KYSTVERKET

Risk Assessment
Preparedness
Accidental spills from ships

Ove Njøten
Norwegian Coastal Administration

Risk assessment task given by the Norwegian Ministry of Fisheries and Coastal Affairs

The last risk assessment with some adjustments was conducted in 2000/2001.

- The preparedness against acute pollution from ships should be based on knowledge about environmental risk.
- The risk assessment should include the further development of traffic (2025) from ships in Norwegian waters, including the effect of risk reducing measures as Emergency Towing vessels, Traffic separation schemes , VTS etc.
- Svalbard is not included.

3 step analyses

1. Analyses of the probability of accidents with spills from shipping accidents

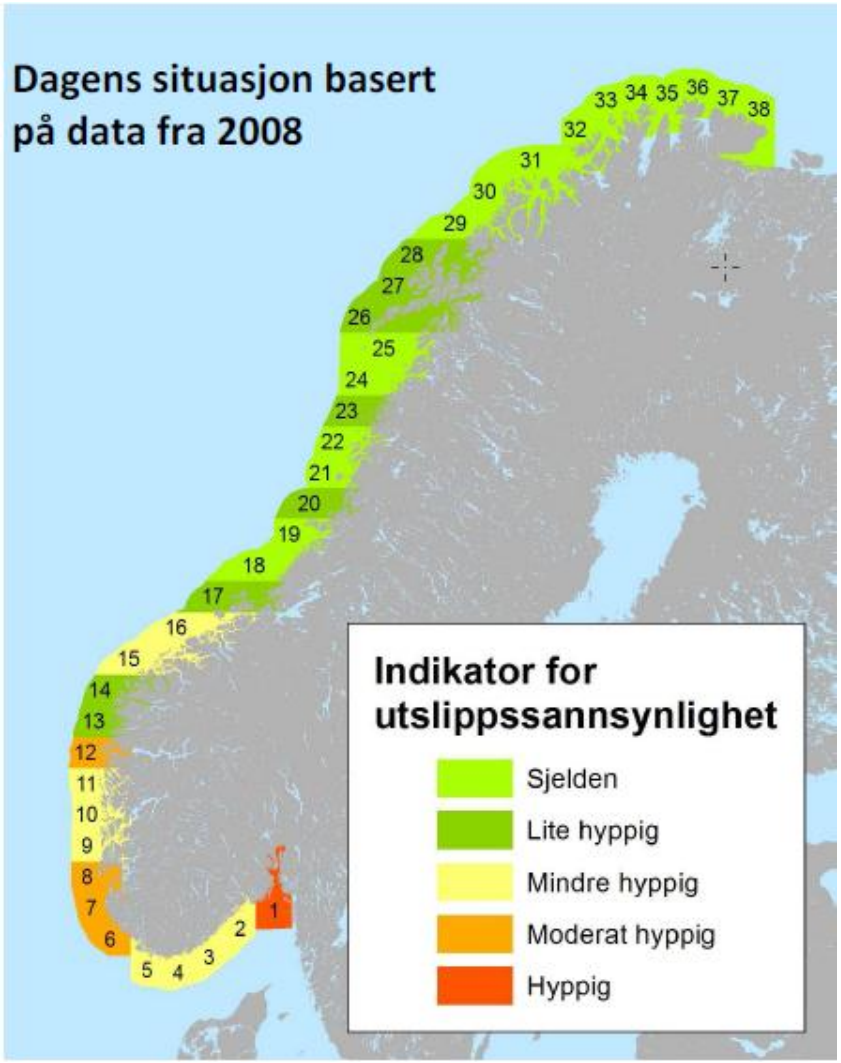
2. Environmental Risk Analyses- The conscience of different spills shipping accidents

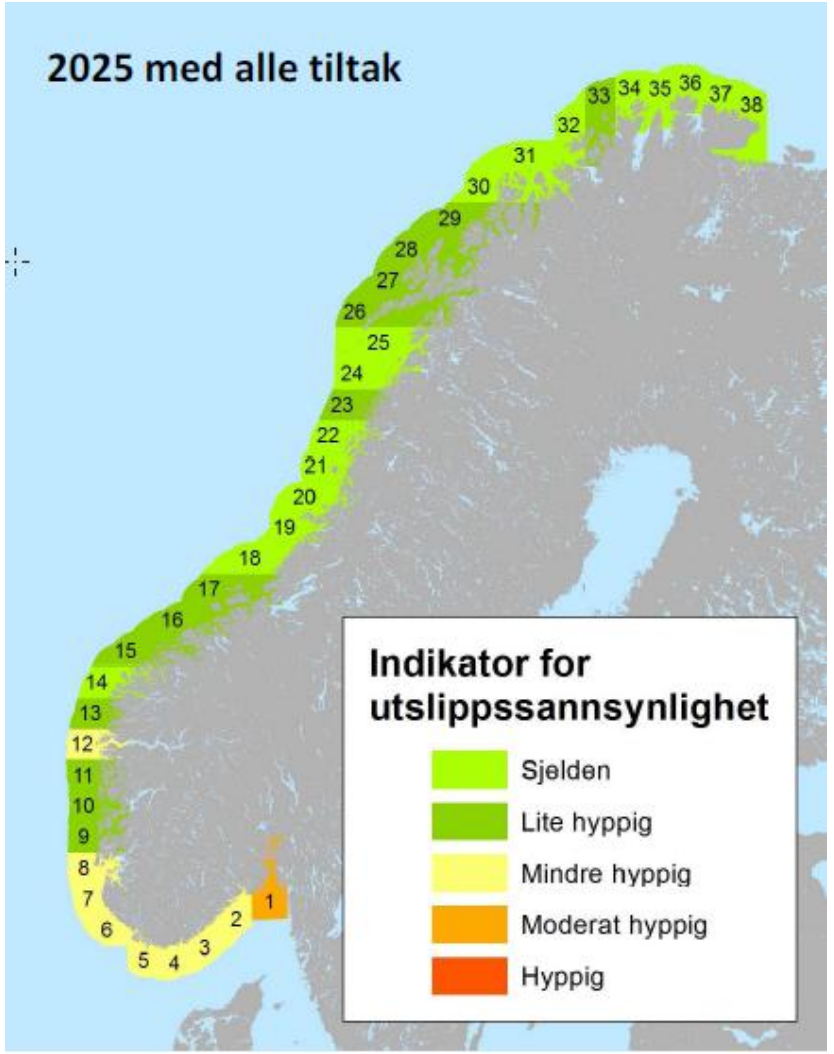
3. Analyses of the preparedness

Right recovery equipment and how much – response time -

Step 1:
Analyses of the Probability of acute spills from shipping accidents 2008-2025
Input

