ENVIRONMENT & OIL SPILL RESPONSE (EOS)

An analytic tool for environmental assessment to support oil spill response planning

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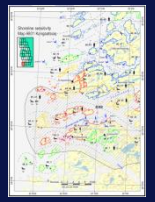
OIL SPILL RESPONSE TECHNIQUES

Do nothing	Mechanical recovery	Chemical dispersing	*In situ* burning (ISB)
Natural degradation of oil	Oil is removed from the environment	Oil is removed from sea surface Delution beyond toxic concentrations Increased degradation rate	Oil is removed from sea surface No oil debris
Oil pollution	Weather dependant Limited efficiency / Oil debris	Toxic concentrations Oil remains in environment for natural degradation	Weather dependant Burning residues Emissions
			

ACUTE: SPILL IMPACT MITIGATION ASSESSMENT (SIMA)

Presence of sensitive organisms / habitats



Fate and effects of untreated oil

SIMA

Impact on population

Fate and effects of treated oil

PLANNING: EOS TOOL

Planning of oil spill response contingency

Based on oil spill scenarios

Based on an environmental assessment of advantages and consequences of oil spill response method

Science based

Interactive tool (excel document)

Can be used for:

- planning of oil spill response contingency for an activity (e.g., oil exploration and exploitation)
- Planning and design of national oil spill response contingency

Can form the base for:

- Cross-border and trans-boundary co-operation and agreements (e.g., shipping lanes)
- capacity building
- location of equipment
- faster action time for oil spill response
- Social perception

REVIEW OF BETA VERSION

Workshop in Copenhagen, Denmark, November 2018

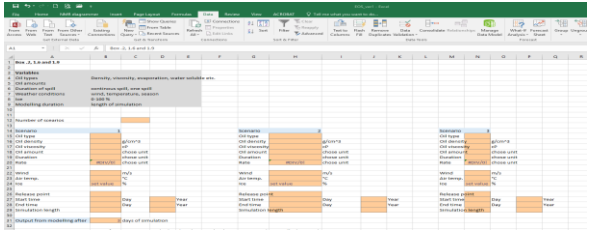
Meetings with Rambøll US and Shell in Copenhagen, January 2019

