Prevention And Mitigation Of Oil Waste In Coastal Areas For Fishing Communities

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Abstract.

Oil spills in coastal areas are a serious environmental issue that can cause damage to marine ecosystems, water pollution, and economic losses for fishing communities. This community service project aims to enhance fishermen's understanding of the negative impacts of oil spills and to provide practical skills and knowledge regarding oil waste management. The approach used includes training on the use of absorbent tools, binding chemicals, and localization technologies to handle oil spills. Additionally, the project introduces environmentally friendly technologies to reduce the risk of oil leaks or spills from fishing vessels. The project results indicate a significant increase in the knowledge and skills of the participating fishermen regarding oil waste management. Further discussion reveals the importance of implementing comprehensive coastal area management strategies to prevent and mitigate oil pollution. In conclusion, this project not only successfully achieved its goal of enhancing fishermen's capacity but also offers a replicable model for similar programs in other coastal areas. Therefore, active participation from fishing communities and continuous support from various stakeholders is essential for environmental sustainability and the well-being of coastal communities.

Keywords: *Oil spills, Coastal areas, Fishing communities and Oil waste management.*

I. INTRODUCTION

Oil spills in coastal areas have become a major concern for scientists and policymakers worldwide due to their extensive negative impacts on marine ecosystems and coastal communities. Spilled oil can contaminate seawater and soil, disrupt food chains, and damage natural habitats such as mangroves and coral reefs. The damage requires a long time to recover and often involves very high restoration costs.Fishermen, as a community heavily dependent on the health of marine ecosystems for their livelihoods, are often the most affected by oil spills. In addition to reducing catches, oil spills can also cause health problems for fishermen and their families.

Therefore, it is important to involve them in efforts to prevent and address oil spills. This community service project aims to increase the awareness and skills of fishermen in handling oil waste, as well as introduce more environmentally friendly technologies and systems to reduce the risk of oil spills from fishing vessels.Furthermore, oil pollution not only affects ecosystems and human health but also has significant economic implications. This pollution can reduce the attractiveness of coastal tourism, damage essential natural resources for fisheries, and increase operational costs for environmental cleanup and recovery. By involving local communities in mitigation efforts and providing them with the necessary tools and knowledge, this project aims to minimize these impacts and promote sustainable practices in coastal areas.

II. RESULT AND DISCUSSION

This project examines various aspects related to coastal area management and oil spill response. Each section discusses in detail various strategies and methods that can be applied to protect and restore coastal environments from the negative impacts of oil pollution. The following are the results and discussions of this project.

2.1 Organic Material Decomposition Process

Marine pollution, particularly due to oil spills, is one of the greatest threats to coastal ecosystems. Spilled oil can form a thin layer on the water's surface, blocking sunlight and reducing the photosynthetic ability of marine organisms (Ogunbiyi et al. 2023). This can lead to a decline in ecosystem productivity and mass deaths of plankton, which are the basis of the marine food chain. Additionally, oil that settles on the seabed can damage benthic habitats and disrupt the organisms living there (Yuewen and Adzigbli 2018).The impact of oil pollution is also seen in the physical damage to coastal habitats such as mangroves, coral reefs, and seagrass beds. Mangroves contaminated with oil will experience a decline in water and soil quality, resulting in the death of plants and animals living in those ecosystems. Coral reefs exposed to oil can experience bleaching and biodiversity loss, while polluted seagrass beds will lose productivity, affecting fish and other marine species that depend on seagrass as habitat. (Carlson et al. 2021).

Oil spills can occur due to various factors, including ship accidents, storage tank leaks, and operational errors. Rapid and effective handling requires the appropriate equipment and techniques to minimize environmental impacts. Some of the technologies used include:

- Absorbent: Materials used to absorb spilled oil on the surface of water or soil. Absorbents can be natural materials like sawdust or synthetic materials like polypropylene.
- Oil dispersant: Chemicals used to break down oil into smaller particles so that it can disperse and degrade more quickly by microorganisms in the environment.
- Oil boom: Localization tools used to surround and isolate oil spills on the water surface, preventing their spread to wider areas.

Fig 1. Oil boom

- Oil skimmer: Suction devices used to collect floating oil on the water surface.

