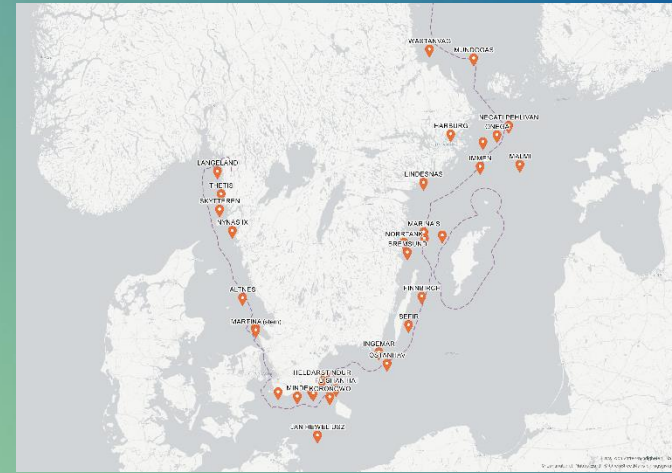


A Coherent National Strategy

-The Swedish Experience



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Water Management

Outline

- Swedish legal framework – ship wrecks
- Inventory – potentially polluting ship wrecks
 - History
 - Authorities and universities
- National strategy
 - VRAKA
 - Remediation

Swedish legal framework – ship wrecks

- Wrecks that constitutes an environmental hazard
 - Lagen om skydd mot olyckor (The Swedish Environmental Code, 2003:778)
 - Lagen om åtgärder mot förorening från fartyg (Act on pollution prevention measures from ships, 1980:424)
 - Risk of leakage of oil and other hazardous substances
 - Imminent risk of release, ~hours.
- Response
 - Remediation of oil spill
 - At sea, territorial waters and EEZ – Coast Guard.
 - Other waters, canals, ports and minor lakes – municipalities.



Swedish Coast Guard

Swedish legal framework, cont.

- Wrecks that constitutes an hazard in respect to navigation
 - Förordningen om undanröjande av vrak som hindrar sjöfart eller fiske (Regulation of disposal of wrecks that hinders navigation or fishing, 2011:658).
 - Lagen om flyttning av fartyg i allmän hamn (The Act on the disposal of ships in public ports, 1986: 371)
 - Wrecked ship in a fairway or in an area with important commercial fishing.
 - In a public port if it hinders the usage of the port, e.g. other ships cannot enter the port.

- Response
 - Fairway: Removal of ship - Swedish Maritime Administration
 - In port: Removal of ship or eventually sell it, to cover costs – Port authorities.



Swedish legal framework, cont.

- Wrecks that constitutes cultural heritages
 - Heritage act (Kulturmiljölagen, 1988:950)
 - Maritime navigation ordinance (Sjötrafikförordningen, 1986:300)
 - Ships wrecked before 1850

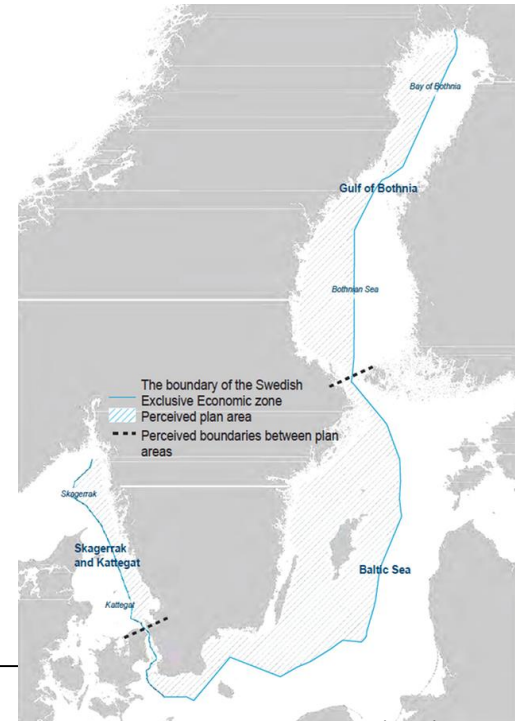
- Response
 - Prohibition anchoring
 - Limitations in diving close to a wreck - County Administrative Boards



aftenposten.se

Swedish legal framework, cont.