- Main changes:
  - Interactive part (excel document)
  - Name change

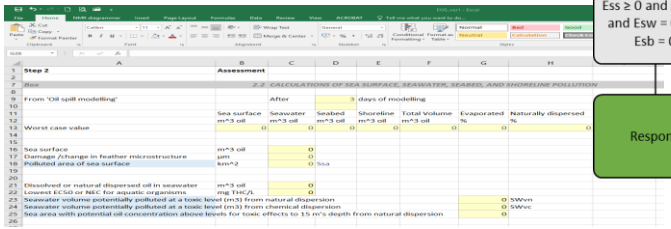




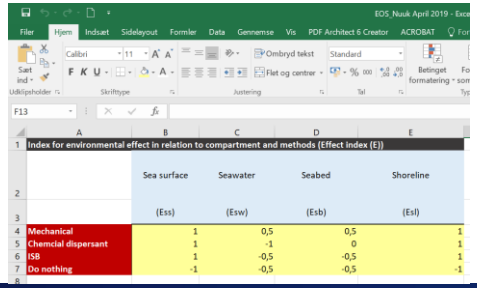
1) Basic information



2) Assessments



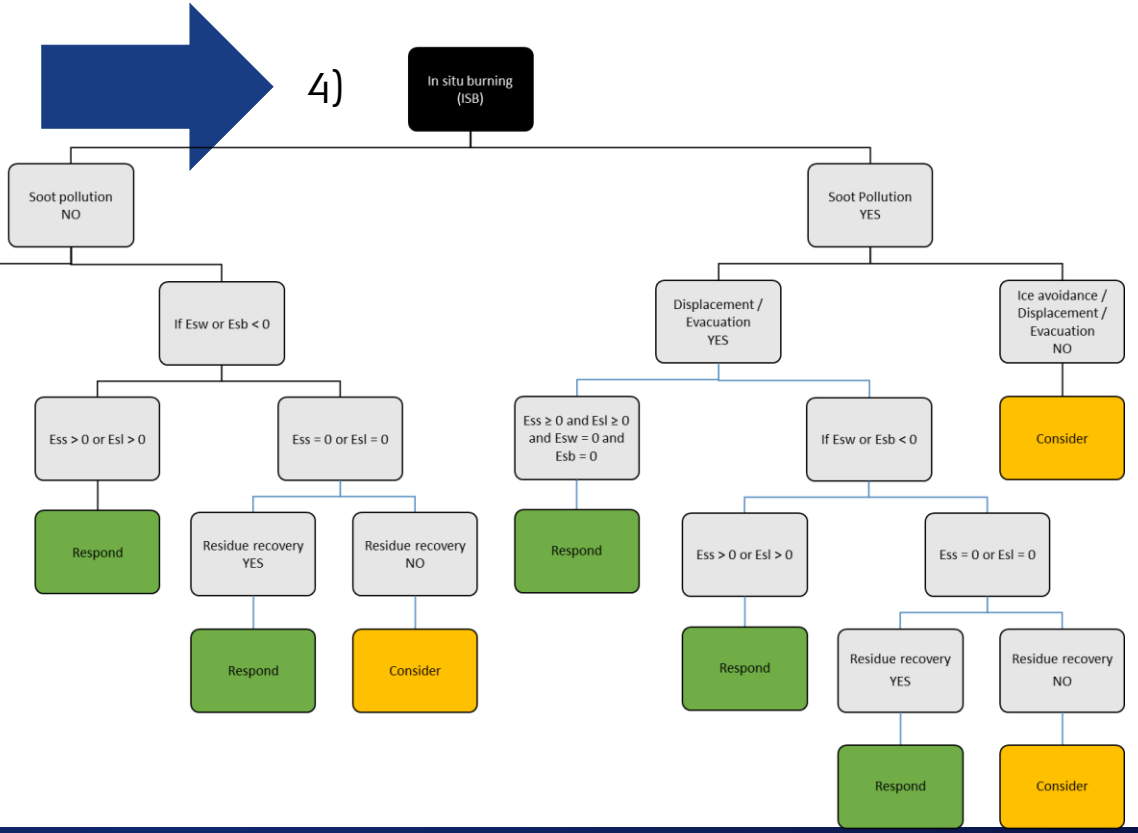
3) Index / Scores



Index for environmental effect in relation to compartment and methods (Effect index (E))

	Sea surface (Ess)	Seawater (Esw)	Seabed (Esb)	Shoreline (Esl)
Mechanical	1	0,5	0,5	1
Chemcial dispersant	1	-1	0	1
ISB	1	-0,5	-0,5	1
Do nothing	-1	-0,5	-0,5	-1

4)



GRACE INFORMATION FOR EOS AND OPERATIONAL ADD-ONS – TABLES TEMPLATES

Ecotox:

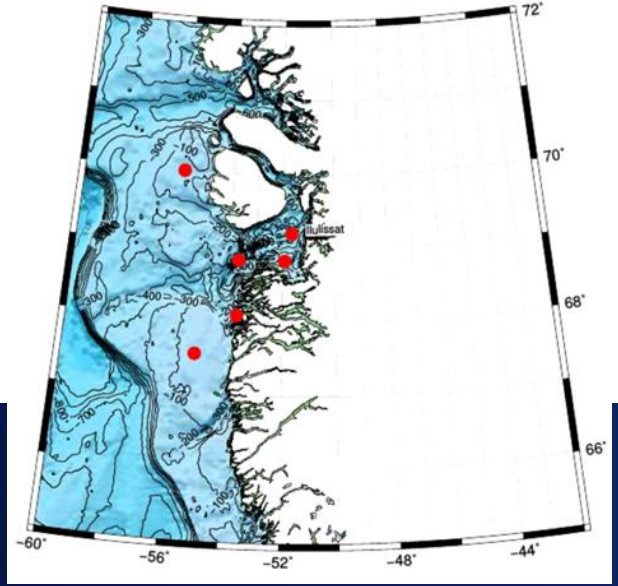
Organims (s)	Treatment	Results	Environmental implications	Publication/ authors/credit

