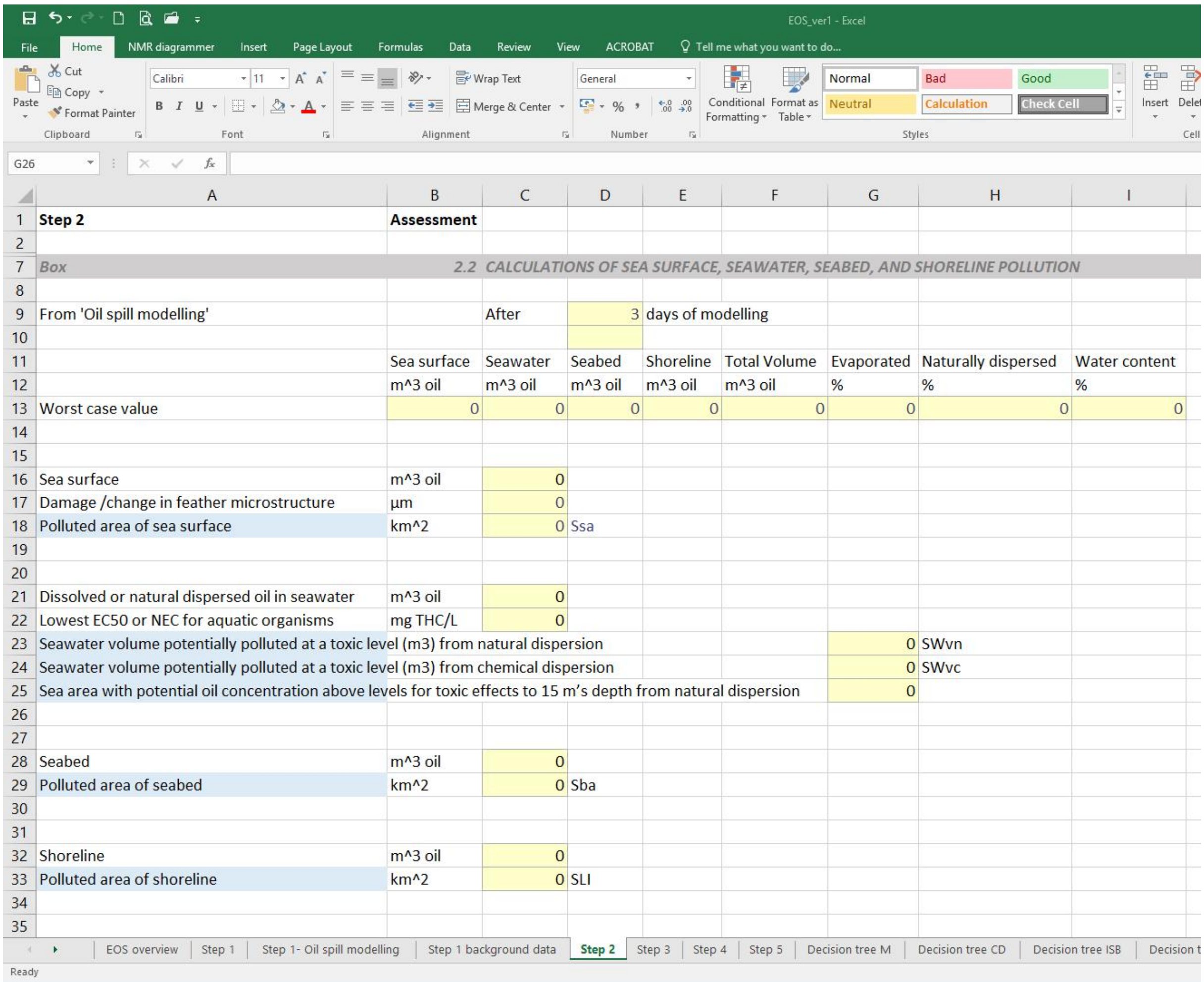
GRACE grant no 679266

SNEBA tool report

D5.11

WP5: Strategic Net Environmental Benefit Analysis (SNEBA)



