WHEN TRUST MATTERS

DOCUMENTATION OF EFFECTIVENESS IN OIL SPILL RESPONSE

Experience with efficiency in mechanical recovery in oil spill response

Forum for framtidas oljevern 2021

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Presentation outline

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Norwegian Governmental Forum for Cooperation on R&D concerning Oil Spill Response by The Norwegian Centre for Oil Spill Preparedness and Marine Environment

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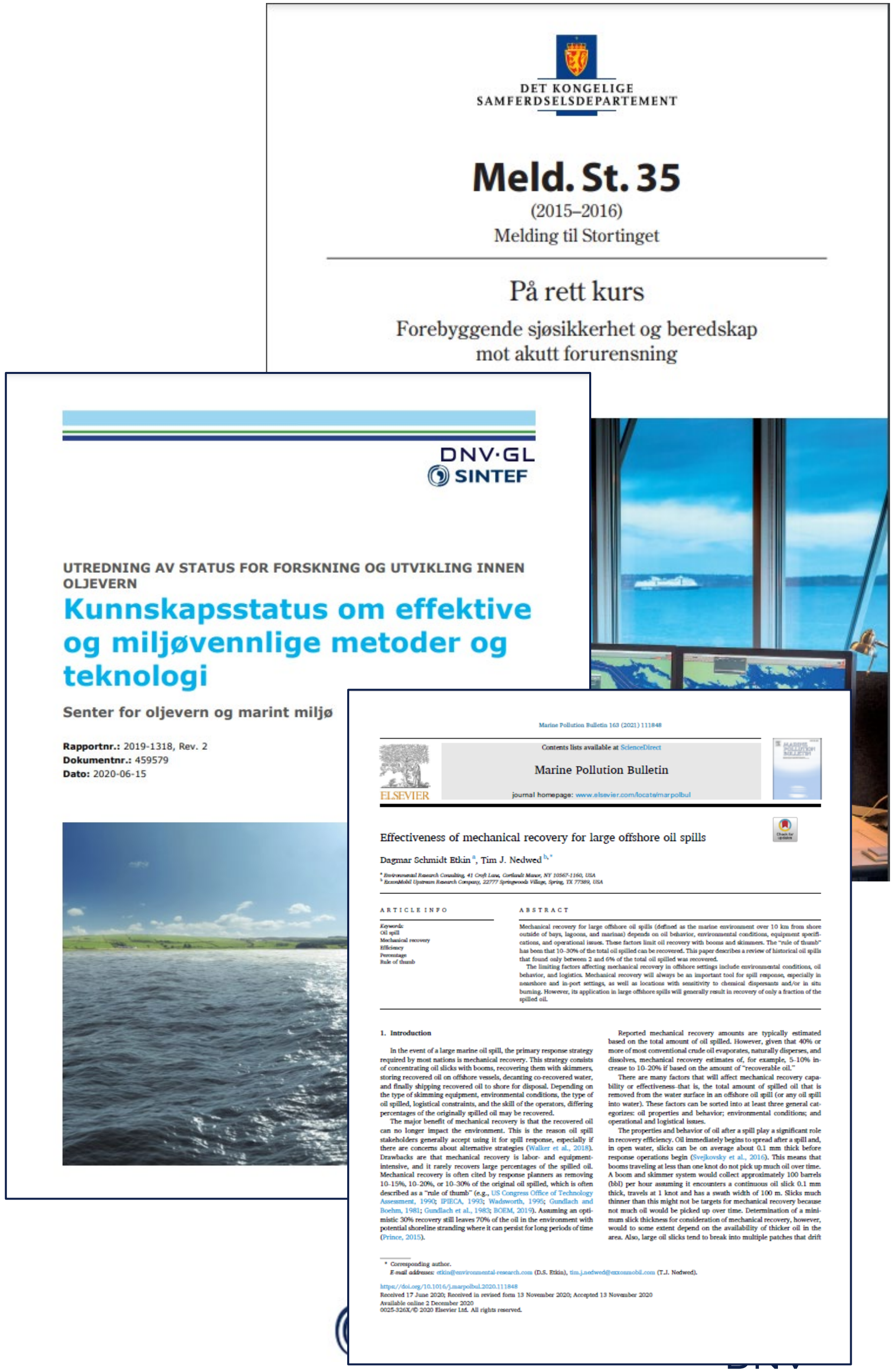
Backdrop

