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NORWEGIAN COASTAL ADMINISTRATION

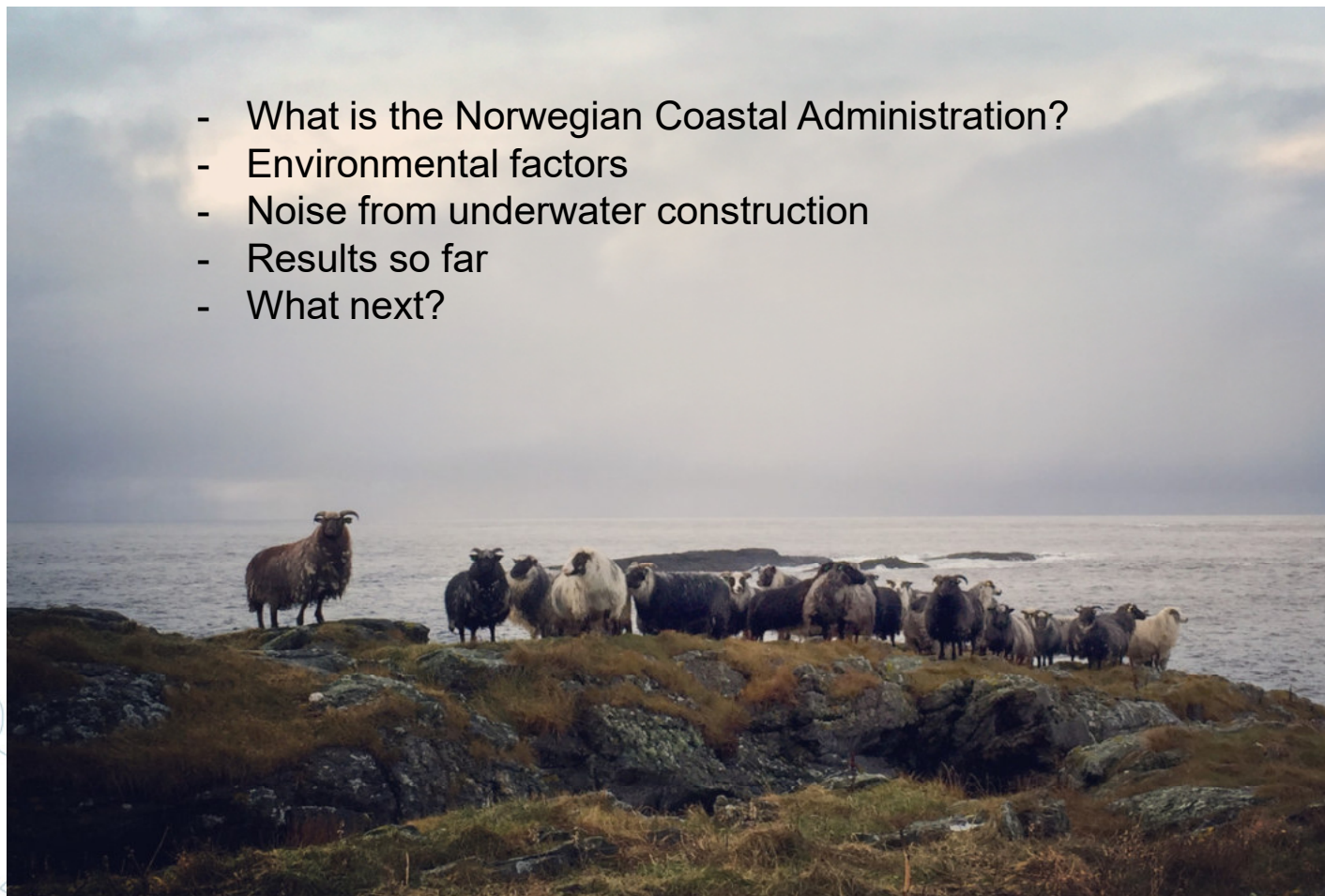
Improving fairways

The potential effect of underwater noise from construction

Camilla Spansvoll, environmental advisor