	A	B	C	D	E	F	G	H	I
1	**Step 2**	**Assessment**							
2									
7	*Box*	*2.2 CALCULATIONS OF SEA SURFACE, SEAWATER, SEABED, AND SHORELINE POLLUTION*							
8									
9	From 'Oil spill modelling'		After	3	days of modelling				
10									
11		Sea surface	Seawater	Seabed	Shoreline	Total Volume	Evaporated	Naturally dispersed	Water content
12		m^3 oil	m^3 oil	m^3 oil	m^3 oil	m^3 oil	%	%	%
13	Worst case value	0	0	0	0	0	0	0	0
14									
15									
16	Sea surface	m^3 oil	0						
17	Damage /change in feather microstructure	µm	0						
18	Polluted area of sea surface	km^2	0	Ssa					
19									
20									
21	Dissolved or natural dispersed oil in seawater	m^3 oil	0						
22	Lowest EC50 or NEC for aquatic organisms	mg THC/L	0						
23	Seawater volume potentially polluted at a toxic level (m3) from natural dispersion						0	SWvn	
24	Seawater volume potentially polluted at a toxic level (m3) from chemical dispersion						0	SWvc	
25	Sea area with potential oil concentration above levels for toxic effects to 15 m's depth from natural dispersion						0		
26									
27									
28	Seabed	m^3 oil	0						
29	Polluted area of seabed	km^2	0	Sba					
30									
31									
32	Shoreline	m^3 oil	0						
33	Polluted area of shoreline	km^2	0	SLI					
34									
35									

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2.0	final	28.02.2019		Steering group

Contents

Executive Summary

Several concepts, methodologies or tools are developed, which are used for supporting and optimising oil spill response and preparedness. The SNEBA tool's uniqueness is related to these other methods and is considered to be novel in this train of "NEBA" tools with respect to including decision trees, which makes the decision process visual and relatively simple, although being based on underlying complex calculations and scoring systems, being generic and not restricted to a specific activity. The SNEBA tool can be used for specific activities, but also for a specified area, it is not focused on particular nations or environmental conditions, and it is not linked to a particular oil spill simulation model, although we recommend using oil spill simulation models which may provide relatively detailed data. In addition, the SNEBA tool will be an open source.

As a result of feedback, input and comments in connection with workshops and meetings where the beta version of the SNEBA tool (D5.8) was presented, it was decided to include a more interactive component in the SNEBA tool. This component consists of an excel document with formulas for calculations and scores with references to the explanatory boxes already developed for the beta version followed by screening through decision trees.

Another result of the expert and stakeholder input, which was gained through workshops and meetings on the beta version of the SNEBA tool was the need to avoid the use of the term "benefit" as in Strategic Net Environmental Benefit Analysis. Therefore, we have proposed a new title of the tool, which is Environment & Oil Spill Response (EOS) - an analytic tool for environmental assessments to support oil spill response design.

The SNEBA (EOS?) tool will be launched at the home pages of GRACE and AU as open source by end of August 2019, but will be presented at the GRACE conference in Tallinn, Estonia, in May 2019.

1 Introduction

The aim of deliverable 5.11 is to present the final form of the SNEBA tool. The tool will be launched at the home pages of GRACE and AU by end of August 2019, but will be presented at the GRACE conference in Tallinn, Estonia, in May 2019.

The SNEBA tool has undergone, as expected, a developing process through all WP5 deliverables (please consult D.5.1-D.5.10), and particularly from:

D5.1, where the platform(s) for the tool was evaluated, and where matrices and decision trees were identified and selected for the further development of the SNEBA tool;

D5.4, where Seatrack Web was presented and used for trajectories and fate modelling simulations of oil spill based on selected scenarios for data input to the SNEBA tool;

D5.5, where the first matrices for the knowledge components that need to go into the analysis were developed. These matrices gathered knowledge on sensitivity of ecological important organisms for oil pollution in all marine spatial compartments; sea surface, water column, seabed, and coast for all seasons, biology, and ecotoxicology of oil (naturally and chemically dispersed as well as oil burning residues) as well as fate (exposure) of the oil spill;