- Traffic data for 2008 - AIS data > 300 Gross register ton
- Divided into 12 categories of type ships and 7 size categories
- Prognoses of shipping for 2025.
  Expected increase in sailed distance from 2008 to 2025 is 16%
- Assumption: Probability of spills is proportional to sailed distance.





Geografisk fremstilling av utslippssannsynlighet beregnet for 2008 og for 2025 med alle tiltak (VTS, TSS og slepebåt)

Main Findings - Propability

- Oslofjord, South/west of Norway, Mongstad/Fedje is the areas with the highest probability of oil spills
- The largest increase towards 2025 is in the North of Norway.
- Most likely incident: Bunker oil from cargo ship, 400 ton
- Crude oil: Most likely between 2000-20000 ton.

Step 2:

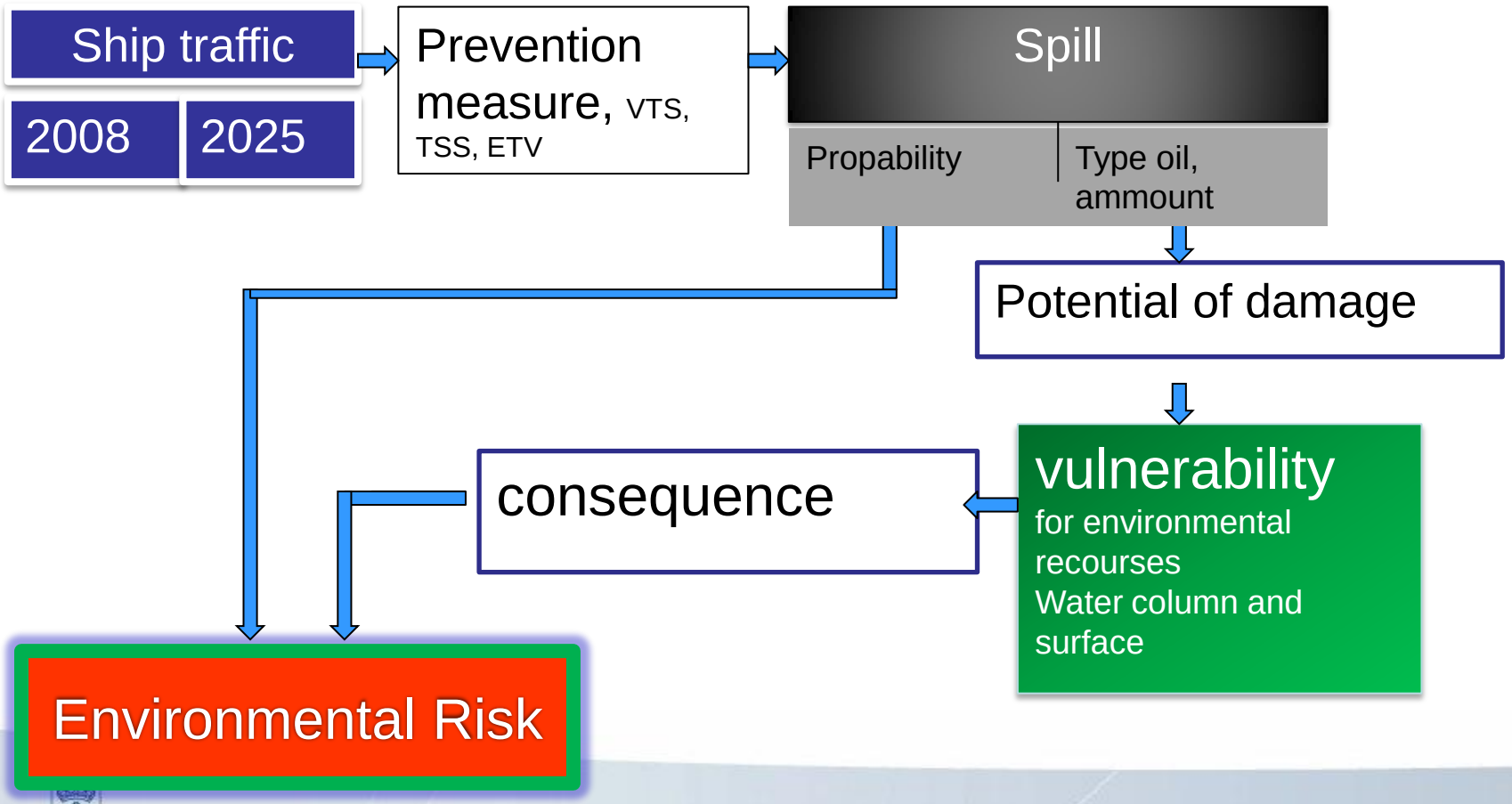
Analyze of environmental risk related to acute pollution from shipping accidents

- The analyze looks into consequence for seabirds sea mammals, Habitats on beaches and fish.

- The type of spill is to consider, how the oil spreads on the surface, how is spread in the water column.

- The Probability analyses is a input to the total risk analyses.