- Nairobi International Convention on the Removal of Wrecks
 - Shipowner responsible to remove hazard that occur after a wreckage
 - Wreck
 - Hazardous substance
 - State can intervene after a deadline
 - shipowner responsible for state´s costs
 - Shipowner (300gt)
 - compulsory insurance
 - other financial security to cover liability
 - EEZ, option expand to territorial waters
 - Sweden ratification 3 February 2018.
 - Expand application to Swedish territorial waters and inner waters.
 - The convention is not applicable on ships that have wrecked prior to the states ratification of the convention.



Swedish legal framework, summary

- 1850-2018
- No owner, insurance
- Not in a fairway or public port
- Potentially polluting, no imminent (~hours) risk of release

- No law applicable (most likely)
- Cost for preventive removal of threat – Swedish taxpayers

- Number of these kind of wrecks in Sweden?
 - History - inventory

Inventory – potentially polluting ship wrecks

History

- 261 potentially polluting ship wrecks in Skagerrak
 - County administrative board - Västra Götaland, 2006
- Costs - oil leakage and remediation, no authority responsible
 - Chalmers University of Technology, 2007
- No authority responsible for remediation in preventive purpose
 - The Swedish agency for public management, 2008
- Inventory of potentially polluting wrecks in Swedish waters
 - Swedish maritime administration, 2011
- Suggestion responsible authority and annual budget for remediation
 - Swedish maritime administration, 2014, 2015



Collaborating agencies

Swedish Agency
for Marine and
Water Management

- Swedish Maritime Administration
- Chalmers University of Technology
- Swedish Agency for Marine and Water Management
- Swedish Coast Guard
- National Maritime Museums
- Swedish Defense Research Agency
- Swedish Armed Forces

STATENS MARITIMA MUSEER
Marinmuseum Sjöhistoriska museet Vasamuseet



CHALMERS
UNIVERSITY OF TECHNOLOGY



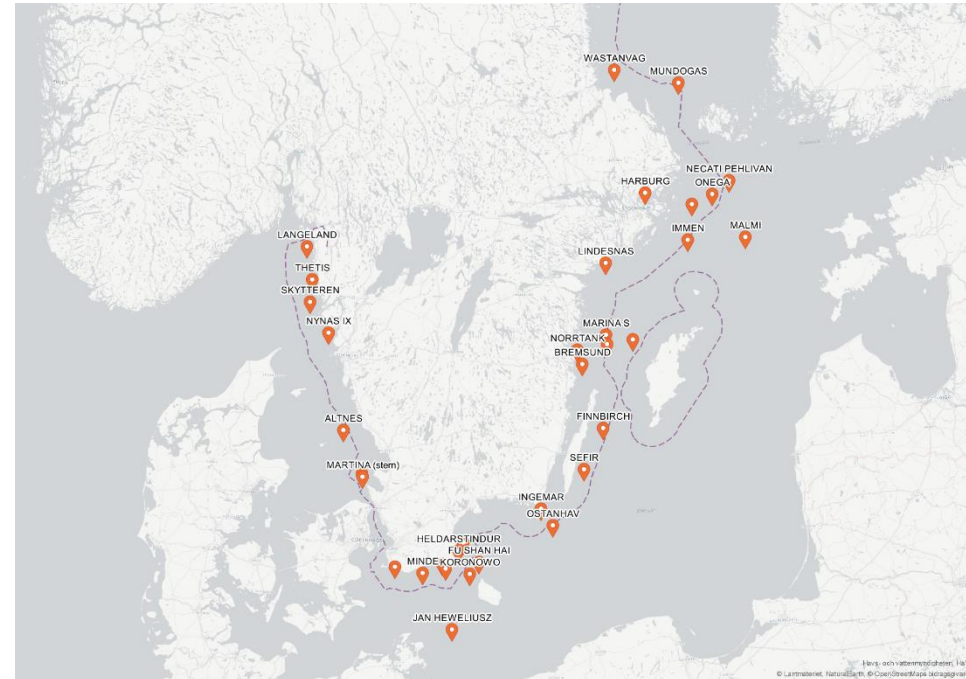
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Inventory – potentially polluting ship wrecks