- National goal: *An effective handelling of acute pollution incidents*
- Complex interaction between spill type, volume, duration, location, oil properties, weather, response strategies, response scale, tactics and tecniques, etc. (ref. *Utredning av status for forskning og utvikling innen oljevern)*
- Often disputed topic in relation to setting requirements and dimensioning of oil spill contingency measures
- Often refferred «rule of thumb»: Between 10 – 30 % will in pratice be recovered
- Recent article on international spills at sea: Only 2 – 6 % mechanically recovered at sea (D.S.Etkin, T.J.Nedwed, 2021).



Scope of work

- Project goal:
  - To obtain reliable and empirical documentation of efficiency from mechanical recovery operations based on experiences from historic accidental oil spills and spill responses.

- The key questions have been:
  - How much of the total oil spill was mechanically recovered at sea?
  - How much oil available for mechanical recovery was recovered?
  - Which factors (internal and external) affected/limited the operation?



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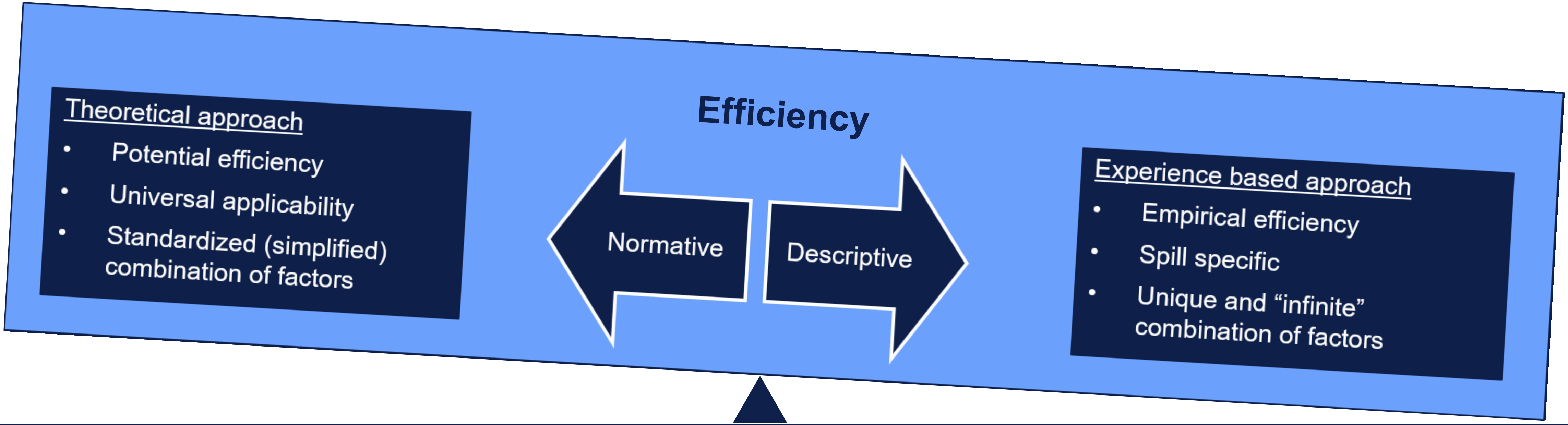
Implications for choice of case-studies

- Descriptive focus
- Quality in the data
- Supplement with interviews where possible



Selected case studies

In this study the following criteria has been used for prioritizing and selecting the cases:

- Type of response: Mechanical containment and recovery at sea
- Type of incident: Accidental acute oil spills - both ship incidents and petroleum industry related
- Type of release: Both point release and continuous release
- Type of oil: Both fuel oils and crude oils
- Geography: Primarily North Americas and Northern Europe
- Year: Newer incidents are prioritized over older incidents
- Documentation: Availability and quality of documentation/informants

Full City. Photo: NCA

Year	Name	Type of incident	Country
2002	Prestige	Ship (tanker) listing followed by breaking in two	Spain
2003	Fu Shan Hai	Ship collision	Denmark
2003	Draugen	Spill from pipe offshore (subsea)	Norway
2004	Rocknes	Ship grounding	Norway
2009	Full City	Grounding	Norway
2009	Montara	Blowout, topside	Australia
2010	Macondo	Blowout offshore (subsea)	USA
2011	Godafoss	Ship grounding	Norway
2011	Golden Trader	Ship collision	Denmark