D.5.8, which was the beta version of the SNEBA tool, was presented at the SNEBA workshop in November 2018 (D5.9). At the workshop, experts and stakeholders were introduced to all the different steps of the SNEBA tool, beta version, for giving comments and feedback. The workshop resulted in valuable input as well as the organization of two other workshops in January 2019 with AU experts as well as with Richard Wenning and Michael Bock, Rambøll US. They have developed the Comparative Risk Assessment (CRA) for the Gulf of Mexico (Bock et al. 2019, French-McCay et al. 2019, Walker et al. 2019). The January workshop with Rambøll US also included a skype meeting with Mathijs Smit, Shell. All in all the January workshops resulted in a suite of recommendations for the SNEBA tool, and further it was emphasized from the participants that the SNEBA tool is a valuable and useful tool for authorities and oil companies, when fully developed.

One of the high priority recommendations from the workshops included a more interactive part of the tool for calculations and scoring. It has been decided to go forward with this development to ensure the usability of the tool. Another important output from the workshops was that the SNEBA tool stands out as being open source compared to other similar tools (See more in Chapter 2). For this open source approach together with the visual part with the decision trees, as well as the tool being generic, it was considered that the SNEBA tool will add to the train of other concepts and methodologies for supporting future oil spill response design and planning by, e.g., oil companies and authorities.

Therefore we here present the form of the next version of the SNEBA tool, now also including an excel document that guide/assist the user through the calculations and scores to be used in the final assessment of the decision trees.

2 SNEBA tool in relation to current practice and methodologies supporting oil spill response planning

Wenning et al. (2018) reviewed current practices and knowledge supporting oil spill risk assessment in the Arctic based on a suite of methodologies, which here is summarized, together with primary references, in Table 1.

The SNEBA tool adds to the train of these methodologies developed to support decision making on oil spill response designs and contingency planning. However, we consider the SNEBA tool unique and stands out with respect to:

1. including decision trees, which makes the decision process visual and relatively simple, although being based on underlying complex calculations and scoring systems
2. being generic:
    a. not restricted to a specific activity. The SNEBA tool can be used for specific activities, but also for a specified area. The output from a SNEBA for a specified area can support decision making with regard to optimising oil spill response contingency plans, including acquisition and placement of oil spill response equipment, but also cross-border agreements between nations on oil spill response methods
    b. not focused on particular nations or environmental conditions. Local or regional information can serve as input to the assessment. Default values are proposed, but more specific or detailed information can be included in the interactive component of the tool
    c. not linked to a particular oil spill simulation model, although we recommend using oil spill simulation models which may provide relatively detailed data (e.g., Seatrack Web).
3. the SNEBA tool being open source. The tool, including the interactive component, will be available for free from the GRACE and AU home pages.

Table 1: Summary of current practices, methodologies and concepts supporting oil spill risk assessment (in the Arctic) from Wenning et al. (2018), but with primary references.

Acronym	**Concept title**	**Reference**
NEBA	*Net Environmental Benefit Analysis*	Baker (1995)
OSRA	*Oil Spill Risk Analysis*	Price et al. (2003)
MIRA	*Methodology for Environmental Risk Analysis*	DNV-GL/Akvaplan Niva (2014)
NEDRA	*Net Environmental Damage and Response Assessment*	SINTEF (2015)
BLOSOM	*Blowout and Spill Occurrence Model*	Nelson et al. (2015)
CERA	*Consensus Ecological Risk Assessment*	Walker et al. (2016)
SNEBA	*Strategic Net Environmental Benefit Analysis - concept*	Wegeberg et al. (2016)
ERA Acute	*Environmental Risk Assessment Acute-implementation*	Libre et al. (2018)
SIMA	*Spill Impact Mitigation Assessment*	Wenning et al. (2018)
CRA GoM	*Comparative Risk Assessment - Gulf of Mexico*	Bock et al. (2019)
EOS	*Environment & Oil Spill Response*	Wegeberg et al. (in prep.)

3 SNEBA tool form description

The SNEBA tool has developed through the GRACE WP5 deliverables and most intensely through presenting the beta version in connection with meetings and workshops with experts and stakeholders in November 2018 (e.g., D5.8) and in January 2019. These inputs have led to considerations in particular regarding 1) title of the final tool and 2) including a more interactive component in the tool than presented in the beta version (D.5.8).