Main outcomes

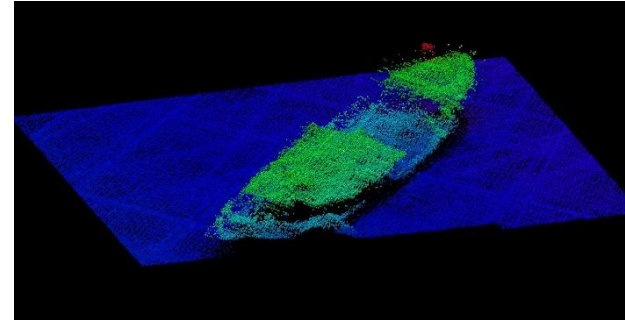
- 17 000 objects
 - >100 gt
 - After 1900
 - Oil as propulsion
- 2700
 - More thorough evaluation of the propulsion
 - Oil vs coal
- 316 potentially polluting ship wrecks
 - Oil still contained
- 31 acute hazardous ship wrecks



Inventory – potentially polluting ship wrecks

Main outcomes

- Hydrographic surveys
 - Positions
 - Multibeam, side scan sonar
 - ROV
- RDCP – m/s, O₂, turbidity, PSU, °C
- Diving – hull thickness
- Ecotoxicological studies – low concentrations of oil
- Development of risk analysis tool – VRAKA



sjofartsverket.se



William Hemberg

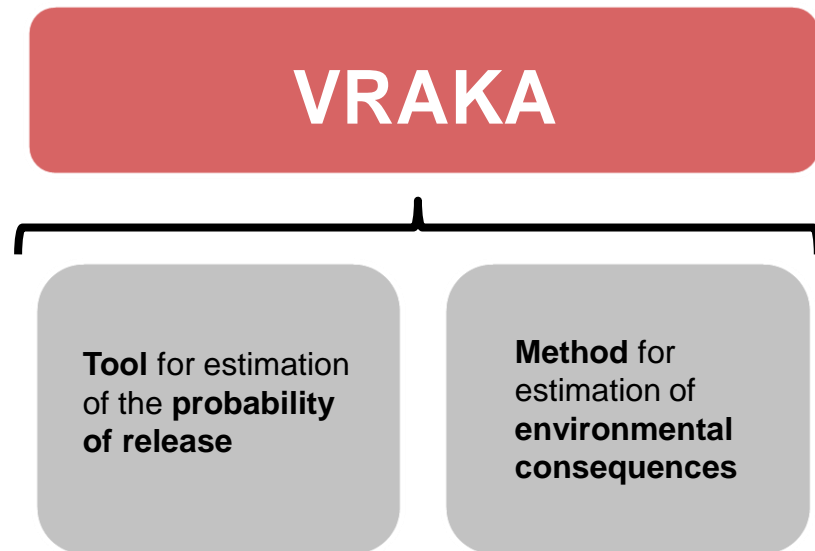
National strategy

- SWAM coordinates the investigation and remediation of polluting ship wrecks
- Annual budget 25M SEK (€ 2.4 M)/year, 10 years
- Remediate 2-3 wrecks annually
- Decision support tool – VRAKA
- Public procurement of remediation services

National strategy - VRAKA

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- Decision support tool
 - Prioritization of wrecks for remediation
- Risk assessment of shipwrecks
 - What can happen?
 - How likely is it?
 - What are the consequences?
- Petroleum products
 - Cargo
 - Bunker
- Chalmers University of Technology