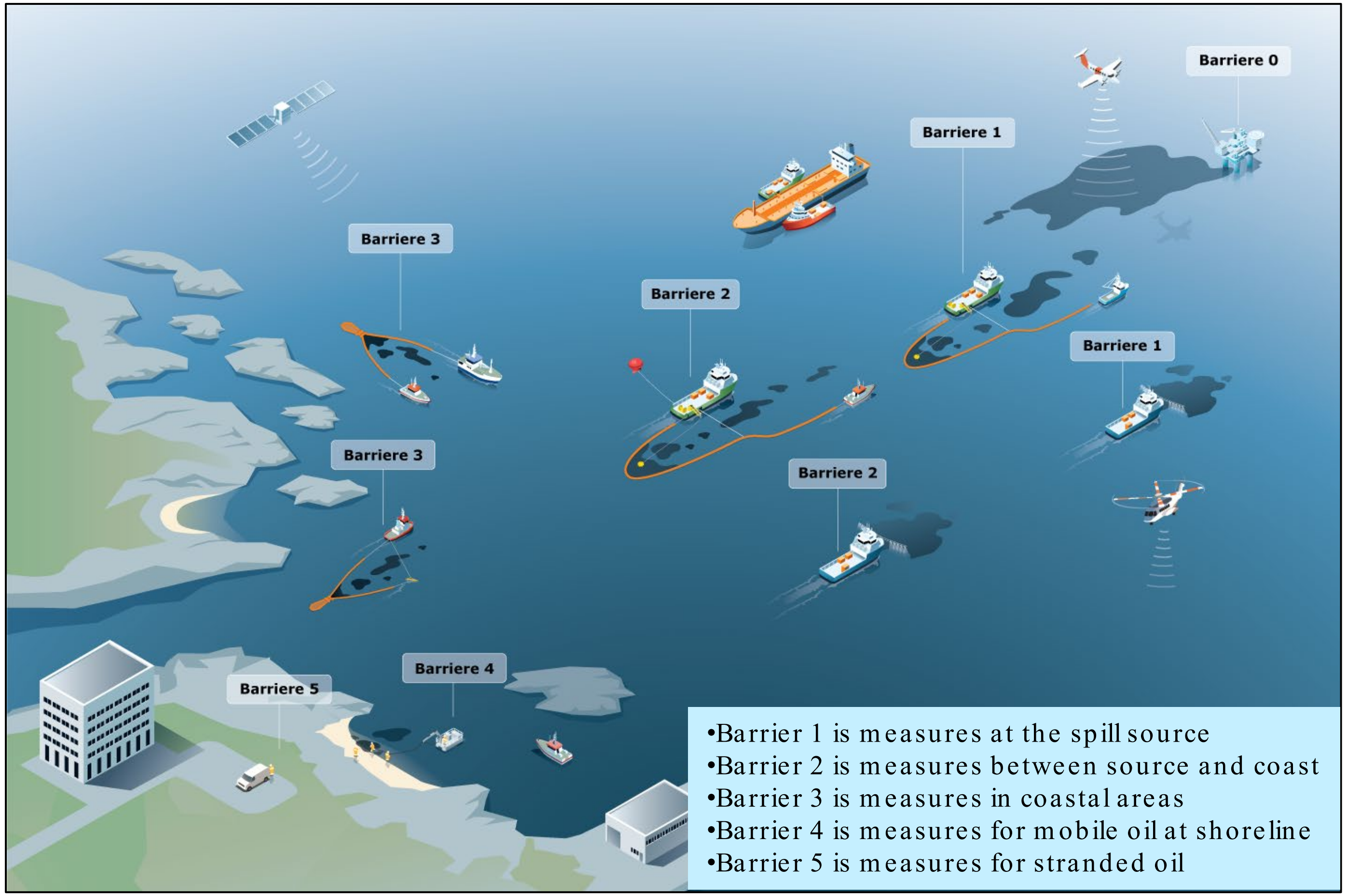
Limitations

- Availability and quality of detailed information proved to be the most critical criteria and the most difficult to obtain. Available data is often limited to gross estimates of spilled and recovered oil. Information regarding response strategies, number, and type of response systems at sea, oil properties and fate, weather, and sea states etc. along the actual timeline of the response operation is often sparse and general.
- Data availability and quality varies among scenarios as well as there might be inconsistency between sources reporting on the same incident. A potential unclarity is linked to the reporting of pure oil vs. oil/water mixture. It is not always clear if the recovered volume is one or the other or a combination. Based on this, the actual numbers should be read cautiously.