3.1 Title

Through all deliverables in WP5 of GRACE the tool has been entitled, Strategic Net Environmental Benefit Analysis - SNEBA. The title is developed from 1) the Net Environmental Benefit Analysis (NEBA) concept that are being applied in an acute oil spill response situation and 2) the word "strategic", which refers to that the SNEBA is a planning tool. However, it seems that between users of the concept "NEBA" there is consensus regarding using the Spill Impact Mitigation Assessment (SIMA) concept instead of the NEBA concept. This is primarily due to a resistance against using the word "benefit" in connection with oil spill, as oil in the environment never is considered "beneficial". We have considered this and still think that "benefit" can be used meaningfully as there may be an overall benefit to the environment from an oil spill response operation compared to doing nothing. However, being pragmatic in order not to take the focus away from the aim of the tool, we are in the process of retitling the tool. Hence, we propose the following:

Environment & Oil Spill Response (EOS) - an analytic tool for environmental assessments to support oil spill response design.

The new title needs to be tested for giving the right associations in relevant fora and expert groups for final decision. The final decision of the title will be launched together with the final tool ver.1 in August 2019.

3.2 Form

In D5.1 it was decided to develop the SNEBA tool around data matrices / scoring tables and decision trees based on development of the SNEBA conceptual framework used for Store Hellefiskebanke in Greenland (Wegeberg et al. 2016) as well as experience with the OSPAR[1] screening tool for Harmonised Offshore Chemical Notification Format (HOCNF) (https://www.ospar.org/work-areas/oic/chemicals).

Until the beta version of the SNEBA tool, these design platforms worked well. However, being introduced to Spill Impact Mitigation Assessment (SIMA) concept (Wenning 2018), and the Comparative Risk Assessment (CRA) methodology used for the Gulf of Mexico (Bock et al. 2019, French-McCay et al. 2019, Walker et al. 2019), and discussing this methodology more in detail at conference/ workshops/meetings (Table 2), it was recommended, and hence decided, to include a more interactive component in the SNEBA tool. This component consists of an excel document with formulas for calculations and scores (see Chapter 3) with references to explanatory boxes. Screening through decision trees will be maintained (see D5.8).

[1] Oslo-Paris Conventions for protection of the marine environment of the North-East Atlantic.

Table 2: List of workshops and meetings where the beta version of the SNEBA tool was presented and discussed with experts and stakeholders for feedback, input and recomendations.

Meeting	Date	Presenter/participants	Title
SETAC[2] conference, Rome	May 2018	Richard Wenning (Rambøll US)	Optimization of oil spill response planning and preparednedd using spill mitigation impact assessment (SIMA)
Pre-WP5 workshop meeting, Copenhagen	November 2018	Richard Wenning (Rambøll US)	
WP5 workshop, Copenhagen (D5.9)	November 2018	Richard Wenning (Rambøll US)	Optimization of oil spill response planning and preparedness using spill mitigation impact assessment (SIMA)
AU meeting, Roskilde	January 2019	Anders Mosbech, Daniel S. Clausen, David Boertmann, Kasper L. Johansen	
Meetings, Copenhagen	January 2019	Richard Wenning and Michael Bock (Rambøll US) Mathijs Smit (Shell)	

[2] Society of Environmental Toxicology and Chemistry.

4 SNEBA tool, interactive component

The next version of the SNEBA tool will as described above also include an interactive component as an Excel document. The intention of the document is to guide/assist the user through the different steps of the SNEBA from compiling the needed input data to completing the background calculations and calculating the scores to be used in the final assessment by the decision trees.

The Excel document is developed in line with beta version of SNEBA tool (see D5.8) and follows the approach of one box for each step/topic in the process. The recommendations from the workshops/meetings are taken into consideration in the development and design of the Excel document. In the following, examples from this Excel document can be found. It should be noted that the exact presentation of this Excel document is still under development and might be changed in the final version of the SNEBA tool launched in August 2019.