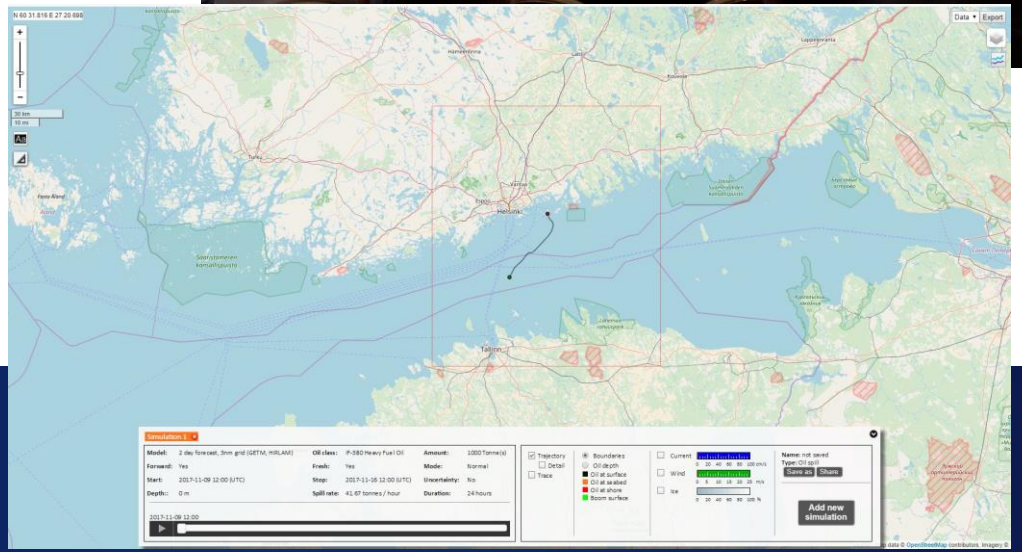
Oil spill support tools

Tool	Application	Results	Environmental implications	Publication/ authors/credit

CASES

- Gulf of Finland
- Disko Bay, Greenland





EOS steps:

1. Basic data and information input
2. Assessments
3. Index / Scores
4a. Decision trees
4b. Chemical dispersion guiding matrix
5. Interpretation and dissemination of EOS results

1) BASIC DATA

Step	Content
1. Basic data	Assessment area / waterbody
1. Oil Spill Modelling	Oil spill scenarios and model out-put
1. VEC selection	- Selection criteria for identification of species and organism groups of concern in the assessment area - Shoreline morphology – persistence of stranded oil spill

2) ASSESSMENT

Step	Content
2. Pollution assessment	Sea surface area and seawater volume with harmful slick thickness or concentrations
2. Oil Spill Response; pros and cons	Assessment of environmental pros and cons of oil spill response methods for spatial compartments; sea surface, seawater, sea bed and shoreline

