The range of environmental considerations in shipwreck removal assessment and recent case studies applicable to the Nairobi Convention

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Introduction

The Nairobi International Convention on the Removal of Wrecks (the Nairobi Convention), which came into force on 14 April 2015, requires signatory nations to address a stricken vessel removal when the vessel presents hazards to the environment or commercial maritime activities. When a vessel casualty cannot be safely refloated and oil or other potentially hazardous cargo is on board, addressing the range of environmental concerns within the framework of the Nairobi Convention presents challenges. As vessels become larger and potential environmental issues range beyond oil pollution to hazards from bulk cargo (i.e., physical smothering, biological oxygen demand), Hazardous and Noxious Substances (HNS), and physical impacts to seafloor life and other biota, the risks become greater and the efforts undertaken to address the risks can be considerable. The International Petroleum Industry Environmental Conservation Association (IPIECA), the American Petroleum Institute (API), and others provide guidance on addressing oil pollution response using tools such as Net Environmental Benefit Analysis (NEBA)(IPIECA, API 2013), often referred to specifically as Spill Impact Mitigation Assessment (SIMA). SIMA is widely accepted in oil spill planning and response. There is no standard approach for addressing shipwreck management in situations where it remains a casualty within the territorial waters of a signatory nation. This paper presents an approach for making relative comparisons of pollution and environmental hazards outcomes associated with of wreck management options. The approach helps to determine and communicate the best "wreck removal" management practices that result in fewer environmental impacts.

Shipwreck Management Net Environmental Benefit Analysis

Like oil spill NEBA or SIMA, shipwreck management analyses should be a consensus risk evaluation involving government, stakeholders, the scientific community and responsible party. Understanding the local biological communities, human use of the site, types of contaminants on board the vessel, their likely fate and effects, and response capabilities is necessary to evaluate the net benefit of wreck management options. Salvage capabilities to effectively manage the vessel, including detailed salvage options, are also necessary to assess the potential effects of each viable option.

Wreck removal management options for evaluation may include:

- no-action, if there are no pollutants and the vessel is neither a hazard to the environment or navigation,

- pollutant removal and vessel sanitation with the vessel left in place if no navigational risk from the structure is present,
- pollutant and partial vessel removal or relocation for navigation and/or aesthetic and other environmental considerations such as human use of the shoreline, and
- complete pollutant and vessel removal and cleaning of the seabed, which may involve restoration.

SIMA is sometimes criticized for being overly qualitative and often seeks semi-quantitative evaluations that lend more technical veracity to decisions. Quantitative evaluations can be time consuming and resultant decisions ineffective for a dynamic spill response. Various tools exist such as Oil Spill Fate and Effect Models, Habitat Equivalency Analysis (HEA), and carbon footprint calculators that may be quickly used in a comparative analysis of the range of possible environmental effects to air, noise, marine life, terrestrial life, human activities, and more to create a qualitative and semi-quantitative analysis. Table 1 lists (a) possible environmental comparisons for a range of wreck management actions and (b) potential methods for relative comparisons of environmental impact.

Table1. Environmental Considerations and Approaches to Comparative Analysis

Category	**Subcategory / Resources Considered**		**Methods**
Ecological/ Local Environment	Terrestrial Ecology	Air Quality	Qualitative comparison
		Noise	Qualitative/Quantitative
	Marine Ecology	Water Quality	Modelling, Qualitative, Analyses, Case Studies
		Neritic Zone (footprint impact on benthic organisms)	Habitat Equivalency Analysis, Benthic surveys
		Hydrodynamics (new habitats created and disturbances on wave & current patterns)	Modelling, Qualitative
		Nekton animals (Fish, Mammals, other)	Modelling, Case Studies, Qualitative
Human Use	Health and Safety	People visiting the wreck site and personnel working on site	Qualitative, Quantitative (surveys), Industrial Hygienist
	Economy	Local/Regional	Qualitative, Stakeholder Interviews
		Aesthetics	Qualitative, Stakeholder Interviews
		Commercial Fishing	Qualitative, Case Studies, Interviews
	Tourism	Tourism Fishing	Qualitative, Stakeholder Interviews
		Diving	Qualitative, Stakeholder Interviews
		Sightseeing	Qualitative, Stakeholder Interviews
	Research	Archaeology, Geology, Ecology	Qualitative, Stakeholder Interviews
	Navigation		Quantitative, shipping/vessel traffic analysis
General / Global	Carbon Footprint Relative Comparison (Carb.)		Semi- Quantitative, Emission calculators

Salvage operations can have an impact on the seabed, carbon footprint, air quality and more if the shipwreck must be moved, ground tackle is proposed, or ancillary vessels and barges will need to be maintained at the site. HEA can be used to compare scenarios based on assumptions of bottom habitat

affected and duration of effects. HEA is a recognized tool in the European Union Environmental Directives, the numerous United States environmental regulations as well as other jurisdictions. The loss or gain of service from proposed actions can be estimated with relative certainty using consistent assumptions of footprint size, magnitude of disruption and recovery times.

Resultant Analyses

The resultant analyses may be presented in ways that are easy to interpret for decision-makers and stakeholders. Qualitative and quantitative results for each category of analysis may be ranked using a category approach with rankings of more or less severe impacts or a numerical ranking of favorable to unfavorable environmental effects as shown in the example in Figure 1.