There will be one overall Excel document that includes different sheets; offhand one sheet for each of the five steps in the SNEBA. The first page will briefly give an overview of the different steps and sheets (Figure 1).

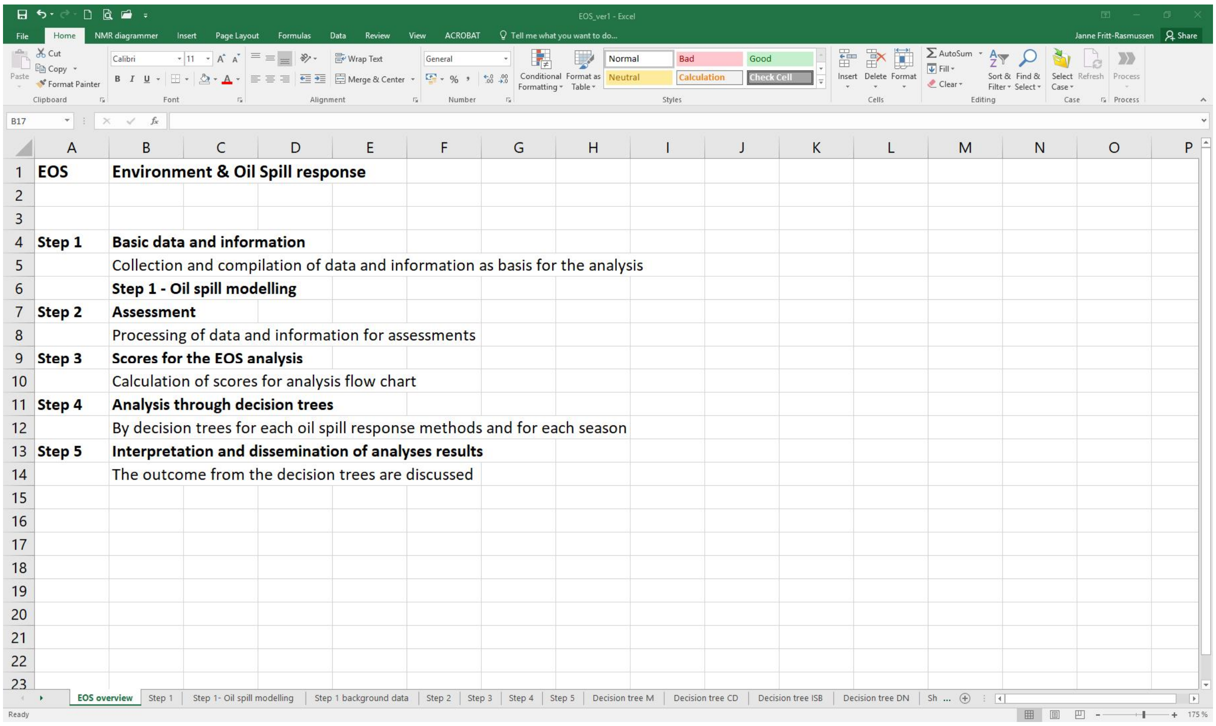


Figure 1: Overview of Excel document for the SNEBA tool.

In some cases, it may be found more appropriate to make separate sheet for a specific topic. This was the case for the three explanatory boxes including different aspects and parts of the oil spill modelling see (D5.8). Thus, these were compiled in one separate sheet (Figure 2). In this sheet, the first parts mention the possible variables to be considered in an oil spill modelling situation, just to guide the author. Next, there is the possibility to include information about different scenarios with respect to oil type, weather conditions etc. The users are able to enter their specific values in the orange cells. In the final table input data from the different oil spill modelling should be compiled.