Rovaniemi, October 11th

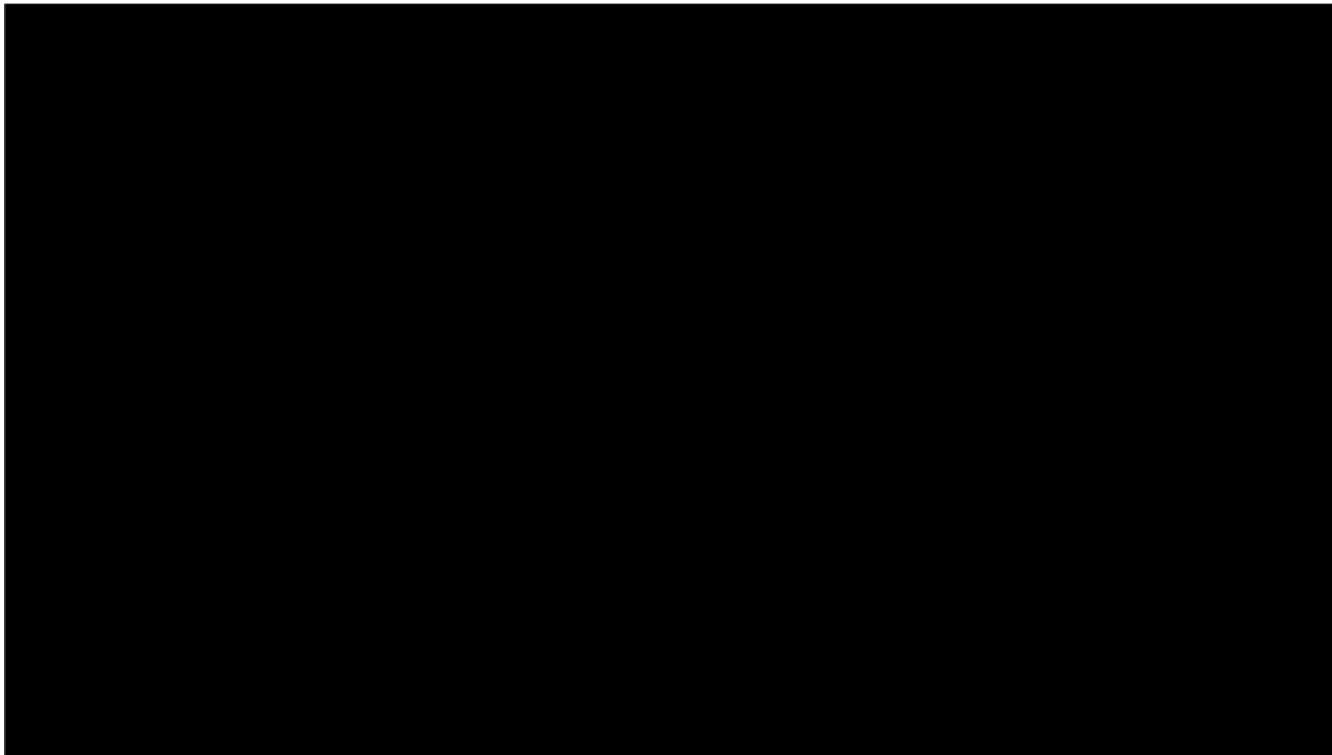
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- What is the Norwegian Coastal Administration?
- Environmental factors
- Noise from underwater construction
- Results so far
- What next?