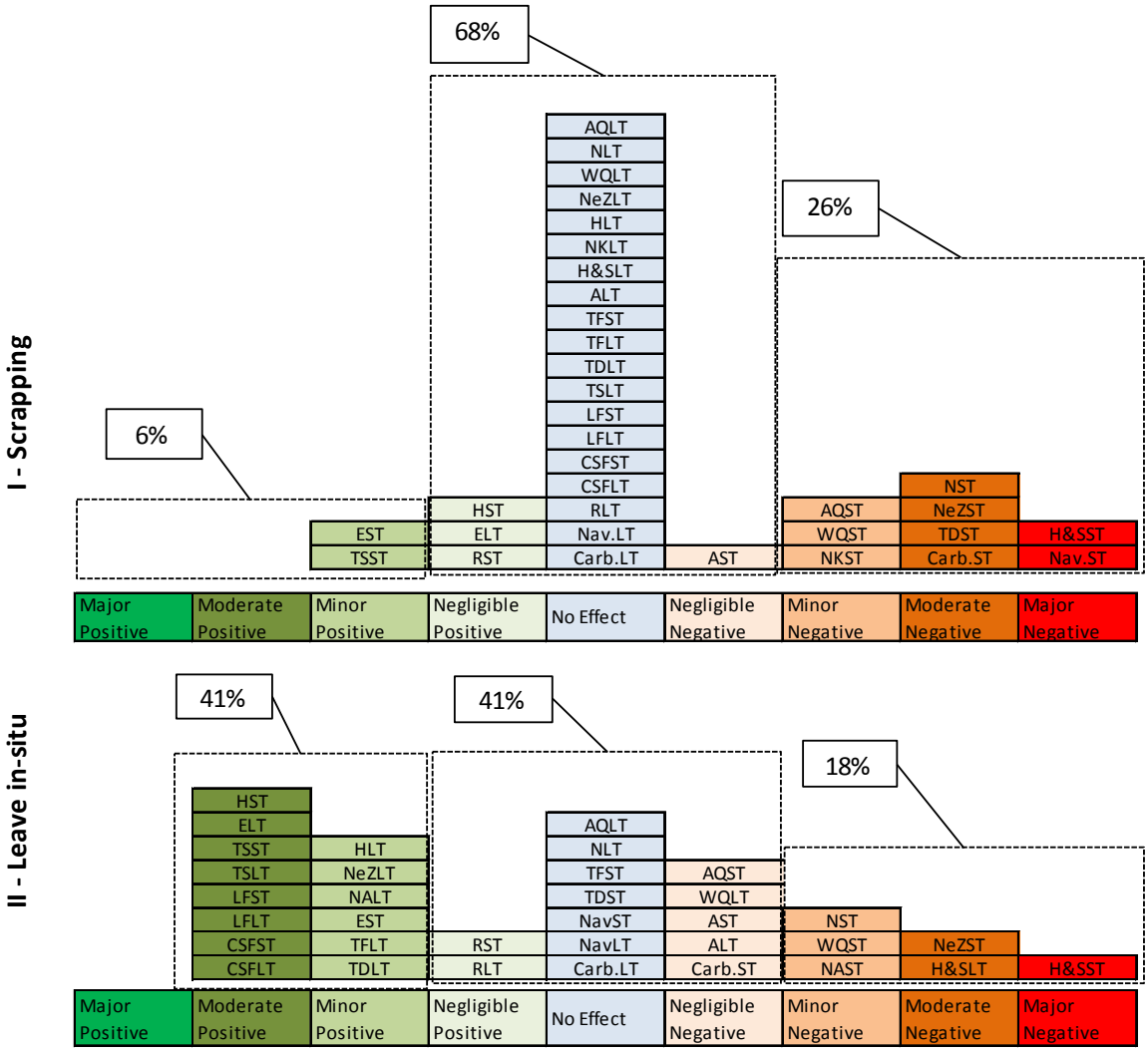

Figure 1. Example diagram of category rankings based on NEBA results for two hypothetical wreck management options.

Conclusions derived through joint efforts of government, stakeholders, and responsible party are more likely to be accepted by the public. Case studies for shipwreck management NEBA include the M/V

NEW FLAME in Gibraltar in the European Union, the M/V LOS LLANITOS in Manzanillo Mexico, the M/V ANGEL N in St. Lucia and the M/V ELSA in Saba in the Caribbean Sea. While several of the nations involved in the Case Studies of Wreck Removal NEBA were not signatories to the convention at the time, the use of the guidelines requiring vessel removal that presents hazards to the environment or navigation were used as a guideline to introduce NEBA. Removal of pollution and SIMA considerations are typically a foregone conclusion in the analyses. However, results vary from complete removal and restoration to leaving a vessel in place for the vessel structure management analyses.

Discussion

There are currently 32 signatories to the Nairobi Convention on the Removal of Wrecks. Many nations have not yet been confronted with the challenges involved in shipwreck management following a casualty. Preparedness to address public and stakeholder concerns when an uninvited vessel arrives onshore may be lacking. A NEBA process directed at shipwreck management options allows those involved to thoroughly examine actions and consequences with data and evidence to reduce uncertainty and provide the provide with a sound rationale for decisions.

References

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