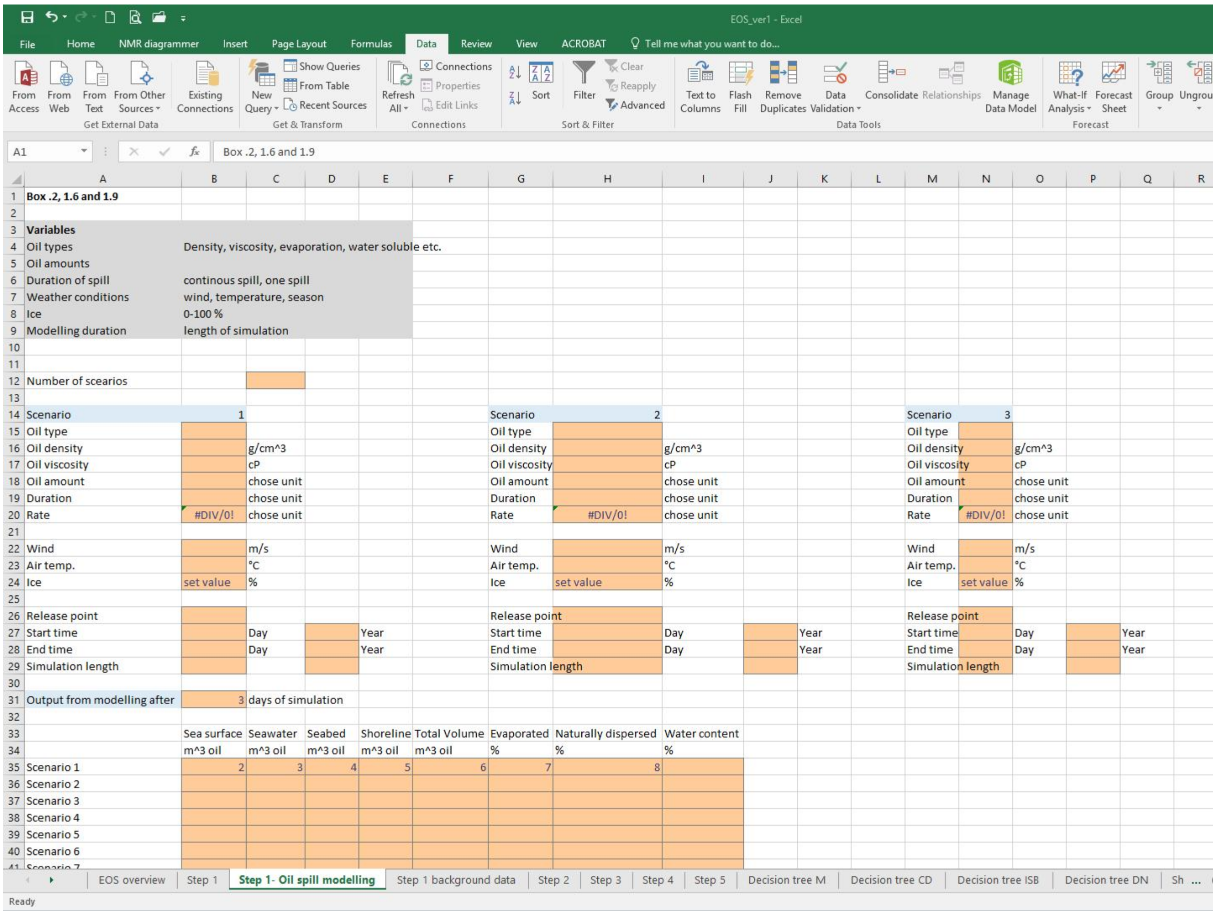
