REPORT

Expert elicitation to identify key uncertainties

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Expert elicitation to identify key uncertainties

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This report summarizes the activities conducted in WP 4 “Risk governance and ocean acidification: understanding the role of uncertainty“, WP 3.4 Task 1 “Expert elicitation to identify key uncertainties”, within the Fram Flagship on Ocean Acidification project “Ocean Acidification - Drivers and Effects on Arctic Marine organisms and ecosystems (OA-DREAM)”.

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PREFACE

Uncertainty and high complexity are key characteristics of the issue of the impact of ocean acidification. Social scientists within the Fram Flagship on Ocean Acidification project "Ocean Acidification - Drivers and Effects on Arctic Marine organisms and ecosystems (OA-DREAM)" will therefore explore how this uncertainty is handled and treated by scientific experts and governmental officials. Here we report on the findings from the first year of the project from WP 4 "Risk governance and ocean acidification: understanding the role of uncertainty", WP 3.4 Task 1 "Expert elicitation to identify key uncertainties", where scientific experts within the Flagship were interviewed on the topic.

Tromsø, 10.04.19

Jannike Falk-Andersson

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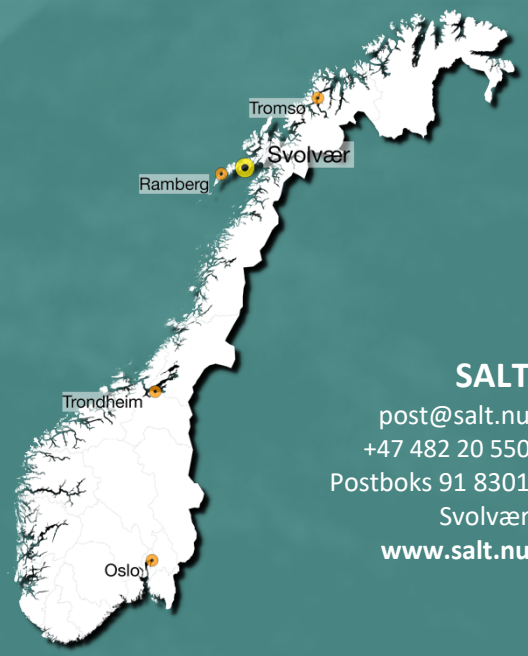
Project leader WP 3.4 Task 1, SALT

Main chapters



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CONTENT

Summary

This report summarizes the activities conducted in WP 4 "Risk governance and ocean acidification: understanding the role of uncertainty", WP 3.4 Task 1 "Expert elicitation to identify key uncertainties", within the Fram Flagship on Ocean Acidification project "Ocean Acidification - Drivers and Effects on Arctic Marine organisms and ecosystems (OA-DREAM)". A workshop with the researchers in the Fram Centre flagship on Ocean Acidification together with a literature review informed an interview protocol that was used in interviewing 18 researchers within the flagship to identify how they view, handle and communicate uncertainties. The interviews were analysed in Nvivo, forming the basis for an extensive analysis on the interview material that will be used as a basis for a scientific publication. The interviews also gave input to Task 2 of WP 3.4 where decision-makers will be interviewed to explore their understanding of the impacts of ocean acidification, uncertainties and management options.

1. INTRODUCTION

Knowledge regarding ocean acidification (OA) impacts and options to manage these are characterized by significant uncertainties, compounded by the multiple stressors context in which OA occur (Kelly and Caldwell 2013; Cvitanovic et al. 2015). Previous studies have found that the knowledge gaps on OA effects on ecosystems and organisms and how these then manifest in society are too large to assess socio-economic impacts of OA on keystone species (Falk-Andersson et al. 2017). Our work has therefore used the analytical approach of risk governance (e.g. van Asselt and Renn (2011)) that take uncertainty and incomplete knowledge as a given and allows us to focus on how management decisions on OA can be taken in the face of uncertainties.

The aim of Task 3.4.1 has been to identify and improve the understanding of how scientists within the Flagship, engaged in different disciplines and areas of OA research view, handle and communicate uncertainties they encounter in their work. This report summarises the background for the project, the method used and illustrates how the interview material was collected and explains how this will be used in the remainder of the project.

2. METHOD

An initial workshop with flagship scientists was held in conjunction with the start-up meeting of the Flagship in June 2018. In the workshop, scientists reflected upon the uncertainties they encounter and manage in their work, individually and in groups. The scientists were introduced to the aims of the workshop which were 1) get input to the interview protocol, 2) get them to reflect on the issue and 3) to spark a discussion on the topic. As a warming up exercise, the scientists were asked to write on a post-it note what uncertainty is to them Figure 1). Then they were asked to reflect 10 minutes individually on the research they were involved with, the type of uncertainties associated with this and how they handled these uncertainties. They were given an example from modelling (Figure 2). Then they were given 20 minutes to discuss this in three predefined groups and finally present the main findings to the whole group (Figure 3).

Figure 1 Workshop participant´s response to the question "What is uncertainty"?