Environmental Risk



Step 3:
Analyzes of preparedness

- How much oil spill recovery equipment should we have and were should it be placed
- expertise : how many qualified people do we need the operate equipment and do work in a oil spill incident

Input

- Environmental risk analyses– were is the highest risk, and what will most likely happen in this area.
- NCA own reports and experience for accidental spills for the last 10 years
- Scientific papers

Resources

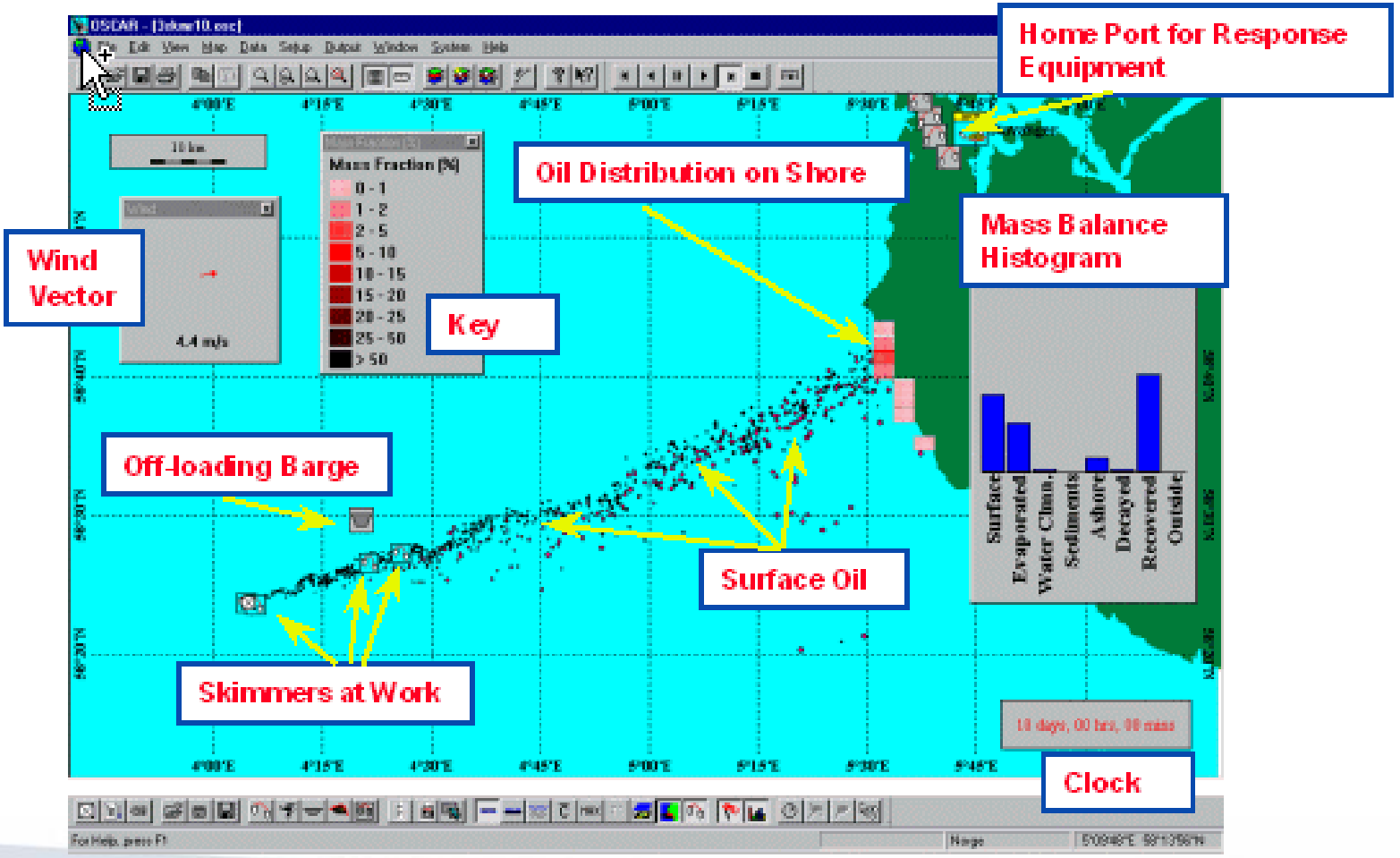
- Municipalities – equipment and qualified personnel
- Industry recourses- equipment and qualified personnel
- NCA and other governmental bodies - equipment and qualified personnel
- International agreements - equipment and qualified personnel

