop, August 27-28, 1996, Baltimore. In: Scientific and Environmental Associates, Inc Alexandria, VA for Marine Preservation Association, Scottsdale, AZ, USA pp. 104.
8. Lunel T, Rusin J, Baily N, Halliwell C, Davies L (1997) The net environmental benefit of a successful dispersant application at the Sea Empress Incident. In International Oil Spill Conference Proceedings 1997(1): 185-194.

DOI: 10.19080/OFOAJ.2022.14.555897

How to cite this article: Yuriy D, Dobrin M. Oil Spill Response Net Environmental Benefit Analysis Dispersant Use. Oceanogr Fish Open Access J. 2022; 14(5): 555897. DOI: 10.19080/OFOAJ.2022.14.555897