

Net Environmental Benefit Analysis: An Overview

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Overview

- NEBA
- NEBA in 4 Stages
- Response Strategy Development using NEBA

Net Environmental Benefit

“Structured approach used by stakeholders during oil spill response, to compare the environmental impacts of different potential response tools, and select the one that will reduce the impact on the environment”

Helps decision-makers use the most beneficial

IPIECA



Response strategy development using net environmental benefit analysis (NEBA)

Good practice guidelines for incident management and emergency response personnel



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

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

Planning scenarios are used to assess the potential effects on the environment.

For specific locations, feasible response options are identified from the 'response toolbox'.

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

Data, information and viewpoints are taken into account to select the combination of response options that will create the greatest net environmental benefit.

The plan shows a full response strategy to be developed encompassing detailed plans, capability development and approvals.

Before a spill ≈ "Strategic" 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 anticipated effects.

Response options identified in the pre-spill planning stage are reviewed against the actual spill conditions and anticipated effects to confirm the list of 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. Continued evaluation and re-balancing 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.

During a spill ≈ "Operational" NEBA

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.

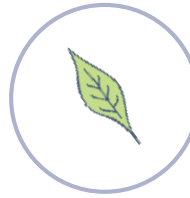
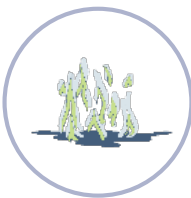
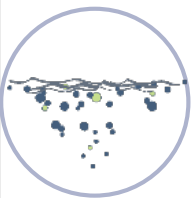
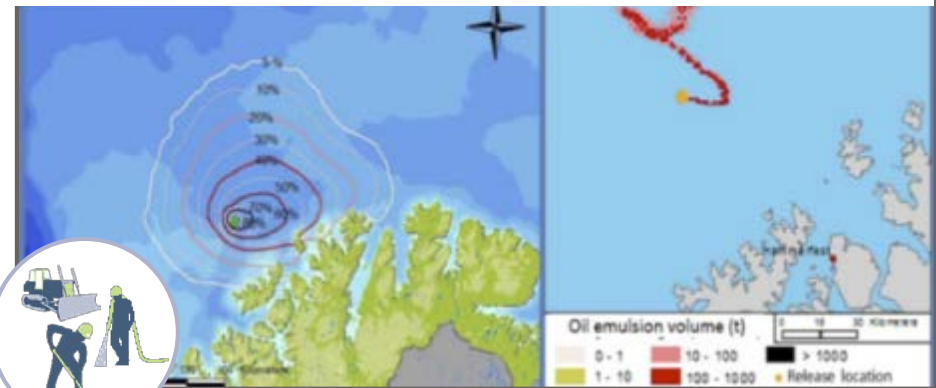
Response strategy development using NEBA