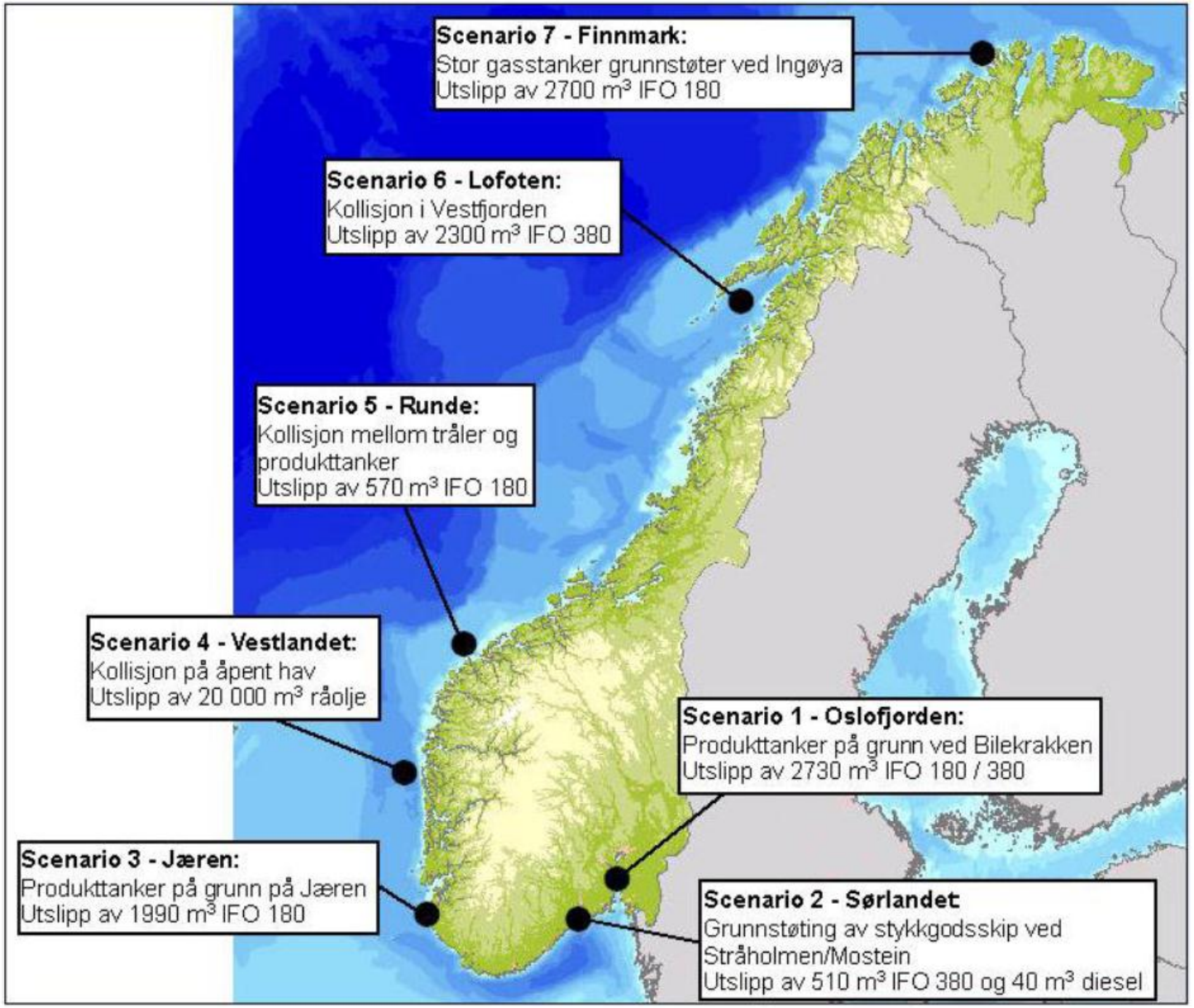
Methodology – High risk preparedness

- 7 incidents of ship accidents simulated trough OSCAR (SINTEF - mathematical model to measure effects of different measures dealing with oil spills).
- Other aspects dealt with out side of OSCAR
  - Beach cleanup operation
  - Competence and management

  Gap analyze between recommended solution and today's preparedness

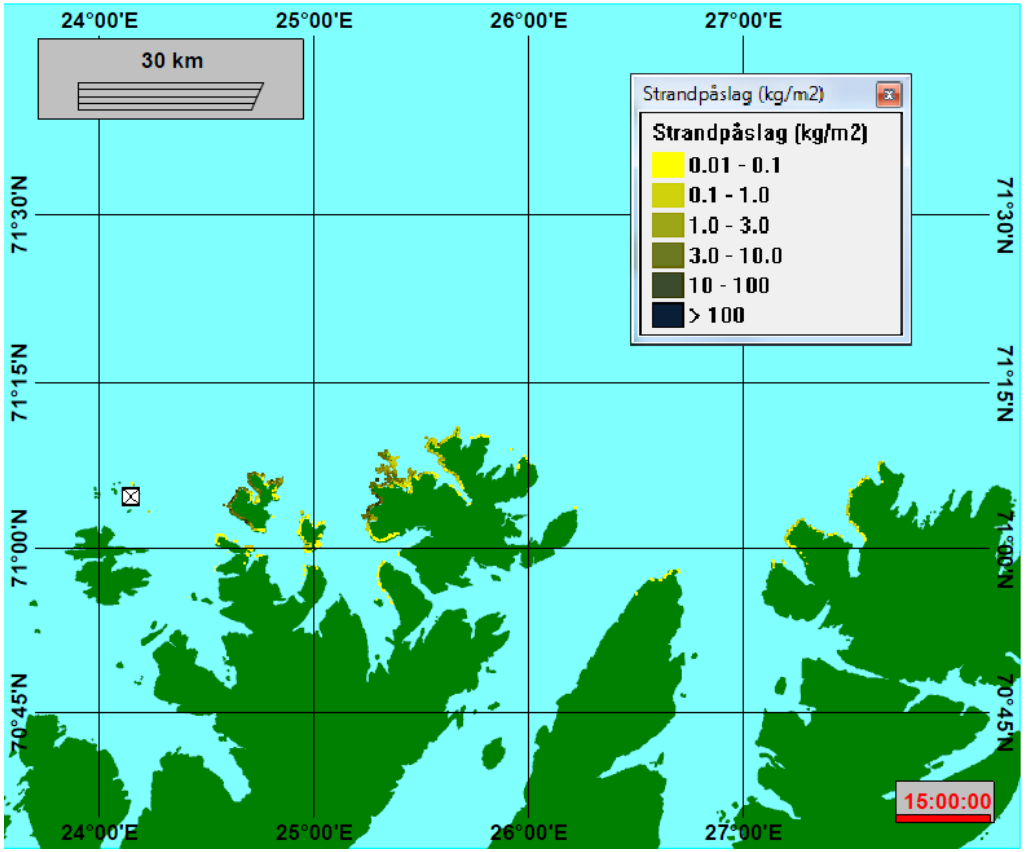
OSCAR


Home Port for Response Equipment
Oil Distribution on Shore
Mass Balance Histogram
Wind Vector
Key
Off-loading Barge
Surface Oil
Skimmers at Work
Clock
Mass Fraction [%]
0 - 1
1 - 2
2 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 50
> 50
4.4 m/s
Surface
Evaporated
Water Chem.
Sediments
Ashore
Decayed
Recovered
Outside