- Efficiency of mechanical recovery based on available oil on sea surface was carried out by using SINTEF's Oil Weathering Model (OWM). The model considers factors such as evaporation and down-mixing of oil following a spill. The approach and findings should be viewed as a supplement to the existing literature on the subject.
- The results are sensitive to the selected cases. In this selection only cases where mechanical recovery actual took place are included. Other cases where the recovery was 0 %, due to various reasons, also exists (for example the Statfjord A spill in 2007). This, as well as the variability from case to case, means an average of the estimated efficiencies in this study will not necessarily be representative in general.

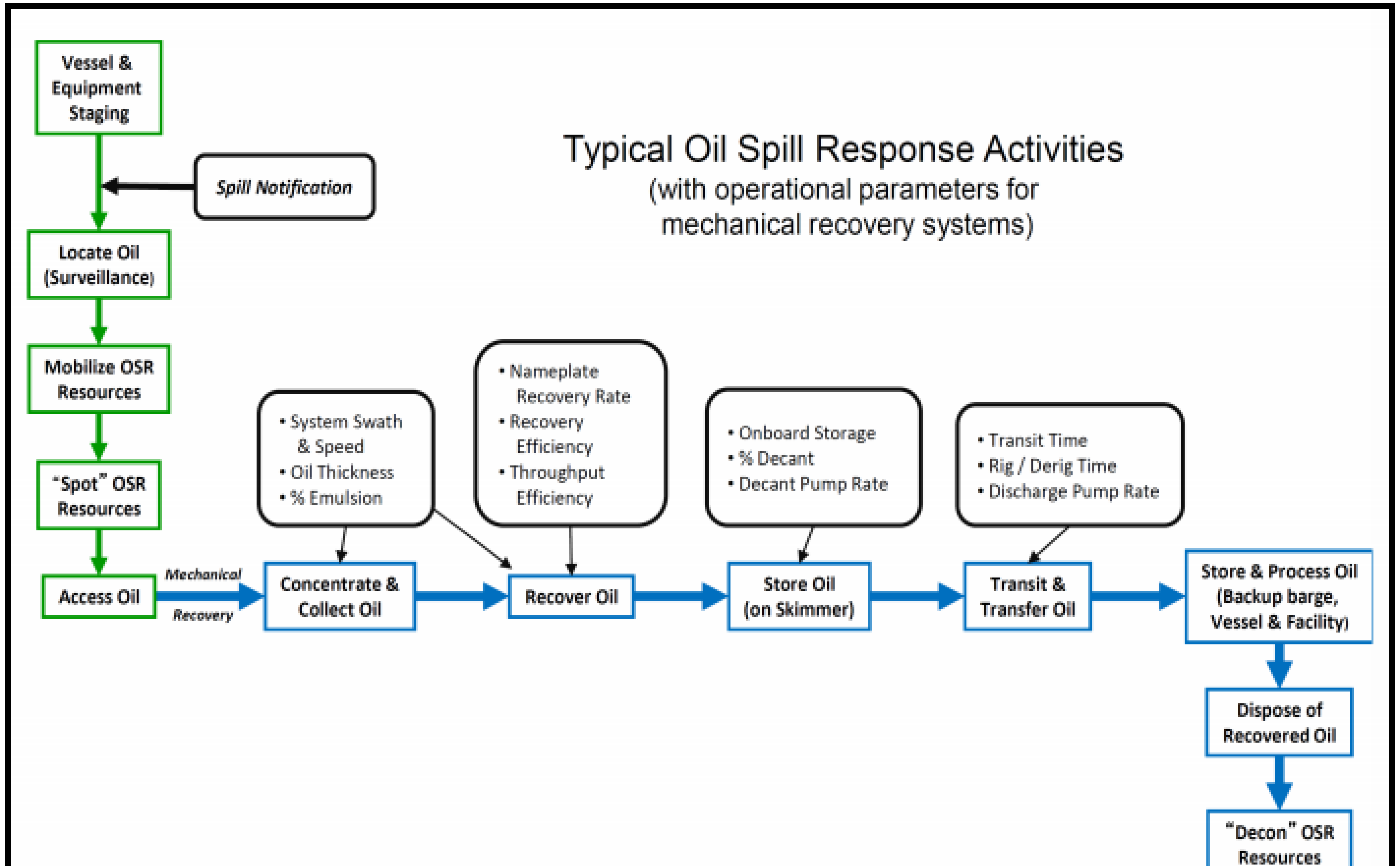
Golden Trader after the collision with the fishing vessel Vidar (Source: Kustbevakningen, 2011).