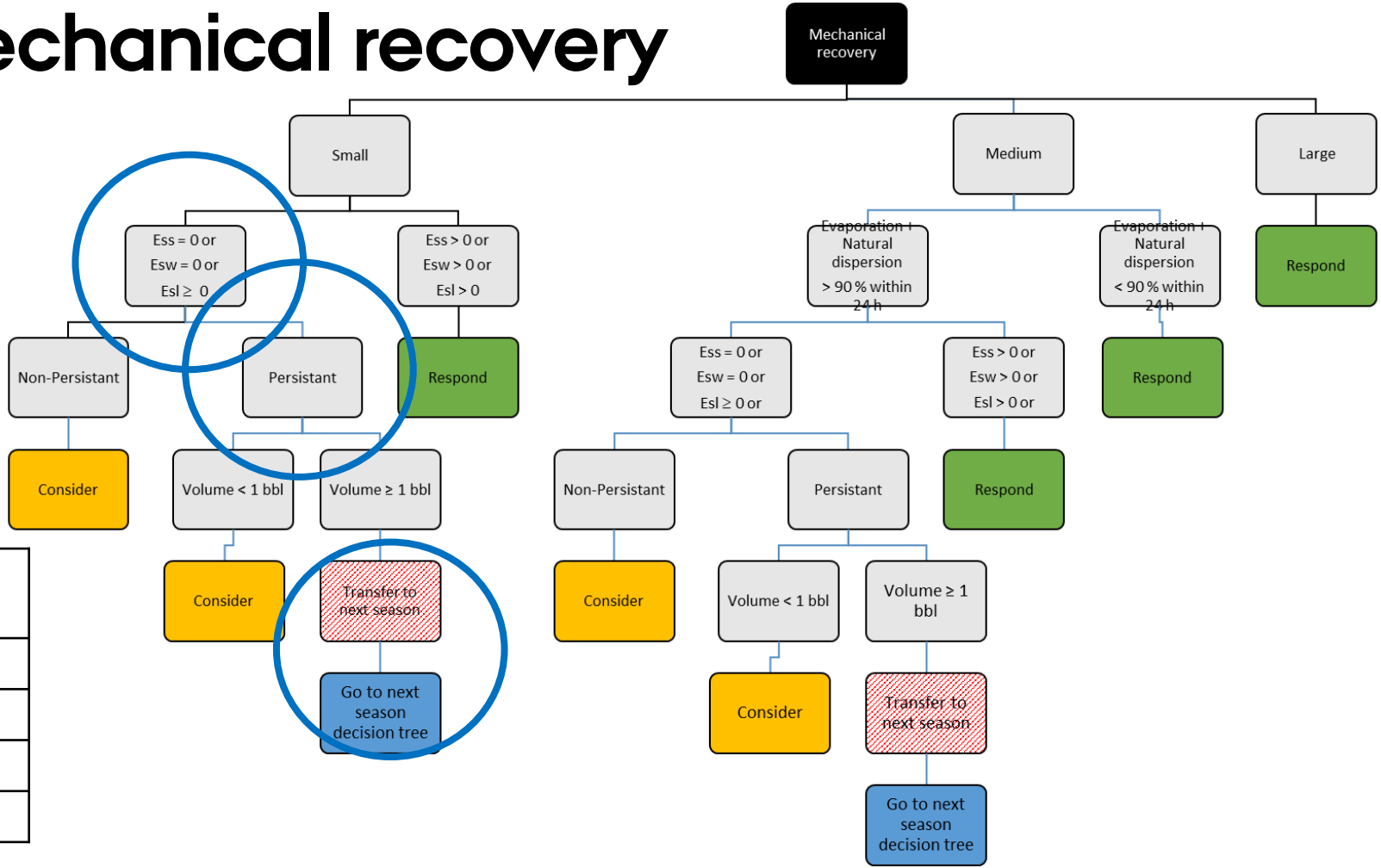
3) SCORES AND INDICES

Step	Content
3. Effect index (E)	Effect index for sea surface, seawater, sea bed and shoreline (÷1 to +1)
3. Soot pollution	Soot Polution (SP) with respect to in situ burning (ISB) as oil spill response method (yes/no)
3. Recover time	- Modelled rehabilitation time for a population - Generation time
3. Recruitment	Fractions of sea surface area and seawater volume with harmful slick thickness or concentrations