Fig 2. Oil skimmer

2.4 Oil Spill Response

Responding to oil spills requires a well-planned strategy to reduce its negative impacts. The response process involves several stages that must be carried out systematically and effectively (Ivshina et al. 2015). This includes various technologies and methods that can be adapted to the spill conditions and the characteristics of the affected environment.

2.4.1 Decomposition of Hemicellulose and Cellulose

The use of absorbent materials to absorb spilled oil. Absorbent materials should be selected based on the type of oil and environmental conditions to achieve maximum efficiency(Teas et al. 2001). This process involves spreading absorbent in the contaminated area and collecting the absorbent that has absorbed the oil for further processing.

2.4.2 Protein Decomposition

The use of localization tools such as oil booms to prevent the spread of oil. These tools function to isolate the spill and facilitate easier oil collection. The placement of oil booms must consider water currents and weather conditions to ensure the effectiveness of localization (Zhu and Strunin 2002).

2.4.3 Lignin Decomposition

Collecting localized oil using suction tools such as oil skimmers. The collection process must be conducted carefully to minimize disruption to the ecosystem and ensure that the collected oil can be properly processed or disposed of. Collection techniques may also involve the use of special vacuums and oil-water separation devices.

2.4.4 Chitin Decomposition

Restoring contaminated land and water through cleaning and rehabilitation processes. This involves the use of bioremediation materials and other recovery techniques to remove residual oil and restore the functions of the contaminated ecosystem (Bala et al. 2022). Recovery techniques may include the use of microorganisms capable of degrading oil, plants that can absorb pollutants, and the physical rehabilitation of damaged habitats.

2.5 The Role of Microorganisms for Carbon in Soil

Organic carbon enters the soil through the decomposition of plant and animal residues, living and dead microorganisms, and soil biota. Decomposing microorganisms of organic matter is used as a strategy to accelerate the decomposition process of plant residues containing lignin and cellulose, as well as to increase soil microbial biomass and activity, reduce diseases, insect larvae, weed seeds, and waste material volume, thereby enhancing soil fertility and health, which in turn is essential for increasing organic matter content in the soil (Hina Khatoon et al. 2017).

2.5.1 Initial Response

Immediate actions must be taken when an oil spill occurs. This includes identifying the source of the spill, assessing the severity, and taking emergency measures to stop the oil flow and prevent further spread (Chenhao and Yupeng 2021). Emergency measures may include valve closures, temporary repairs on leaks, and evacuation of contaminated areas.(Rafeeq et al. 2023)

2.5.2 Localize

Localizing the spilled oil using localization tools such as oil booms. The goal is to isolate the spill and prevent the oil from reaching sensitive or difficult-to-clean areas. Effective localization requires continuous monitoring and adjustment of the localization tool positions according to oil movement and environmental conditions.

2.5.3 Collection

Collecting localized oil using suction tools such as oil skimmers. This process must be conducted carefully to minimize environmental damage and ensure that the collected oil can be properly processed. Oil collection can also be done manually using tools like shovels and buckets in areas difficult to reach by mechanical equipment.

2.5.4 Absorb

Using absorbent materials to absorb residual oil on the surface of water or soil. Absorbent materials should be selected based on the type of oil and environmental conditions to achieve maximum efficiency. This process involves spreading absorbent in the contaminated area and collecting the absorbent that has absorbed the oil for further processing.

2.5.5 Reclaim

Restoring contaminated land and water through cleaning and rehabilitation processes. This includes the use of bioremediation materials and other recovery techniques to remove residual oil and restore the

functions of the contaminated ecosystem. Recovery techniques may include the use of microorganisms capable of degrading oil, plants that can absorb pollutants, and the physical rehabilitation of damaged habitats.

III. CONCLUSION

This project successfully enhanced the understanding and skills of fishermen in handling oil waste and introduced environmentally friendly technologies that can reduce the risk of oil spills. These results demonstrate that appropriate training and education can improve the capacity of coastal communities to respond effectively to oil spills. Additionally, the implementation of comprehensive coastal area management strategies proved important in preventing and addressing oil pollution. Active participation from the fishing community in this program not only benefits the environment but also supports their economic sustainability. Continued support from the government and various stakeholders is essential to ensure the long-term success of this initiative.

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