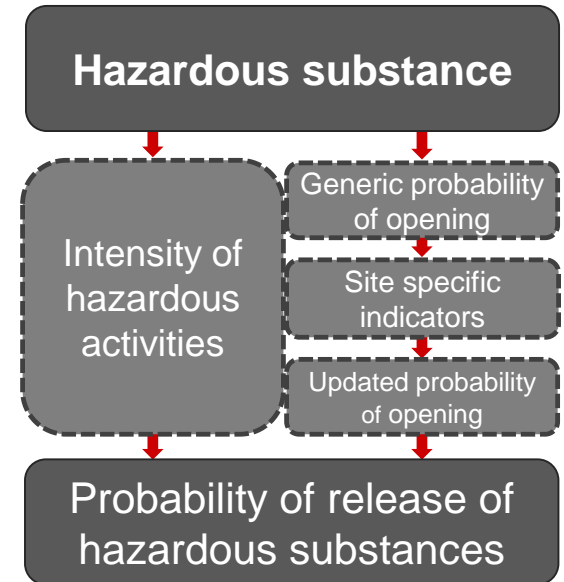


Part 1

Tool for estimation of the probability of release

Cargo/Bunker

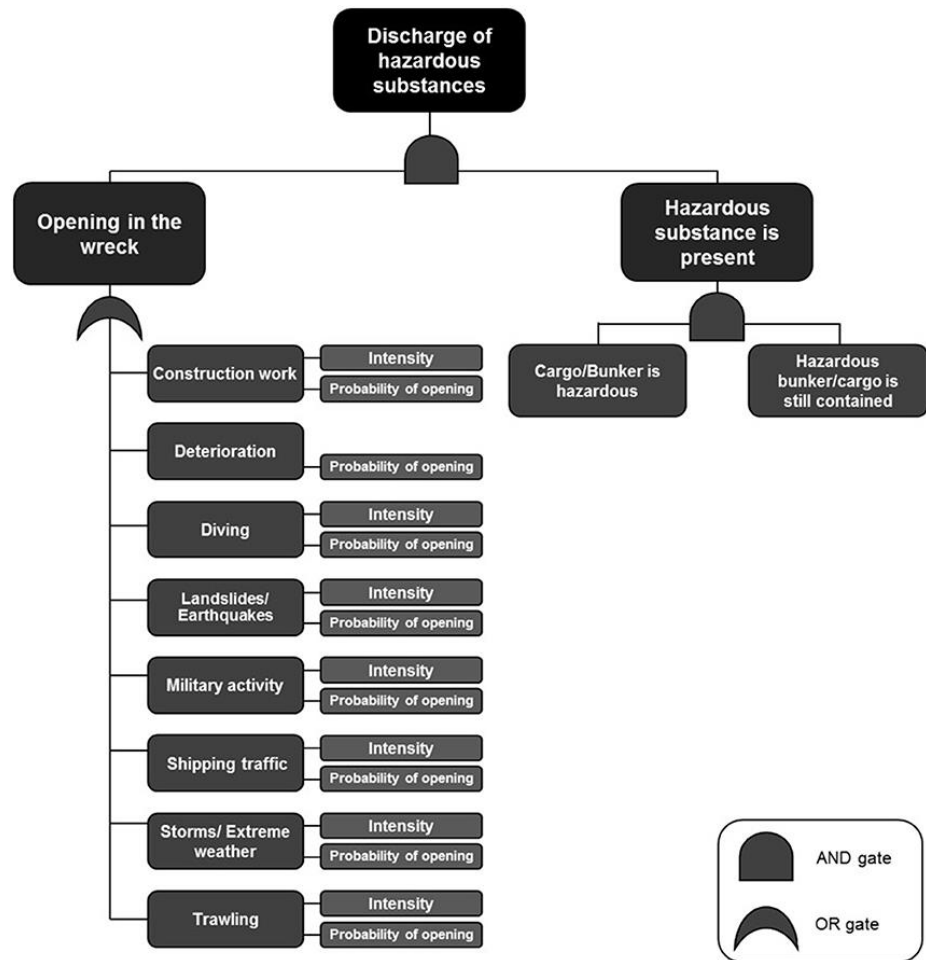
- Hazardous
- Still present within the wreck