Scenario 7 - Finnmark:
Stor gasstanker grunnstøter ved Ingøya
Utslipp av 2700 m³ IFO 180
Scenario 6 - Lofoten:
Kollisjon i Vestfjorden
Utslipp av 2300 m³ IFO 380
Scenario 5 - Runde:
Kollisjon mellom tråler og produkttanker
Utslipp av 570 m³ IFO 180
Scenario 4 - Vestlandet:
Kollisjon på åpent hav
Utslipp av 20 000 m³ råolje
Scenario 1 - Oslofjorden:
Produkttanker på grunn ved Bilekrakken
Utslipp av 2730 m³ IFO 180 / 380
Scenario 3 - Jæren:
Produkttanker på grunn på Jæren
Utslipp av 1990 m³ IFO 180
Scenario 2 - Sørlandet
Grunnstøting av stykkgodsskip ved Stråholmen/Mostein
Utslipp av 510 m³ IFO 380 og 40 m³ diesel

Simulation

- MEMW OSCAR 6.0 (Oil Spill Contingency And Response)
- Oil drift and weathering.
- Distribution of oil on the surface, in the water column, in sediments and stranded oil.
- 10 different actions (total oil spill recovery operation) is analyzed for each incident.



Environmental target for the action in each simulation

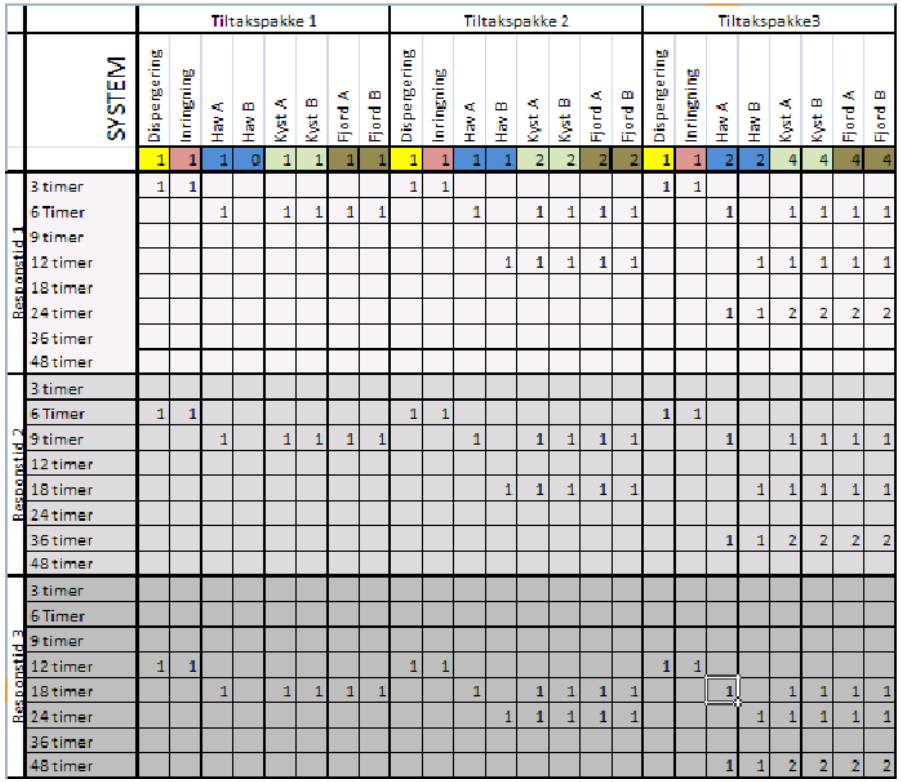
- Stop spreading of oil
- Consider use of dispersant
- Collect oil on surface.
- Protect environmental sensitive areas.
- Prohibit re mobilization of oil
- Clean up within certain time

Systems with recover capacities

Different action simulations

More recourses

Shorter Response time



		Tiltakspakke 1								Tiltakspakke 2								Tiltakspakke3							
	SYSTEM	Dispergering	Inringning	Hav A	Hav B	Kyst A	Kyst B	Fjord A	Fjord B	Dispergering	Inringning	Hav A	Hav B	Kyst A	Kyst B	Fjord A	Fjord B	Dispergering	Inringning	Hav A	Hav B	Kyst A	Kyst B	Fjord A	Fjord B
		1	1	1	0	1	1	1	1	1	1	1	1	2	2	2	2	1	1	2	2	4	4	4	4
Responstid 1	3 timer	1	1							1	1							1	1						
	6 Timer			1		1	1	1	1			1		1	1	1	1			1		1	1	1	1
	9 timer																								
	12 timer												1	1	1	1	1				1	1	1	1	1
	18 timer																								
	24 timer																			1	1	2	2	2	2
	36 timer																								
	48 timer																								
Responstid 2	3 timer																								
	6 Timer	1	1							1	1							1	1						
	9 timer			1		1	1	1	1			1		1	1	1	1			1		1	1	1	1
	12 timer																								
	18 timer												1	1	1	1	1				1	1	1	1	1
	24 timer																								
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Responstid 3	3 timer																								
	6 Timer																								
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	12 timer	1	1							1	1							1	1						
	18 timer			1		1	1	1	1			1		1	1	1	1			1		1	1	1	1
	24 timer												1	1	1	1	1				1	1	1	1	1
	36 timer																								
	48 timer																			1	1	2	2	2	2