Overall efficiency

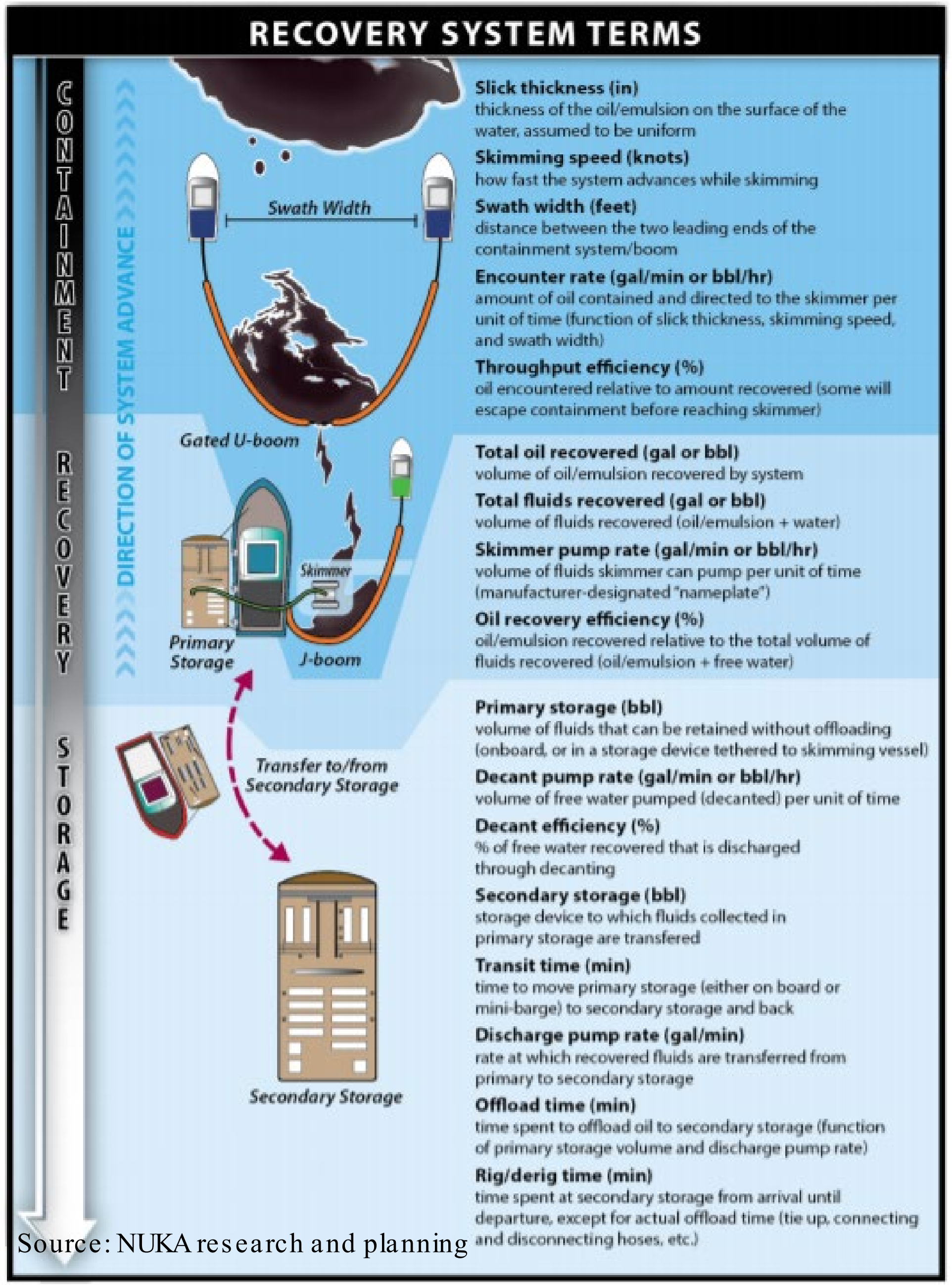
- Percentage recovered from spilled oil
- Percentage recovered from spilled oil that is available for recovery at sea depending on:
  - Type, volume and location of the spill
  - Oil properties and weathering processes
  - Weather and sea states over time
  - HSE limitations (e.g. fire and explosion hazards)
  - Quality and availability of remote sensing and common operation picture
  - Command, control and communication
  - Priorities, strategies and tactics
  - Scale of the response
  - Sufficient logistics and operational cycles
  - Level of training, skills and competence
  - …