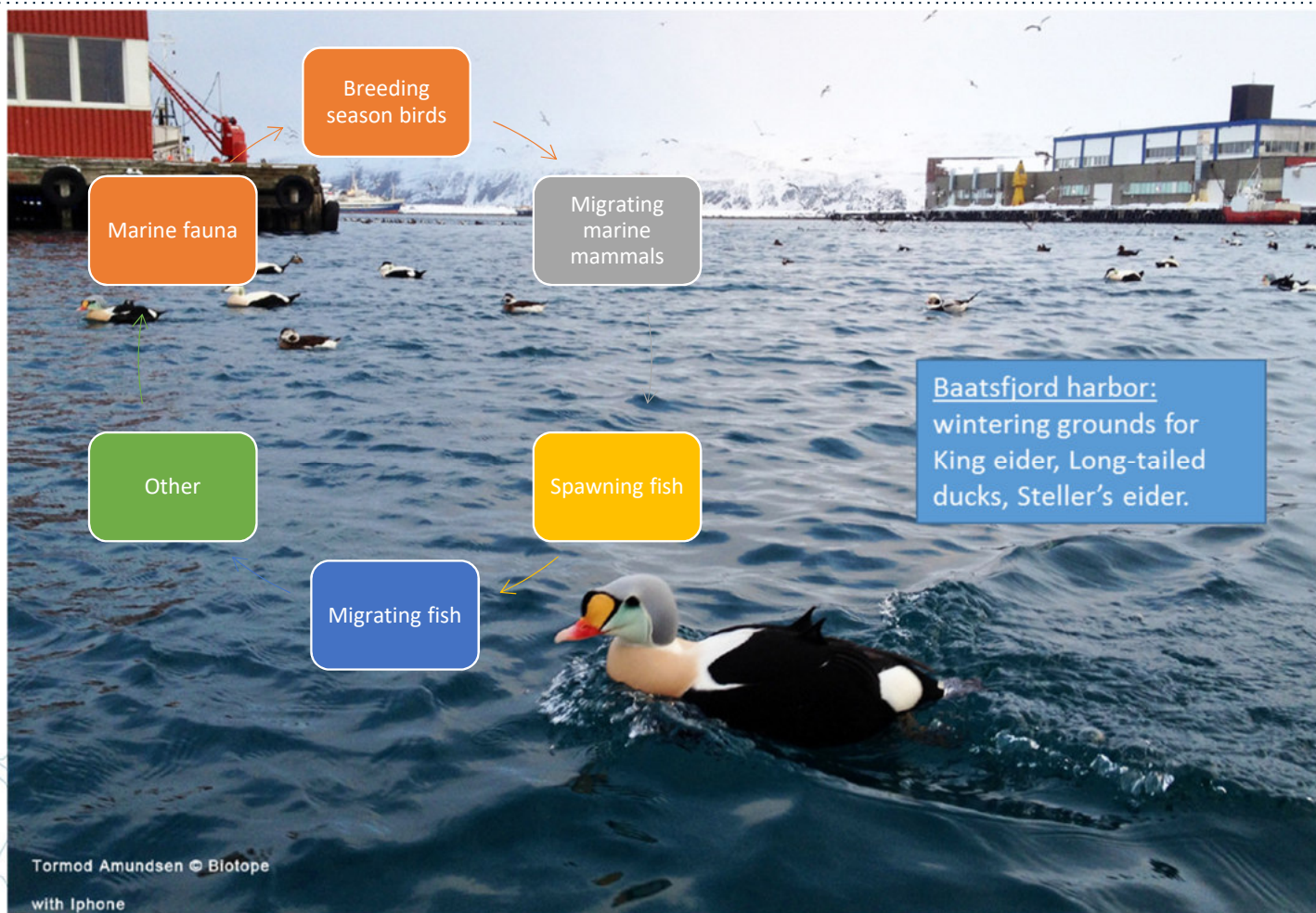
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The Norwegian Coastal Administration - NCA



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Environmental factors - examples



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Underwater noise from construction

Underwater explosions assessment in Baatsfjord



Identifying properties of piling noise



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Underwater measurements - Baatsfjord