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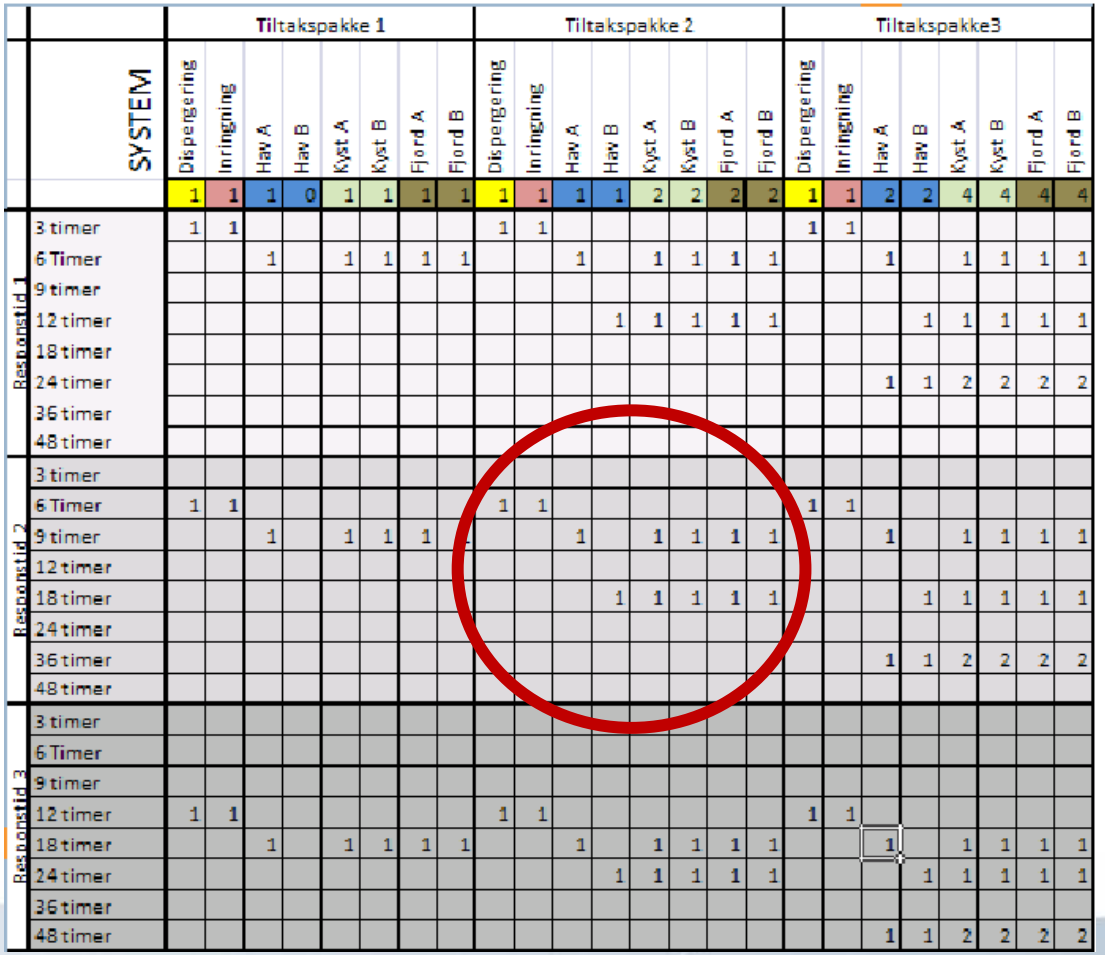
Evaluation

Responstid	Tiltakspakke	1	2	3
1	Rangering	1	1	1
	- Mengde opptatt olje	320 tonn	320 tonn	335 tonn
	- Lengde påvirket kystlinje	217 km	225 km	218 km
	- Influert havområde	175 km^2	175 km^2	175 km^2
2	Rangering	1	**1**	1
	- Mengde opptatt olje	275 tonn	**285 tonn**	310 tonn
	- Lengde påvirket kystlinje	218 km	**216 km**	219 km
	- Influert havområde	178 km^2	**172 km^2**	170 km^2
3	Rangering	-	-	-
	- Mengde opptatt olje	210 tonn	225 tonn	230 tonn
	- Lengde påvirket kystlinje	226 km	224 km	224 km
	- Influert havområde	180 km^2	180 km^2	180 km^2

- +Oil trough environmental sensitive areas
- + a cost/benefit analyses

Recommended preparedness

- **Tiltakspakke 2**
- **Responstid 2**



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		1	1	1	0	1	1	1	1	1	1	1	1	2	2	2	2	1	1	2	2	4	4	4	4
Responstid 1	3 timer	1	1							1	1							1	1						
	6 Timer			1		1	1	1	1			1		1	1	1	1			1		1	1	1	1
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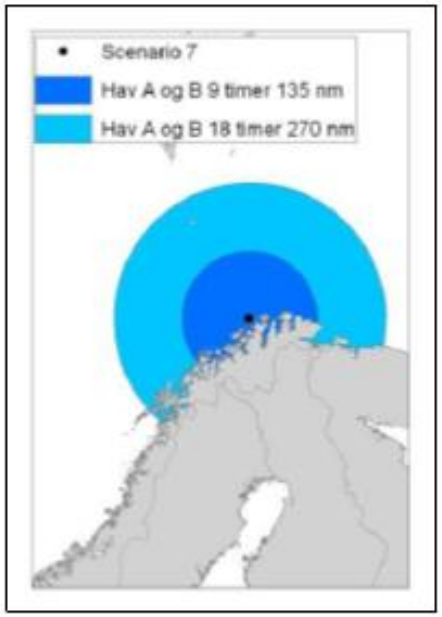
	12 timer	1	1							1	1							1	1						
	18 timer			1		1	1	1	1			1		1	1	1	1			1		1	1	1	1
	24 timer												1	1	1	1	1				1	1	1	1	1
	36 timer																								
	48 timer																			1	1	2	2	2	2

GAP-analyses

- A GAP Analyses has so been done for each of the 7 areas were the risk is highest

- For all other areas a GAP Analyses has been done for the most likely incident (400 ton bunker oil – cargo ship)

Responstid 2	Tiltakspakke 2							
	Dispergering	Inringning	Hav A	Hav B	Kyst A	Kyst B	Fjord A	Fjord B
	1	1	1	1	2	2	2	2
3 timer								
6 Timer	1	1						
9 timer			1		1	1	1	1
12 timer								
18 timer				1	1	1	1	1
24 timer								
36 timer								
48 timer								