System efficiency



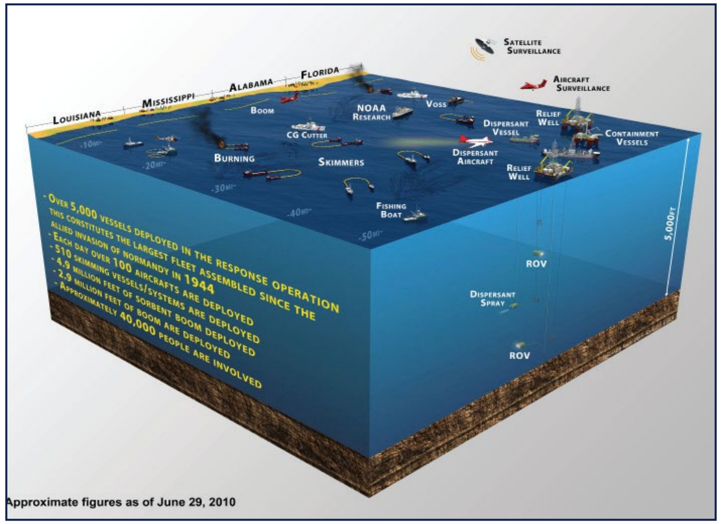
Source: Genwest_EDRC-Project



Source: NUKA research and planning

General observations

- Much literature regarding theoretical approaches to efficiency – and (surprisingly) little on actual experiences (on an operational/detailed level)
- Post-spill assessments mainly reports overall efficiency (total recovered/treated vs. spilled)
- Detailed "accounting" of recovered oil for each mobilized system or barrier during a response are seldom reported in detail, but level of detail varies
- Often more "aftermath" on environmental and socioeconomic impact from the spill than on the response operation



Approximate figures as of June 29, 2010

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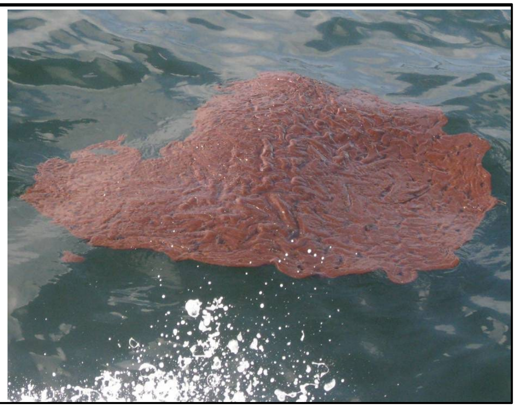
Overview of the spills, estimated recovery ratios and reported limiting factors for mechanical recovery

- Significant variability in the results
- Indications that mechanical recovery in many cases has higher efficiency than often reported, when taking availability caused by oil weathering into account.
- Oil availability is affected by several external factors:
  - Spill type/location
  - Oil type/properties
  - Weather/sea state
- Given that the oil is available for recovery and a sufficient response is executed, this study indicates that mechanical recovery can be very effective.
- Each spill is unique, generalizing based on a few cases, should be avoided.
- The approach taken in this study and the findings should be regarded as a supplement to existing studies and assessments.