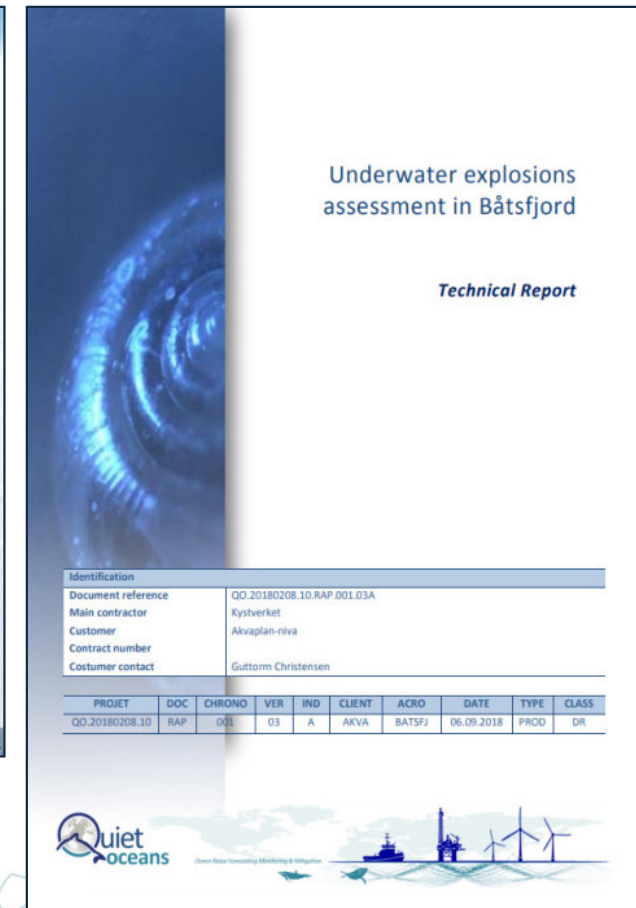
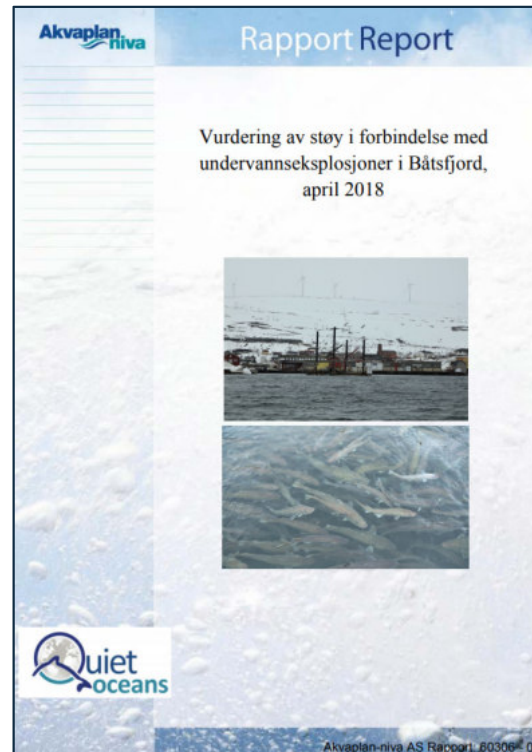
24th – 26th of April, 2018

Underwater acoustic measurements
of dynamite-type explosive blasting

- Part of a expansion of the mooring area

Five buried explosive blasts (56 – 529 kg)
were made in different configurations

Special attention on the effects on a nearby
fish farm (900 meters distance)



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Some results

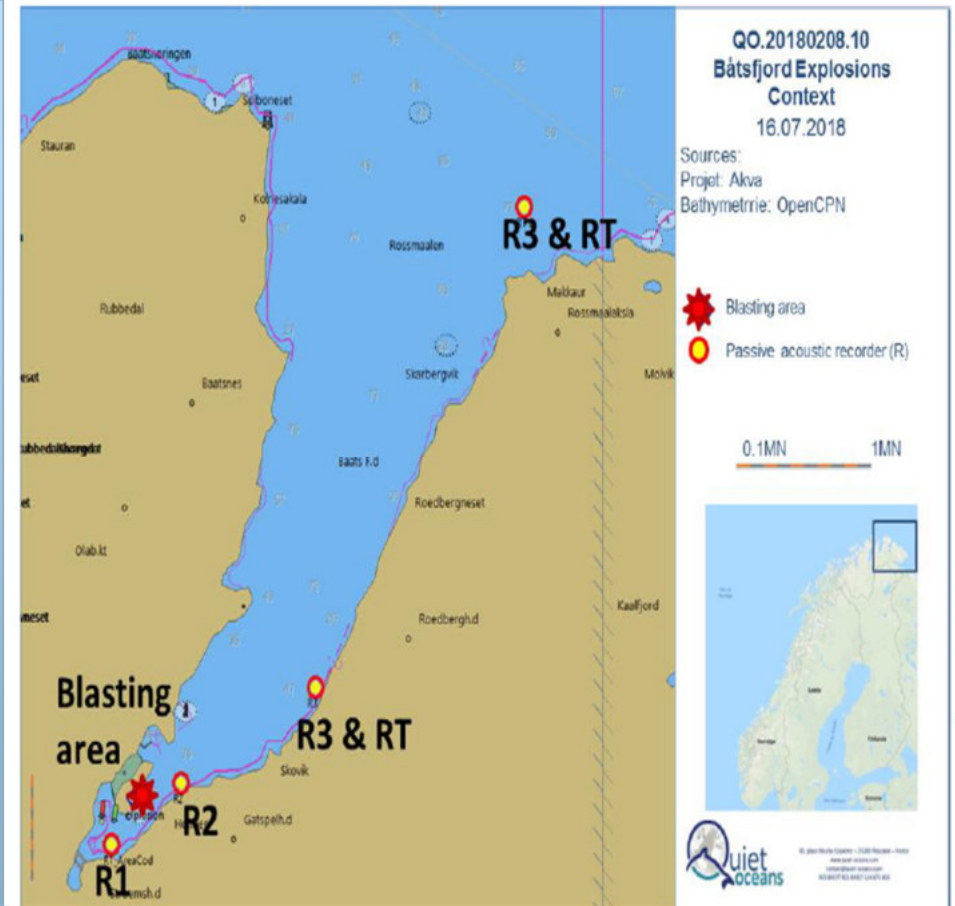
Small variations in peak-values for all explosive loads (56 – 529 kg)