Compile and
evaluate data

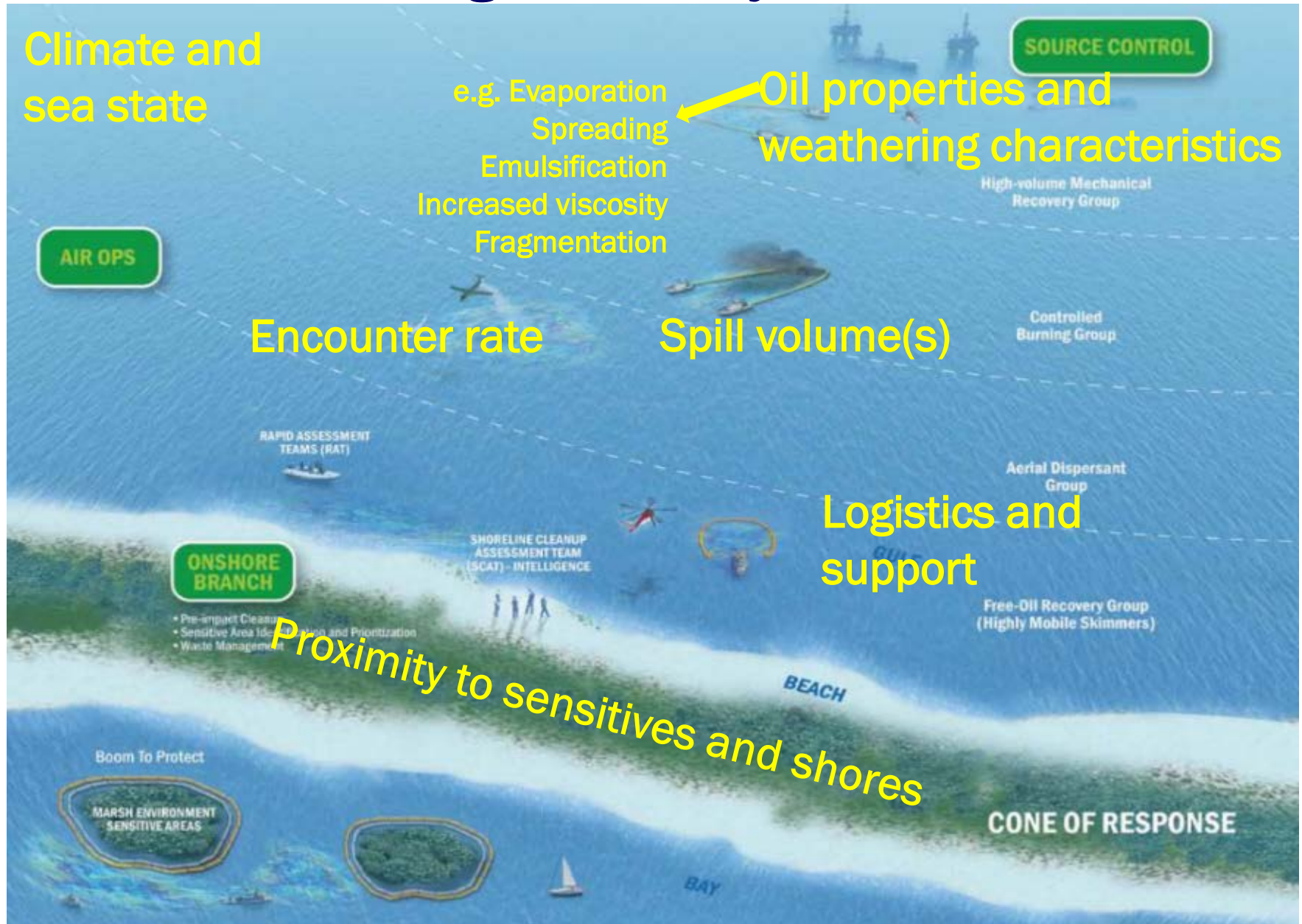
Predict outcome

Select best

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



Factors Influencing Feasibility



Response strategy development using NEBA

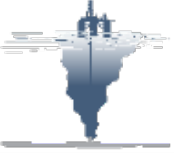
Compile and
evaluate data

Predict outcomes

Balance trade-offs

Select best
option(s)

- 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

EXAMPLE SCENARIOS		POSSIBLE RESPONSE TOOLS				
OFFSHORE RELEASE TANKER SPILL		DISPERSANTS 	MECHANICAL RECOVERY 	IN-SITU BURNING 	PHYSICAL REMOVAL	NATURAL PROCESSES 
OFFSHORE RELEASE SUBSEA SPILL						
OFFSHORE RELEASE SPILL FLOWING TOWARDS POPULATED AREA						
NEAR SHORE RELEASE SPAWNING SEASON						

Response strategy development using NEBA

Compile and
evaluate data

Predict outcomes

Balance trade-offs

Select best
option(s)

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 to any environmental resource in the NEBA process. The process allows 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)

① Compile &
evaluate data

Oil spill
modelling

Sensitivity
data

Candidate
response
options

② Predict outcomes

Estimating the baseline
environmental impact

Ecological
considerations

+

Socio-
economic
considerations

Baseline
predicted
environmental
impact of
spill

Characterizing the effects of
response options

Evaluation of candidate response
options in combination

- Benefits
- Drawbacks
- Direct or indirect
environmental impacts of
technique

Predicted
outcomes of
response
options

Response strategy development using NEBA

Compile and
evaluate data



Predict outcomes



Balance trade-offs



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

Compile and
evaluate data

Predict outcomes

Balance trade-offs

Select best
option(s)

BALANCING
TRADE-OFFS

RESPONSE TOOLBOX	BENEFITS	DRAWBACKS
DISPERSANTS  DISPERSANTS ALLOW SMALL OIL DROPLETS TO FORM WHICH SPEED UP NATURAL BREAKDOWN IN THE WATER COLUMN.	- HIGH AERIAL COVERAGE RATE POSSIBLE AT THE WATER SURFACE - HIGH TREATMENT EFFICIENCY POSSIBLE SUBSEA - 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 MANPOWER 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	- SPECIAL APPROVALS REQUIRED - LESS KNOWN ABOUT LONG TERM EFFECTS OF SUBSEA 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  MECHANICAL RECOVERY USES BOOMS AND SKIMMERS TO CONTAIN AND REMOVE OIL FROM THE WATER SURFACE.	- 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	- 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  IN-SITU BURNING INVOLVES IGNITING CONTAINED OIL SLICKS.	- HIGH OIL ELIMINATION RATE POSSIBLE - NO RECOVERED OIL STORAGE REQUIREMENTS (EXCEPT POSSIBLY FOR BURN RESIDUE) - EFFECTIVE OVER WIDE RANGE OF OIL TYPES AND CONDITIONS - SPECIALIZED EQUIPMENT (BOOM) IS AIR TRANSPORTABLE - MINIMAL ENVIRONMENTAL IMPACT	- 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  PHYSICAL REMOVAL CONSISTS OF THE PHYSICAL REMOVAL OF SURFACE OIL BY CREWS WITH TOOLS AND MACHINERY.	- 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	- 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  NATURAL REMOVAL ALLOWS FOR MORE EFFECTIVE RECOVERY IN ENVIRONMENTS WHERE INTERVENTION WOULD BE DETRIMENTAL.	- 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	- 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

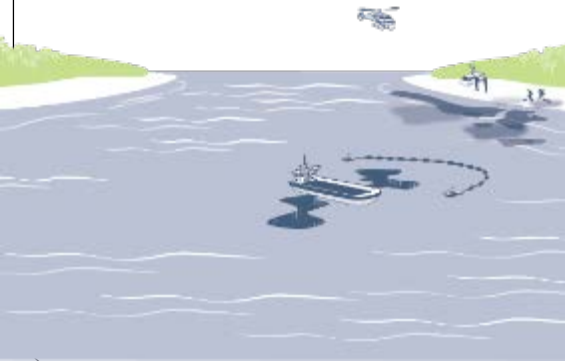
Compile and
evaluate data

Predict outcomes

Balance trade-offs

Select best
option(s)

- 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



Summary



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)