	Year	Name	Type of incident/spill	Recovery of spilled oil (%)[a)]	Recovery of available oil (%)[b)]	Reported limiting factors for mechanical recovery
Petroleum incidents	2010	Macondo[c)]	Blowout offshore (subsea)	4 %	10 %	• Response strategy • Aerial misguiding • Debris/seaweed • Operational restrictions
	2009	Montara[d)]	Blowout offshore (topside)	9 %	13-22 %	• Response strategy • Oil properties
	2003	Draugen	Spill from pipe offshore (subsea)	23 %	44-51 %	• Delayed response • Surveillance/remote sensing • Slick patchiness
Ship incidents	2011	Godafoss	Ship grounding	57 %	63 %	• Low temperatures and sea ice
	2011	Golden Trader[e)]	Ship collision	9 %	33 %	• Oil properties • Weather conditions • Strategy/decision making
	2009	Full City	Ship grounding	10 %	11 %	• Weather conditions • Nearshore
	2004	Rocknes	Ship grounding	31 %	32-35 %	• Nearshore • Tidal currents • Tactics
	2003	Fu Shan Hai	Ship collision	75 %	80 %	• Oil properties • Strategy/decision making • Weather conditions
	2002	Prestige	Ship (tanker) listing followed by breaking in two	41 %	45 – 57 %	• Oil properties • Strategy/decision making • Weather conditions

Some findings

- For all the cases there are uncertainties related to the reported oil budgets. The available data does not support a further break-down of the efficiency estimates to a system level.
- Adequate strategies and decision making in the early phase are often reported as an important factor for a successful response
- Quick and accurate detection/overview of the spill is also key to establish a corresponding type of response at tactical and technical level.
- Other internal factors such as equipment, logistics and organisational and communication issues, have the potential to reduce the overall efficiency, but this study indicates that such factors to a large degree can be counterweighted by competence, skills, and sufficient planning at all levels.

Recommendations

- It is recommended to establish better routines for documentation of recovery efficiency at sea during responses. This should include a common framework for tracking the recovery at system levels and ensure a more detailed and accurate logging of the operations during the response.
- A relevant follow-up may also be to investigate how oil availability, as well as internal and external factors, are taken into consideration in existing planning tools such as modelling tools and system calculators:
  - Reconstruct some of the cases using such tools to calculate the efficiency of mechanical recovery.
  - This could give insight in how the output of these tools compares to empirical data, and the sensitivity of the various factors.

NOFO Avfallsplan - Veileder
NOFO - #47899
Versjon: 1

NOFO

VEDLEGG 2. Leveringsseddel for levert avfall

"LOGO OPERATØR"	Lokasjon:	Avfallsselskap:		
	Dato:	Klokkeslett.:		
Lossing av flytende avfall skip (eventuelt med mellomtransport med tankbil)				
Navn på skip:				
Total mengde mottatt:	m3	Antall leveranser totalt		stk.
	Prøve tatt for analyse	**Oljefase**	**Emulsjon**	**Vannfase**
Leveranse nr. 1	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 2	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 3	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 4	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 5	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 5	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 7	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 8	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 9	☐ Ja ☐ Nei	m3	m3	m3
Leveranse nr. 10	☐ Ja ☐ Nei	m3	m3	m3
Sum alle leveranser lossing av skip		**m3**	**m3**	**m3**
Levering av flytende avfall med slamsuger				
Total mengde mottatt:	m3			
	Prøve tatt for analyse	**Oljefase**	**Emulsjon**	**Vannfase**
Leveranse bil	☐ Ja ☐ Nei	m3	m3	m3
Leveranse tilhenger	☐ Ja ☐ Nei	m3	m3	m3
Sum bil og tilhenger		**m3**	**m3**	**m3**
Levering av fast avfall med lastebil/containerbil				
Total mengde mottatt:	tonn			
	Prøve tatt for analyse	**Oljefase**	**Emulsjon**	**Vannfase**
Leveranse container 1	☐ Ja ☐ Nei	tonn	tonn	tonn
Leveranse container 2	☐ Ja ☐ Nei	tonn	tonn	tonn
Leveranse container 3	☐ Ja ☐ Nei	tonn	tonn	tonn
Leveranse container	☐ Ja ☐ Nei	tonn	tonn	tonn
Sum total leveranse		**tonn**	**tonn**	**tonn**

Sted og dato

Signatur

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Thank you for your attention

The report will become available at marintmiljo.no

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