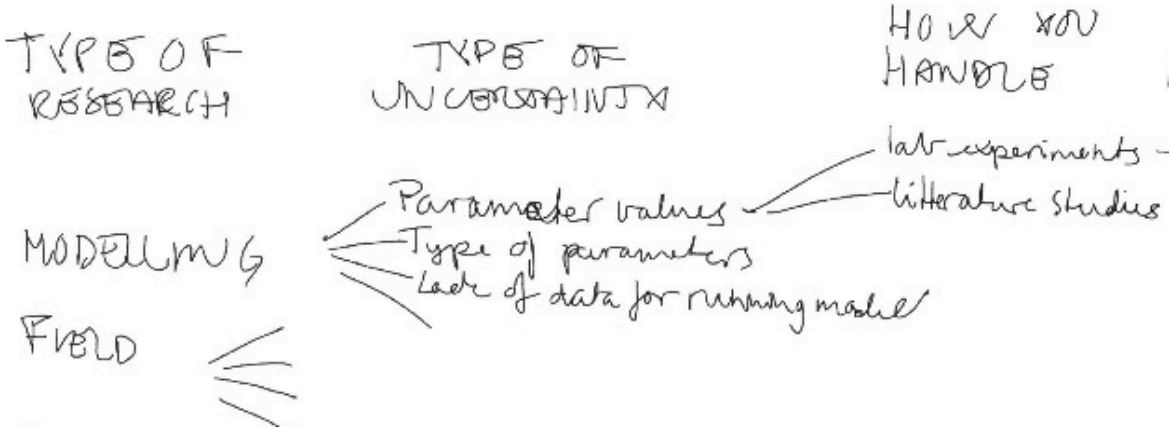

Figure 2 Example of type of uncertainty and how it is handled with respect to modelling.

Figure 3 Group work on uncertainty related to OA research. Type of research was listed on the sheet to the left, the type of uncertainties related to these in the middle, and how they handled these on the sheets to the right.

Based on the workshop and a literature review, we developed an interview protocol that allows us to capture and categorize various uncertainties and means of managing and communicating these. Those interviewed were informed about the ethical requirements of the interview, including that their anonymity would be secured, and their right to withdraw at any stage. The interview started with some background questions on their research, then asked about different types of uncertainty related to context, data, modelling and unknowns (known unknowns) in their research, what their drivers were, how it affected their work, how they managed this and who they communicated this to. Finally, the scientists were asked some implication questions.

Due to a delay in receiving the necessary approval for data collection (semi-structured interviews) and storage of data from the Norwegian Centre for Research Data, there was a delay in the start-up of the interviews. Interviews were conducted in the period December 2018-March 2019. A total of 18 researchers were interviewed, notes were taken during the interview and the interviews analysed using Nvivo using the following nodes: Lack of data, Uncertainty related to data, Compensation for lack of data, Data collection to reduce uncertainty, Data analysis to reduce uncertainty, Interconnections between units and the system, Predicting changes, Need for basic research to understand the system, Communicate uncertainty, Working interdisciplinary, Advice to managers and decision makers and Uncertainty and unknown integrated in the science.

3. RESULTS

The initial findings suggest that scientists have a clear understanding of how uncertainty is a part of the science they do at different levels, from designing the research, conducting, analysing and communicating their research. They also have some knowledge on what types and how this uncertainty is and isn't communicated to the management level.

An extensive working document analysing the interview material has been produced and will be used as a basis for a scientific report synthesising results from Task 1 and Task 2 in WP 3.4. To avoid potential conflict with requirements from scientific journals that results cannot have been published previously, we will only give an example here of how the interview material has been processed, further analysis and how it may be used to inform Task 2.

Example of analysis of node "Data analysis to reduce uncertainty"

Table 1 gives an overview of which respondents mention different types of tools used in data analysis to reduce the level of uncertainty.

How data is interpreted is an important factor in data analysis (5 respondents). The difference between causation and correlation was mentioned, so was the importance of a balanced interpretation recognising uncertainty and that one had to be careful about the conclusion drawn from models.

Whether we are looking at the right type of data to understand the changes in nature was mentioned (5 respondent). The data also has to be statistically good and it is important to secure that the analysis is correct and of good quality.

Good communication with modellers was also stressed (2 respondents).

Comparing the output of different models (5 respondents) that are built up differently either due to differences in underlying assumptions, parameters and/ or relationships can give different scenario projections, improve our understanding of mechanisms and relationships in nature and be used to discover uncertainty. "When you get a difference between the model and your observations, then you know that you have an uncertainty" (NP 3). Also, running the same model under different scenarios and doing sensitivity analysis involving looking at the effect of making small changes in parameter values was stressed as important.

Interview object nr/ Tools	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Interpretation	x		x					x	x							x
Use of the right data and analysis						x				x				x	x	x
Communication	x					x										
Compare output of different models/ model runs	x	x					x	x								x

Table 1 Overview of which respondents mentioned how data analysis can contribute to reducing uncertainty.

Further analysis

The interview material will be further processed to synthesise the material in overview tables with examples in the text summarising important inputs from the scientists. Relevant papers on risk governance will be identified and form the basis for the scientific paper integrating results from Task 1 and Task 2.