4) DECISION TREES

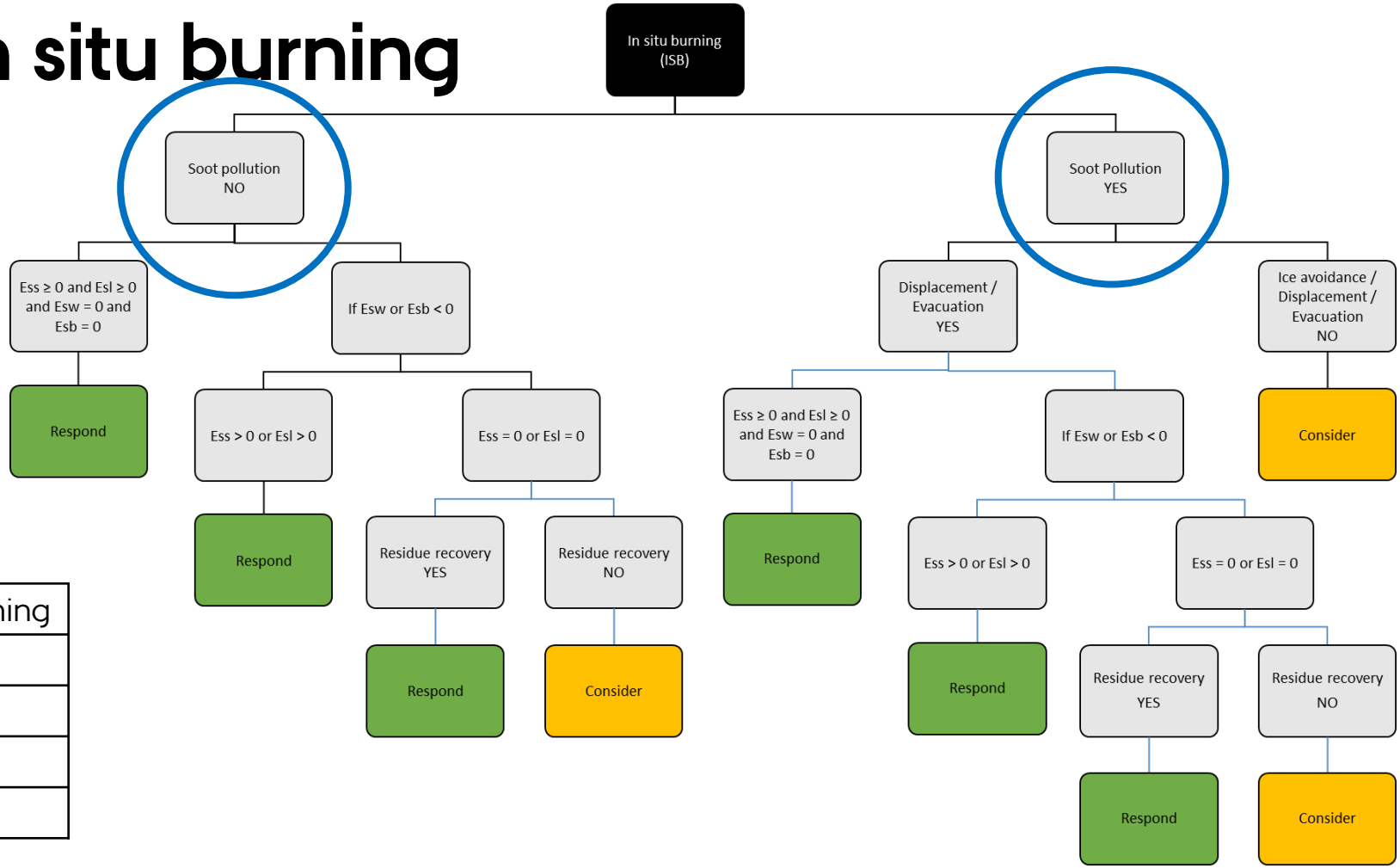
Step	Content
4. MR	Mechanical recovery
4. DN	Do nothing
4. ISB	In situ burning
4. CD	Chemical dispersion, incl. guiding matrix