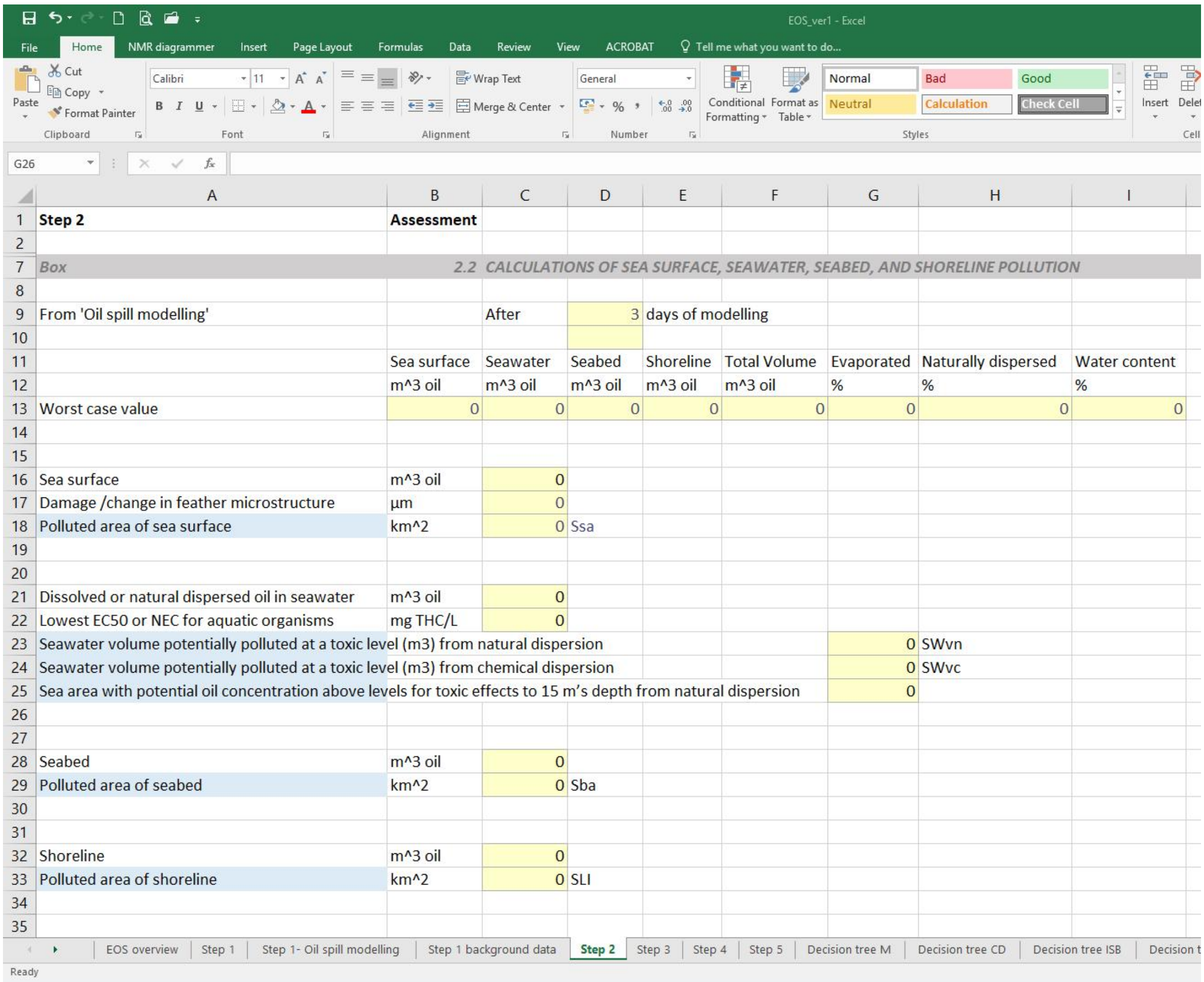