- Can be explained by the use of micro-delay
- The use of delay reduces the “peak”, but the total amount of energy for the blast is more or less the same.

The sound perceived at the location of the fish farm (900 m away) was reduced due to a strong attenuation and refraction by the topography of the fjord.

To date, the threshold for fish mortality is in the range of 258 – 359 m (Popper, et al., 2014).

A rough extrapolation calculates that the sound from each explosion could be heard 96 – 400 km away



Shot	Date	Blasting time UTC	Recorder	Location	Distance from blasting point (m)	SPL pk-pk (dB ref 1μPa) Unweighted	SPL 0-pk (dB ref 1μPa) Unweighted	SPL rms (dB ref 1μPa) Unweighted	SEL (dB ref 1μPa²s) Unweighted
D2_S01	24/04/2018	08:34:00	ENR-018	R1	900	177.3	171.9	154.1	153.6
			ENR-015	R2	1100	214.3	208.6	192.2	188.2
			ENR-017	R3	4500	NA	NA	NA	NA
			icl1738	RT	4500	NA	NA	NA	NA
D2_S02	24/04/2018	12:34:00	ENR-018	R1	900	181.6	176.4	158.8	157.0
			ENR-015	R2	1100	216.8	212.3	193.7	189.8
			ENR-017	R3	13100	166.1	161.6	135.0	134.0
			icl1738	RT	13100	172.0	167.7	151.0	146.0
D2_S03	24/04/2018	15:44:50	ENR-018	R1	900	179.2	175.4	157.8	156.3
			ENR-015	R2	1100	214.5	210.0	192.6	188.7
			ENR-017	R3	13100	172.6	166.9	155.8	147.7
			icl1738	RT	13100	167.3	161.5	146.3	145.9
D3_S01	25/04/2018	19:32:00	ENR-018	R1	900	176.0	171.0	154.9	154.8
			ENR-015	R2	1100	215.0	210.8	196.1	193.0
			ENR-017	R3	13100	170.8	165.9	154.7	152.1
			icl1738	RT	13100	174.6	169.2	158.6	155.6
D4_S01	26/04/2018	14:56:00	ENR-018	R1	900	191.3	188.3	166.3	162.8
			ENR-015	R2	1100	NA	NA	NA	NA
			ENR-017	R3	13100	171.4	166.4	155.5	149.9
			icl1738	RT	13100	171.8	166.7	155.7	150.9

Cod reacting to the largest explosion



- 900 meters from site
- 29 wells, 529 kg dynamite (sequential/micro-delay)
- Not a conventional fish farm, but live storage of cod
- Reaction seen on the fish before blast could be heard above water