4) Mechanical recovery



Mechanical recovery
MR_{spring}
MR_{summer}
MR_{autumn}
MR_{winter}

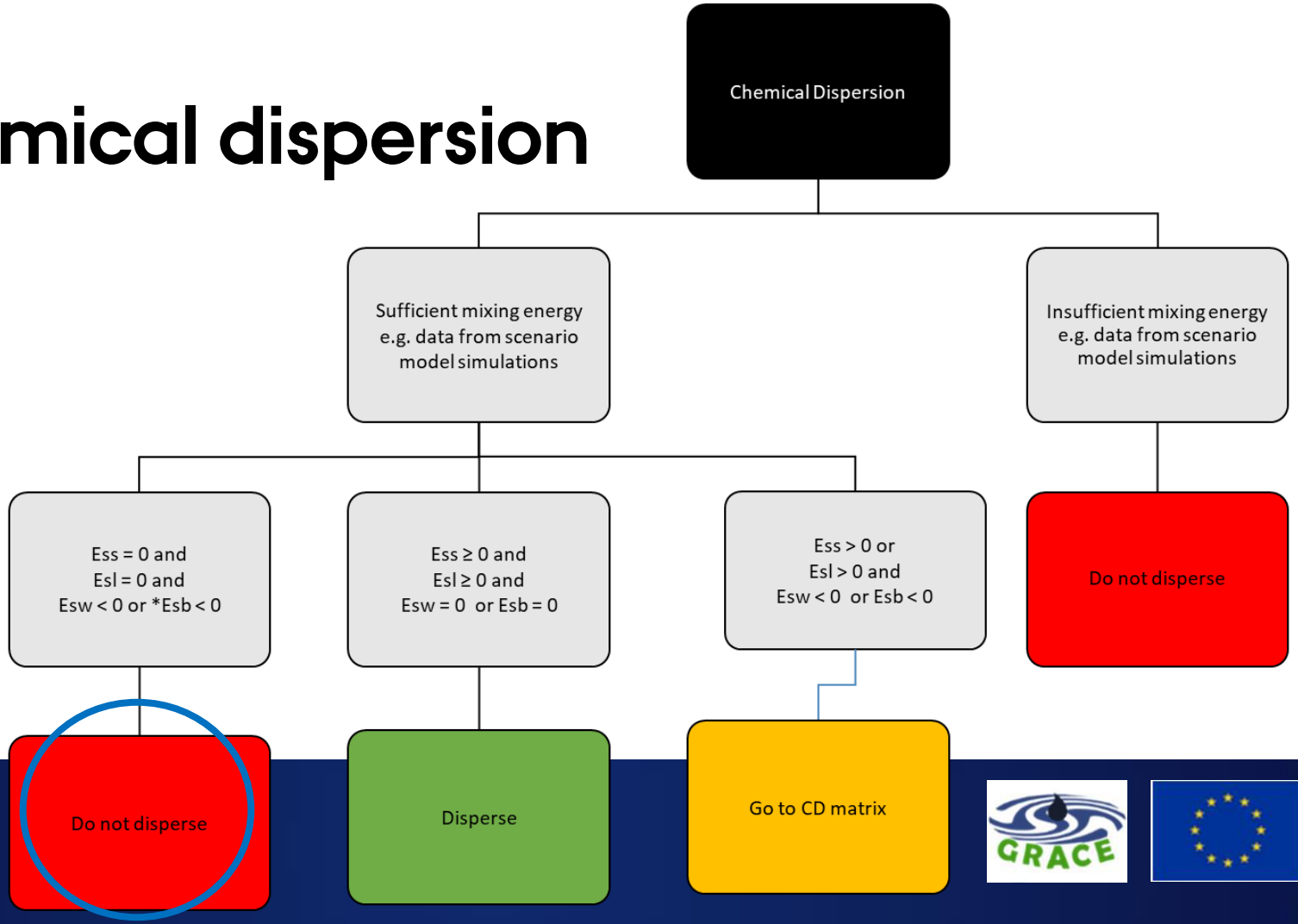
4) In situ burning



In situ burning
ISB_{spring}
ISB_{summer}
ISB_{autumn}
ISB_{winter}

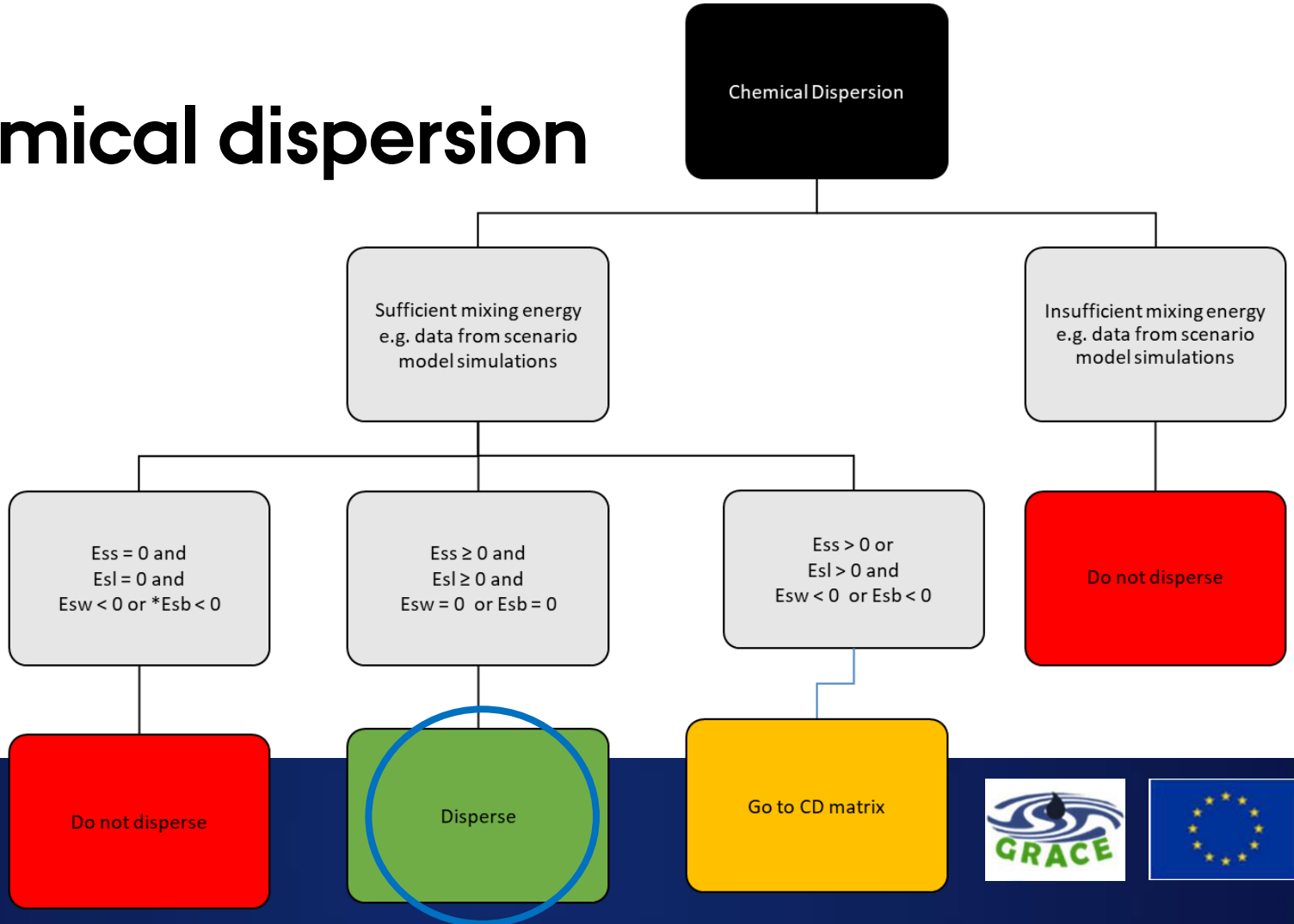
4) Chemical dispersion

Chemical dispersion
CD_{spring}
CD_{summer}
CD_{autumn}
CD_{winter}



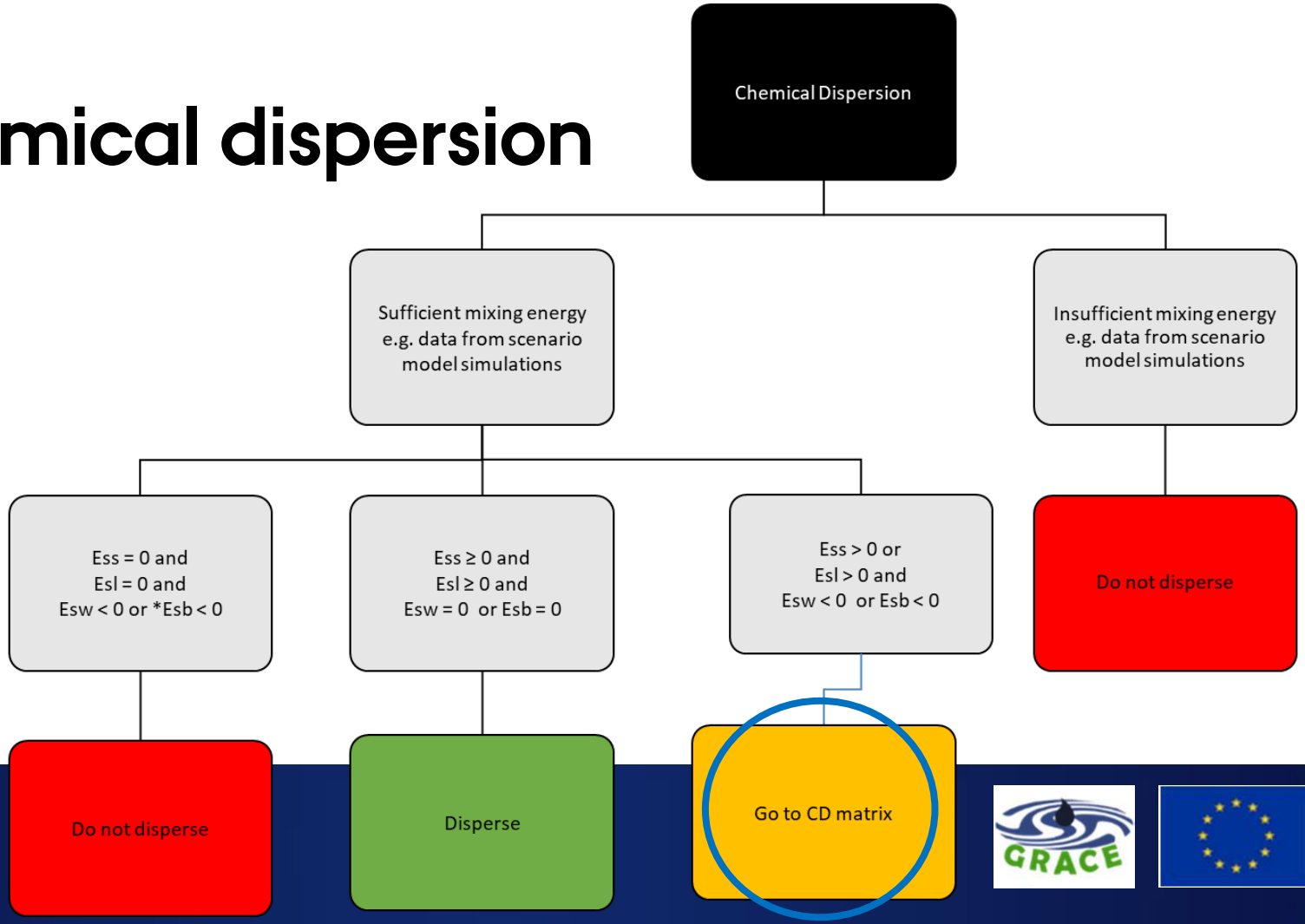
4) Chemical dispersion

Chemical dispersion
CD_{spring}
CD_{summer}
CD_{autumn}
CD_{winter}



4) Chemical dispersion

Chemical dispersion
CD_{spring}
CD_{summer}
CD_{autumn}
CD_{winter}



Fraction	Sea surface	Small	Small	Large	Large
Seawater	Recover time	Short	Long	Short	Long
Small	Short	Disperse	Disperse	Disperse	Disperse
Large	Short	Not	1	2	3
Small	Long	Not	4	5	6
Large	Long	Not	Not	7	8

1 Disperse, but not if *Rsb > Rss or Rsl
2 Disperse, but not if *Rsb > Rss or Rsl
3 Disperse, but not if *Rsb > Rss or Rsl
4 Disperse, but not if Rsw > Rss or Rsl or *Rsb > Rss or Rsl
