Net Environmental Benefit Analysis: An Overview

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Overview

- NEBA
- NEBA in 4 Stages
- Response Strategy Development using NEBA
Net Environmental Benefit Analysis (NEBA)

“Structured approach used by the response community and stakeholders during oil spill preparedness and response, to compare the environmental benefits of potential response tools, and develop a response strategy that will reduce the impact of an oil spill on the environment.”

Helps decision-makers use the response tools to achieve the most beneficial outcome overall.

New IPIECA-IOGP
Good Practice Guidance
NEBA in 4 stages

1. **Compile and evaluate data** to identify exposure scenario and potential response options, and to understand the potential impacts of that scenario

2. **Predict outcomes** for the given scenario to determine which techniques are effective and feasible

3. **Balance trade-offs** by weighing a range of benefits and drawbacks resulting from each feasible response option

4. **Select the best options** for a given scenario, based on which combination of tools and techniques will minimize impacts
Response strategy development using NEBA

Before a spill ≈ “Strategic” NEBA

Compile and evaluate data
A wide range of data is compiled and evaluated to understand the area potentially affected, and to identify and prioritize environmental and community assets with regard to environmental sensitivities and social values.

Predict outcomes
Planning scenarios are used to assess the potential effects on the environment. For specific locations, feasible response options are identified from the ‘response toolbox’.

Balance trade-offs
The advantages and disadvantages of the potential response options are evaluated and weighed against the environmental and social effects on each, to understand and balance trade-offs.

Select best option(s)
Data, information and viewpoints are taken into account to select the combination of response options that will create the greatest net environmental benefit. A full response strategy to be developed encompassing detailed plans, capability development and approvals.

During a spill ≈ “Operational” NEBA

If no pre-spill planning work has been undertaken, or if analogue planning scenarios cannot be adjusted to correlate with the specifics of a spill, response strategy development using NEBA follows an expedited version of the process above. In this instance, it is possible that the data which forms the basis of the analysis may be incomplete or limited, thus necessitating a greater reliance on professional judgement to correctly balance the trade-offs and select the best options, especially given the time-pressured nature of a response.

During a spill
Based on the specifics of the spill, a range of data is evaluated to assess likely outcomes.

Response options identified in the pre-spill planning stage are reviewed against the actual spill conditions and anticipated effects. Realistic and feasible response options considered.

The balancing of trade-offs carried out in the pre-spill planning stage is adjusted and confirmed against the actual conditions of the spill to provide and rebalancing of trade-offs takes place to address evolving conditions.

The response strategy is developed based on the optimum response options for the conditions. The strategy is implemented and continually monitored and adjusted based on ongoing evaluations. Pre-spill planning work facilitates rapid decision making during a response, minimizing delays.

The ongoing application of the NEBA process throughout a response allows clean-up end points to be determined and agreed to by stakeholders early and in a systematic manner. This helps to avoid unnecessary clean-up activities which could result in additional detrimental effects on the environment.
Response strategy development using NEBA

- Know your oil
- Model fate and trajectory
- Consider sensitivity data
- Identify potential response options:
  - effectiveness
  - feasibility
  - regulation

Compile and evaluate data ➤ Predict outcomes ➤ Select best

Compile and evaluate data

Predict outcomes

Select best
Factors Influencing Feasibility

- Climate and sea state
- Encounter rate
- Spill volume(s)
- Logistics and support
- Proximity to sensitives and shores

Oil properties and weathering characteristics:
- Evaporation
- Spreading
- Emulsification
- Increased viscosity
- Fragmentation
Response strategy development using NEBA

- For chosen scenarios, review consequences of “no response” activities
- Consider how different combinations of response options may change these impacts in order to characterize trade-offs

<table>
<thead>
<tr>
<th>EXAMPLE SCENARIOS</th>
<th>POSSIBLE RESPONSE TOOLS</th>
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<tbody>
<tr>
<td><strong>Offshore Release</strong></td>
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<tr>
<td>Tanker Spill</td>
<td>Dispersants</td>
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<tr>
<td>Subsea Spill</td>
<td>Mechanical Recovery</td>
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<tr>
<td>Spill flowing towards populated area</td>
<td>In-Situ Burning</td>
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<td>Physical Removal</td>
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<td>Natural Processes</td>
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<td><strong>Near Shore Release</strong></td>
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<td>Spawning Season</td>
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How to predict outcomes?

- ‘No response’ scenario covers the timescale needed for the oil to weather and naturally attenuate.

- Overall, the NEBA process provides an estimate of potential environmental effects at a general level. With the number of variables involved, it is impractical to quantify potential damage in every environmental resource. This may allow the parties to compare and select preferred combinations of response options.

- Subject matter expert input, drawing on extensive knowledge of oil impacts.