Figure 2: Example of Step 1 Oil spill modelling, where the three explanatory boxes related to the oil spill modelling is complied into one sheet.

Data from the Oil modelling data sheet and Step 1 sheet are linked to the Step 2 sheet, as can be seen from Figure 3. The light yellow cells indicate where input are retrieved from the other sheets and used to calculate, e.g., the pollution of sea surface, seawater, seabed and shoreline.

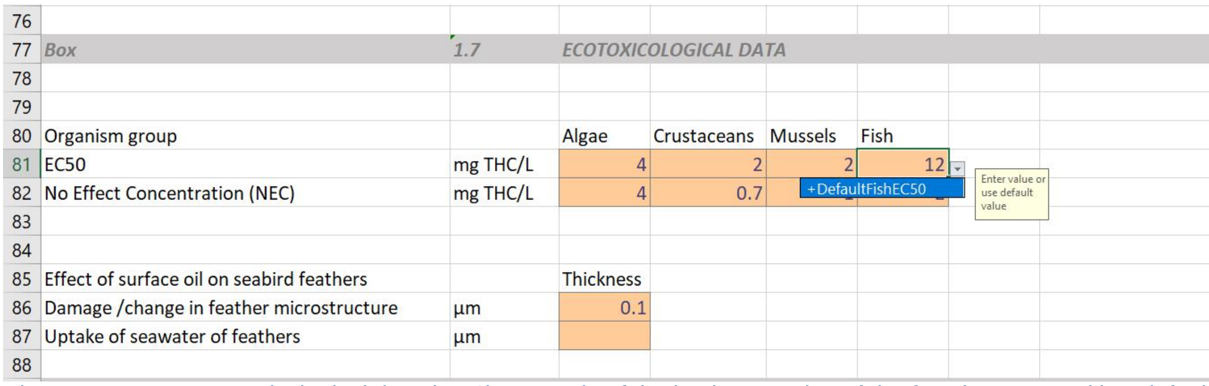
Another feature in some of the cells in the Excel document is the possibility to either include specific values or default values. This is the opportunity for, e.g., the Box 1.7 Ecotoxicological data (D5.8) (Step 1), where we have provided default values, but where it is possible to enter a specific value if more relevant for the specific area that the SNEBA is made for. This approach will be used in the entire Excel document where it is appropriate. See Figure 4 for an example.

In the sheets of Step 3, 4 and 5, the scores and decisions trees will be presented and also linked to the other sheets in the same manner as described above.



	A	B	C	D	E	F	G	H	I
1	**Step 2**	**Assessment**							
2									
7	*Box*	*2.2*	*CALCULATIONS OF SEA SURFACE, SEAWATER, SEABED, AND SHORELINE POLLUTION*						
8									
9	From 'Oil spill modelling'		After	3	days of modelling				
10									
11		Sea surface	Seawater	Seabed	Shoreline	Total Volume	Evaporated	Naturally dispersed	Water content
12		m^3 oil	m^3 oil	m^3 oil	m^3 oil	m^3 oil	%	%	%
13	Worst case value	0	0	0	0	0	0	0	0
14									
15									
16	Sea surface	m^3 oil	0						
17	Damage /change in feather microstructure	µm	0						
18	Polluted area of sea surface	km^2	0	Ssa					
19									
20									
21	Dissolved or natural dispersed oil in seawater	m^3 oil	0						
22	Lowest EC50 or NEC for aquatic organisms	mg THC/L	0						
23	Seawater volume potentially polluted at a toxic level (m3) from natural dispersion						0	SWvn	
24	Seawater volume potentially polluted at a toxic level (m3) from chemical dispersion						0	SWvc	
25	Sea area with potential oil concentration above levels for toxic effects to 15 m's depth from natural dispersion						0		
26									
27									
28	Seabed	m^3 oil	0						
29	Polluted area of seabed	km^2	0	Sba					
30									
31									
32	Shoreline	m^3 oil	0						
33	Polluted area of shoreline	km^2	0	SLI					
34									
35									

Figure 3: Step 2, Box 2.2 (D5.8) calculation of sea surface, seawater, seabed and shoreline pollution.



76						
77	*Box*	*1.7*	*ECOTOXICOLOGICAL DATA*			
78						
79						
80	Organism group		Algae	Crustaceans	Mussels	Fish
81	EC50	mg THC/L	4	2	2	12
82	No Effect Concentration (NEC)	mg THC/L	4	0.7		
83						
84						
85	Effect of surface oil on seabird feathers		Thickness			
86	Damage /change in feather microstructure	µm	0.1			
87	Uptake of seawater of feathers	µm				
88						

Figure 4: Box 1.7 Ecotoxicological data (D5.8), example of the implementation of the function to use either default values or more area specific values.

5 Conclusive remarks

As a result of feedback, input and comments in connection with workshops and meetings where the beta version of the SNEBA tool (D5.8) was presented, it was decided to include a more interactive component in the SNEBA tool. This component consists of an excel document with formulas for calculations and scores (see Chapter 3) with references to explanatory boxes. Screening through decision trees will be maintained (see D5.8).

To avoid the use of the term “benefit” as in Strategic Net Environmental Benefit Analysis, the title of the tool may change to Environment & Oil Spill Response (EOS) - an analytic tool for environmental assessments to support oil spill response design.

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