5 Disperse, but not if Rsw > *Rsb or Rsl
6 Disperse, but not if Rsw > Rss or Rsl or *Rsb > Rss or Rsl
7 Disperse, but not if Rsw > *Rsb or Rsl
8 Disperse, but not if Rsw > Rss or Rsl or *Rsb > Rss or Rsl

* only if plume depth = water depth or plume reaches seabed VEC

5) INTERPRETATION AND DESSIMINATION

Step	Content
5. Results	Colour codes for mechanical the four response methods and for four seasons
5. Results	EOS results

	Mechanical recovery	Chemical dispersion	In situ burning	Do nothing
Spring	2	1	2	1
Summer	3	2	3	2
Autumn	3	3	3	1
Winter	3	3	3	1

5. EOS RESULTS

Green

The oil spill response method can be considered an option for oil spill combat in the assessment area for the specific season in order to obtain an overall environmental mitigation from the oil spill by response the method operation.

Yellow

The oil spill response method may be considered an option for oil spill combat in the assessment area for the specific season, however, expert judgement is needed in the specific oil spill situation and season in order to obtain an overall environmental mitigation from the oil spill by the response method operation

Red

The oil spill response method cannot be considered an option for oil spill combat in the assessment area for the specific season in order to obtain an overall environmental mitigation from the oil spill by the response method operation.

WHAT THE EOS RESULTS CAN AND CANNOT BE USED FOR

- Identify oil spill response methods that may, in overall, environmentally **mitigate** oil spill in the assessment area for a specified season
- EOS results **do not compare** the oil spill response methods in order to select the best option
- Several tools in the toolbox

Please note that the EOS must be followed by a Spill Impact Mitigation Analysis (SIMA) in an acute oil spill situation.

EOS TOOL AND OPERATIVE ADD-ONS

Matrix for operational requirements

Oil-in-ice Code

Assessment of risk for oil spill

EOS tool

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