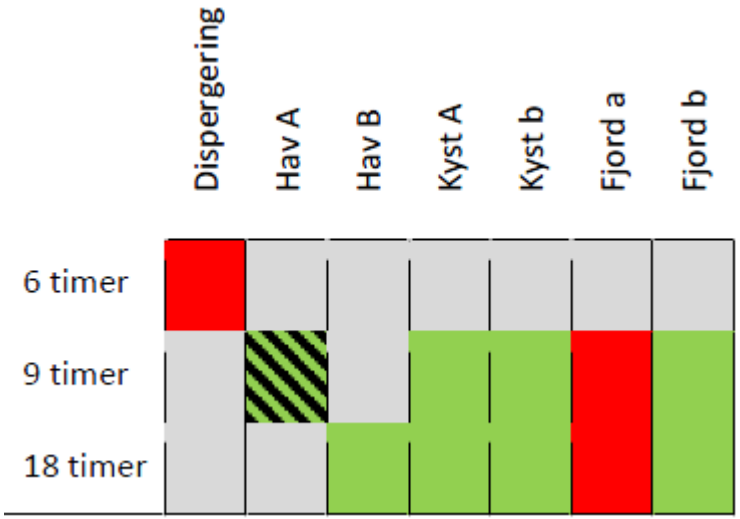


- NCA?
- Coastguard?
- Industry recourses?
- International recourses?
- NCA equipment ?

Tabell 6.2 Avstand (km) og frakttid (tt:mm) for utstyr mellom depoter

	Vadsø	Hammerfest	Tromsø	Lødingen	Bodø	Sandnessjøen	Ørland	Ålesund	Florø	Solund	Fedje	Bergen	Stavanger	Kristiansand	Horten
Vadsø		6:36	12:47	16:14	19:57	23:35	24:51	34:55	38:22	33:25	34:08	39:44	43:07	41:22	37:44
Hammerfest	421		8:27	11:58	15:37	19:15	24:11	30:35	34:02	32:45	33:28	35:24	38:47	37:04	33:25
Tromsø	751	451		5:11	9:14	12:52	19:43	24:11	27:39	28:17	29:00	29:01	32:24	30:39	27:01
Lødingen	1172	725	325		4:00	7:12	14:42	17:57	21:07	23:16	24:00	23:48	26:58	25:10	21:33
Bodø	1265	965	561	246		5:39	12:58	17:08	20:36	21:32	22:15	21:58	25:21	23:38	19:59
Sandnessjøen	1483	1182	780	466	342		8:50	13:09	16:36	17:24	18:07	17:58	21:21	19:37	15:58
Ørland	1782	1662	1246	935	810	552		5:23	8:32	10:42	11:25	11:23	14:53	13:24	9:47
Ålesund	2157	1857	1454	1131	1016	761	315		4:18	5:48	6:31	7:19	12:10	13:12	9:33
Florø	2439	2139	1736	1325	1298	1043	509	218		2:58	3:42	4:07	9:07	11:21	8:35
Solund	2294	2174	1758	1447	1322	1064	632	336	183		1:53	2:20	5:50	9:35	9:27
Fedje	2329	2209	1792	1482	1356	1098	666	371	217	104		1:37	5:07	8:52	8:53
Bergen	2515	2215	1812	1492	1374	1118	680	390	234	143	79		5:04	8:22	7:53
Stavanger	2699	2399	1996	1671	1559	1303	886	628	445	349	284	211		3:42	7:18
Kristiansand	2678	2377	1975	1648	1537	1282	886	826	655	579	514	485	234		3:58
Horten	2445	2144	1741	1396	1303	1048	633	593	529	604	524	476	460	248	

Gap for response at sea



Farge	Betydning
	Fartøy og/eller utstyr ikke tilgjengelig innenfor ønsket responstid
	Fartøy og utstyr **kan** være tilgjengelig innenfor ønsket responstid
	Fartøy og utstyr tilgjengelig innenfor ønsket responstid
	Fartøy og/eller utstyr ikke tilgjengelig innenfor ønsket responstid. Fartøy tilfredsstiller ikke kravene i forskrift for oljevernfartøy.
	Fartøy og utstyr **kan** være tilgjengelig innenfor ønsket responstid. Fartøy tilfredsstiller ikke kravene i forskrift for oljevernfartøy.
	Fartøy og utstyr tilgjengelig innenfor ønsket responstid. Fartøy tilfredsstiller ikke kravene i forskrift for oljevernfartøy.

Response – shore cleanup

Nøkkeltall	Resultat
Lengde påvirket kystlinje	216 km
Påvirket kystlinje i mob a- og naturvernområder	~26 km

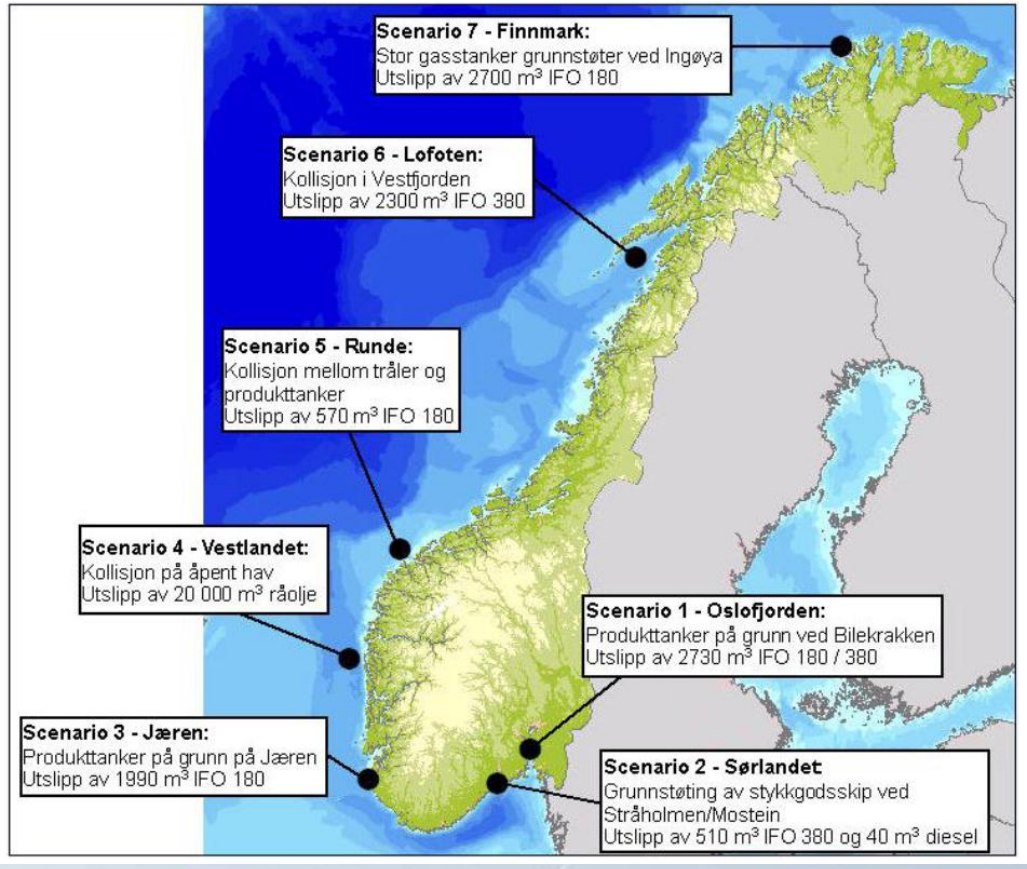
goal
Clean up before 15. mars, nesting season - seabirds