Response strategy development using NEBA:

Compile and evaluate data ➔ Predict outcomes ➔ Balance trade-offs ➔ Select best option(s)
Response strategy development using NEBA

1. Compile & evaluate data
   - Oil spill modelling
   - Sensitivity data

2. Predict outcomes
   - Estimating the baseline environmental impact
     - Ecological considerations
     - Socio-economic considerations

   Characterizing the effects of response options
   - Evaluation of candidate response options in combination
     - Benefits
     - Drawbacks
     - Direct or indirect environmental impacts of technique

Baseline predicted environmental impact of spill

Predicted outcomes of response options

Select best option(s)

• May be differing priorities relating to perceptions of the importance of sensitive resources
• No universally accepted way to assign value or importance to different environmental and socioeconomic sensitivities
• Essentially a qualitative process
  ➢ Seeks consensus
  ➢ A risk-based decision making approach may allow comparison of disparate resources in order to facilitate consensus on relative values of resources
  ➢ A more quantitative approach is being developed
# Response strategy development using NEBA

## BALANCING TRADE-OFFS

### RESPONSE TOOLBOX

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<th>Dispersants</th>
<th>Mechanical Recovery</th>
<th>In-Situ Burning</th>
<th>Physical Removal</th>
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<tr>
<td>Dispersants allow small oil droplets to form which speed up natural breakdown in the water column.</td>
<td>Mechanical recovery uses boom and skimmers to contain and remove oil from the water surface.</td>
<td>High oil elimination rate possible. No recovered oil, storage requirements (except possibly for burn residue). Effective over wide range of oil types and conditions.</td>
<td>Physical removal consists of the physical removal of surface oil by crews with tools and machinery.</td>
<td>Natural removal allows for more effective recovery in environments where intervention would be detrimental.</td>
</tr>
</tbody>
</table>

### BENEFITS

- **Dispersants**
  - High aerial coverage rate possible at the water surface
  - High treatment efficiency possible if subsurf
  - Large volumes of oil can be treated
  - Potentially high oil elimination rate
  - Reduced vapors at the water surface; improves safety
  - No recovered oil, storage requirements
  - Lower maintenance requirements
  - Potentially the quickest response option
  - Prevents oil from spreading to shoreline
  - Useful in higher wind and sea conditions
  - Effective over wide range of oil types and conditions

- **Mechanical Recovery**
  - Well-accepted, no special approvals needed
  - Effective for recovery over wide range of spilled products
  - Large “window of opportunity”
  - Minimal side effects
  - Greatest availability of equipment and expertise
  - Recovered product may be reprocessed

- **In-Situ Burning**
  - High oil elimination rate possible
  - No recovered oil, storage requirements (except possibly for burn residue)
  - Effective over wide range of oil types and conditions

- **Physical Removal**
  - Non-aggressive methods can have minimal impact on shore structure and shore organisms
  - Useful for detailed cleaning of near shore environment in specific or sensitive areas

- **Natural Processes**
  - No intrusive removal or cleanup techniques that further damage the environment
  - Complements other response techniques
  - May be best option if there is little to no threat to human or environmental well-being
  - When selected for certain areas and conditions, the environment can recover from the spill more effectively than it might when using other response tools

### DRAWBACKS

- **Dispersants**
  - Special approvals required
  - Less known about long-term effects of dispersa use
  - Perceived to be unsuitable for calm seas
  - Short-term, localized reduction in water quality
  - Potential impact on water column ecology
  - Specialized equipment and expertise required
  - Usage near shore in shallow water could result in greater water column impacts
  - Will not work on high viscosity fuel oils in calm, cold seas
  - Has a limited “window of opportunity” for use

- **Mechanical Recovery**
  - Inefficient and impractical on thin slicks
  - Ineffective in inclement weather or high seas
  - Requires storage capability
  - Typically recovers no more than 10-20 percent of the oil spilled
  - Labor- and equipment-intensive

- **In-Situ Burning**
  - Special approvals required
  - Ineffective in inclement weather or high seas
  - Black smoke perceived as significant impact on people and the atmosphere
  - Localized reduction of air quality
  - Specialized equipment and expertise required
  - Potential for secondary fires during inland use
  - Burn residue can be difficult to recover

- **Physical Removal**
  - Aggressive removal methods may impact shoreline and shore organisms (e.g., sand removal and cleaning)
  - Potential for heavy equipment and high foot traffic (trampling) can cause additional environmental damage
  - Removal occurs after oil has already impacted shore
  - Labor-intensive

- **Natural Processes**
  - Winds and currents can change, sending the oil spill toward sensitive areas
  - Residual oil can impact shoreline ecology, wildlife, and economically relevant resources
  - Public perception that responders are doing nothing
Response strategy development using NEBA

- Target an optimum response strategy for planning scenarios and incident specific conditions
  - Before a spill, response strategies are defined for each of the planning scenarios, and response capabilities are designed and developed accordingly
  - During a spill, NEBA supports
    - the deployment and adjustment of response resources as conditions change
    - decisions about when response end-points have been reached
A systematic NEBA process can:
• establish an understanding of the potential effects of a spill on environmental and other resources
• help to evaluate various response options
• address potential trade-offs that may result for different response strategies

NEBA also has a role when a response is under way:
• safety at the forefront
• NEBA should regularly be considered as a scenario evolves
• response strategies are optimized for a balance of response techniques
• government and industry working together cooperatively
• effective, timely and transparent communication

Currently looking to standardize the focus beyond environmental
• Spill Impact Mitigation Assessment (SIMA)