National strategy - VRAKA

Part 1 Hazardous activities

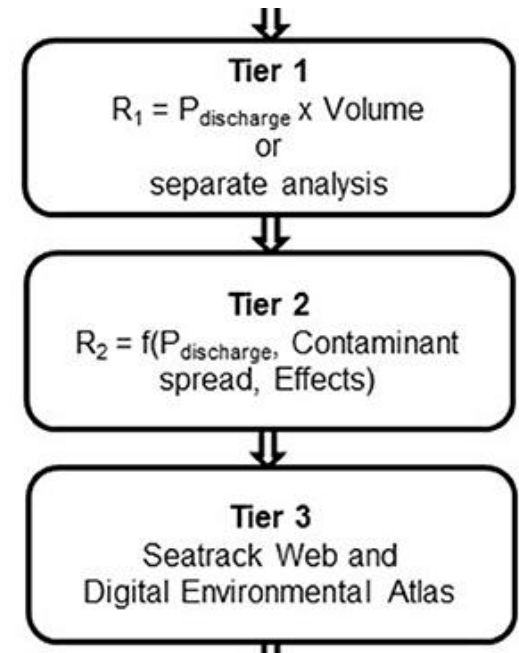
- 8 different types of activities
 - Intensity
 - Probability of opening



Part 2

Method for estimation of environmental consequences

- Three levels of Risk estimation
 - Level of detail
 - Users choice



National strategy - VRAKA

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Tier I

- Probability of discharge x Volume released.
 - $P_{\text{Release}} \times \text{Expected amount of oil} = \text{Risk}_{\text{Total}}$



Tier 2

- Probability of discharge
- Volume
- Distance to shoreline
- Effects

	Low severity	Moderate severity	High severity
Volume	<100 m ³	100 – 500 m ³	> 500 m ³
Distance to shore	> 10 nm	1 – 10 nm	< 1 nm
Sensitivity	Nearest shore is: Sand, steep cliffs or rock walls or facilities.	Nearest shore is: Cliff beaches, pebble, boulder or gravel beaches.	Nearest shore is: Reedbeds, meadows, fine sediment beaches, or mixed beaches

National strategy - VRAKA

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Tier 3

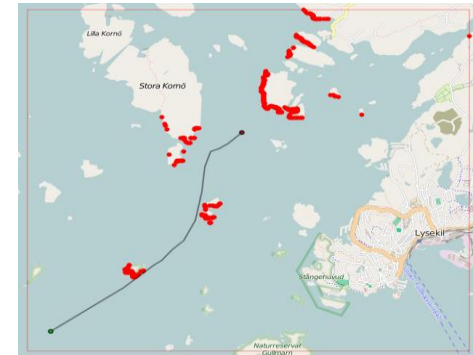
- Tools for oil spill trajectory modelling and sensitivity of receptors

1. SeaTrack Web

- Oil spill trajectory simulation
- Release from the sea floor

2. Digital Environmental Atlas

- Sensitivity to oil spill
- Ecological aspects, foremost difficulty to remediate
- Shore types have a value 1-9



National strategy - remediation

- Prioritization – VRAKA
 - Input from workgroup
 - Input from in situ investigations
 - Risk value
- Cost of remediation
- Decision
 - Input from workgroup
- Outsource the remediation
 - public procurement
 - private sub-sea companies
 - oil removed from ship wreck

Name	Risk Value			Aprox cost of remediation	Remediated
	Tier I	Tier II	Tier III		
ALTNES					
BREMSUND					
FINNBIRCH					
FU SHAN HAI					
HARBURG					
HELDARSTINDUR					
IMMEN					
INGEMAR					
IREVIK					
JAN HEWELIUSZ					
KORONOWO					
LANGELAND					
LINDESNÄS					
MALMI					
MARINA S					
MARTINA (bow)					
MUNDOGAS					
NECATI PEHLIVAN					
NORRTANK					
NYNÄS I					
NYNÄS IX					
ONEGA					
RONE					
SANDÖN					
SEFIR					
SKYTTTEREN					
THETIS	0	0	0		X
TILIA					
VILLON					
WÄSTANVÄG					
ÖSTANHAV					
MARTINA (stern)					
ALMUT					
HOHENEICHEN					

Summary

- An improved regulatory framework is being implemented
 - “new ship wrecks”
- ~30 ownerless acute hazardous ship wrecks
- Risk assessment
 - VRAKA
 - List of prioritized wrecks
- Annual budget
 - Investigation
 - Remediation

Questions/Comments ?