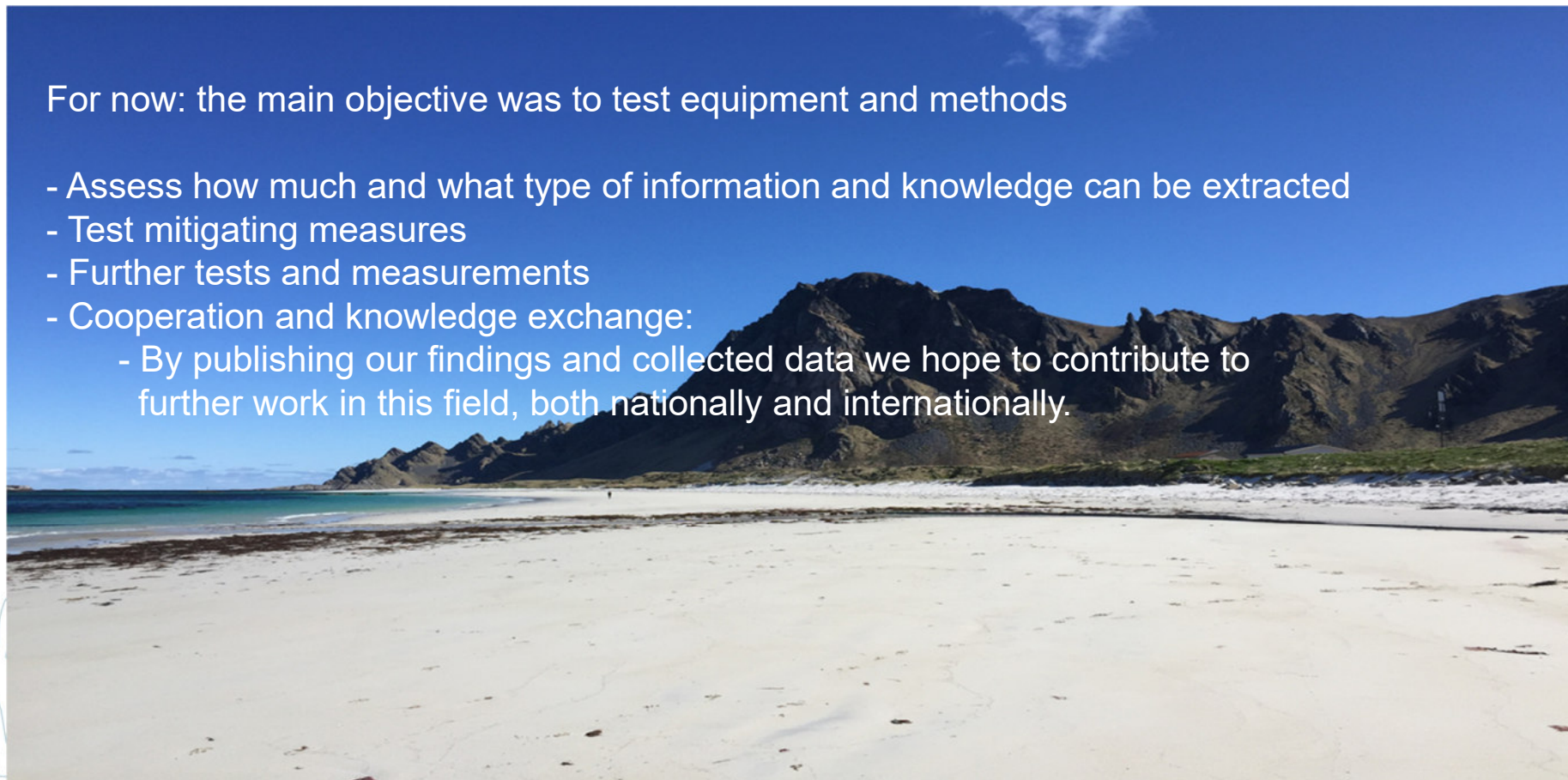


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What next?

For now: the main objective was to test equipment and methods

- Assess how much and what type of information and knowledge can be extracted
- Test mitigating measures
- Further tests and measurements
- Cooperation and knowledge exchange:
 - By publishing our findings and collected data we hope to contribute to further work in this field, both nationally and internationally.



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CLEAN, SAFE AND EFFICIENT SEAWAYS

www.kystverket.no

camilla.spansvoll@kystverket.no