How the interviews in Task 1 informed Task 2

Task 2 will map and analyse the uncertainties and knowledge gaps identified and held by national and regional government officials. The interviews of the scientists identified several potential issues that may be integrated in the interview protocol to be used in Task 2.
Some of the scientists pointed to the fact that while the impact of OA on coastal ecosystems have the largest impact on society, this is where we have the least information. Also, there are different levels of impact, from impact on individuals, to populations, to ecosystems, which all have uncertainties connected to them. Our understanding of impacts also decreases as we move from studying individuals to understanding the impact on ecosystems, in addition to multiple stressors (i.e. OA and warming) affecting the system simultaneously.
There seems to be a potential conflict between the knowledge the researchers believe is missing to increase our understanding of the impacts of OA, and the research being prioritised. Furthermore, while the scientists do a lot to reduce uncertainties related to their research, they would like to communicate to the management level how uncertainties that affects their conclusions.
Other topics that scientists raised with respect to uncertainty included the difference between correlation and causation, uncertainties related to modelling of OA impact and the ability to predict changes over time.
After analysing the interview material, we also felt that it would be interesting to know if the managers have been involved in research project on OA, if they have any advice to OA scientists, what information they would like and if they feel they have the tools needed to manage OA. How they deal with the uncertainties related to OA impact will be a central issue to be discussed, but also if and how the management level contributes to reducing CO_2 emissions, and what tools they have to reduce the impact of OA.

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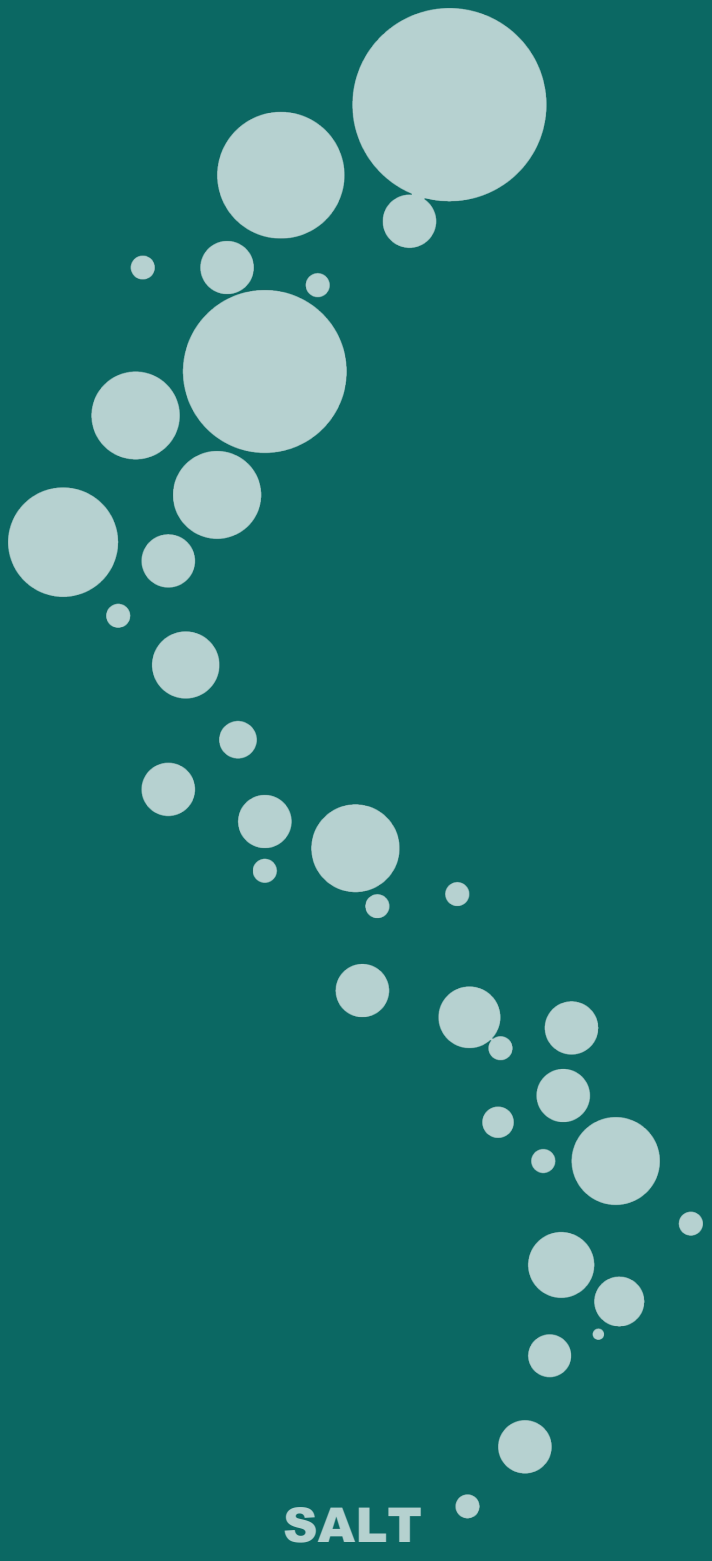
SALT kunnskap – friske ideer



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