Beach cleanup operation

- 216 km polluted beach line will demand 54000 day's work. (4 meter beach-clearing pr person/day).
- In the case in the north of Norway (Scenario 7) there is 77days from the incident to the goal to finish the cleanup. This means that there is a need for 701 persons each day..

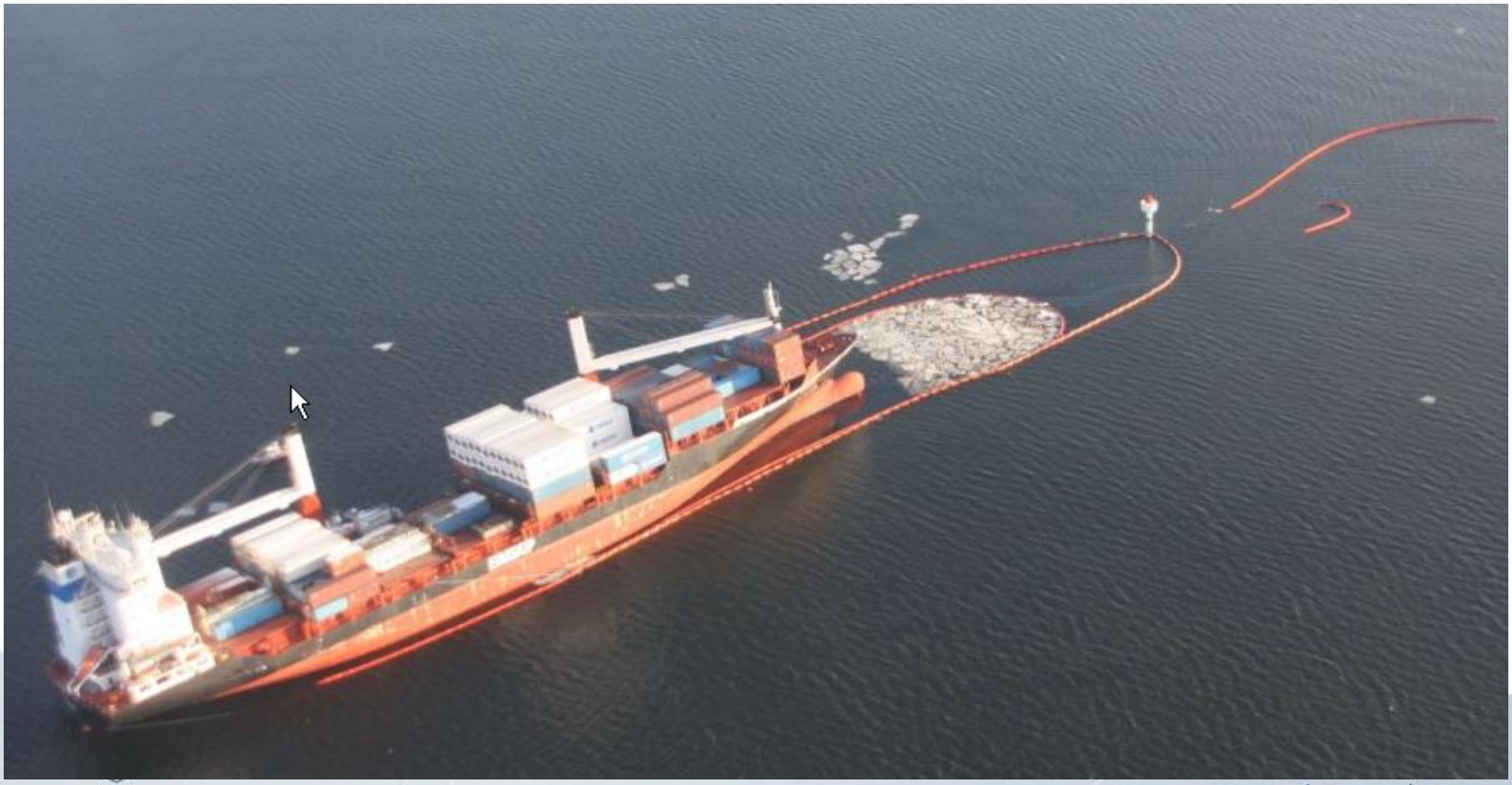
Result

- Quick response is essential
- Big operation on shore (Beach cleaning) on all incidents.



Some Recommendations:

• oil booms on sight within 6 hours to ring in vessel.



Emergency towing vessels:

- Oil recovery capacity


Foto: Ole Jacob Dingen


Foto: Roar Jensen


Foto: Bugser og Berging AS


Foto: Roar Jensen


Foto: Roar Jensen

- 7 new NCA multi task vessels with oil recovery capacity.