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Технологии механической очистки от нефтезагрязнений в ледовых условиях

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ENPI
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Содержание

- Baltic Sea - dense traffic area
- Maritime traffic and risks
- Accident and incident types
- Risks of winter navigation
- Winter recovery
- Mechanical oil recovery in ice
- Conclusions

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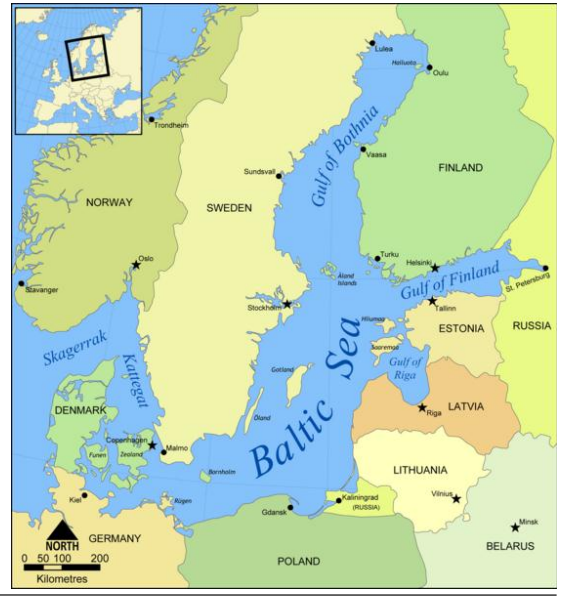
Балтийское море:

- 9 стран,
- 9 языков.

- Выход в Северное море/Атлантический океан через узкий пролив



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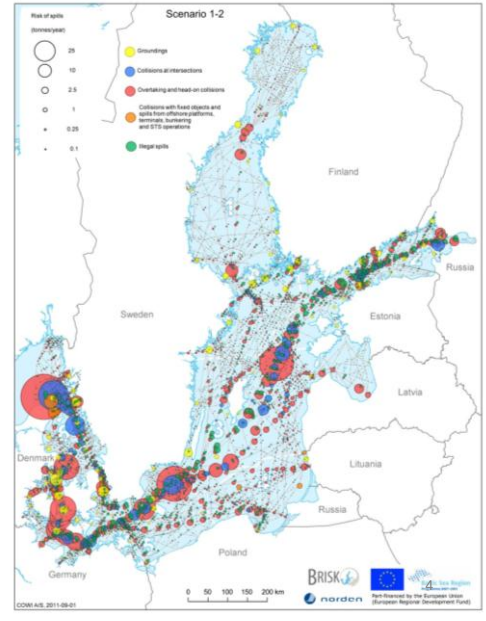
Результаты сценариев

All spills
- Existing Ship Traffic
- Existing Response Capacities
- Existing Navigational Aid

ESTIMATES OF EXPECTED INTERVALS BETWEEN SPILL EVENTS

Sub-region	Large accidents: 300–5.000 tonnes spilt	Exceptional accidents: 5.000< tonnes spilt
1. Gulf of Bothnia	36 years	600 years
2. Gulf of Finland	39 years	255 years
3. Northern part of the Baltic Proper	30 years	175 years
4. South-eastern Baltic Proper	140 years	1,060 years
5. South-western Baltic Proper	17 years	97 years
6. Sound and Kattegat	11 years	65 years
Entire Baltic Sea	4 years	26 years



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Типы аварий и происшествий

(www.iceadvisors.fi)

Accident/incident type	Typical ice related situation
Collision	▪ In icebreaker assistance ▪ Between unassisted vessels in narrow ice channel
Drift groundings	▪ Vessel gets stuck in ice and drifts with the ice on a shoal
Powered grounding	▪ Ice prevents from making needed manoeuvre to keep ship on safe route ▪ Vessel is seeking for an easier route in difficult ice conditions and thus deviates from the normal route
Icing	▪ Cold and windy open sea conditions

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Риски зимней навигации в северной акватории Балтийского моря (Jalonen et al, 2005)

Winter classification	Fatalities	Pollution	Total loss
mild winter	once in 40–75 years	once in 8–17 years	once in 12–20 years
normal winter	once in 10–20 years	once in 2–5 years	once in 2–5 years
severe winter	once in 3–6 years	yearly	once in 1–2 years

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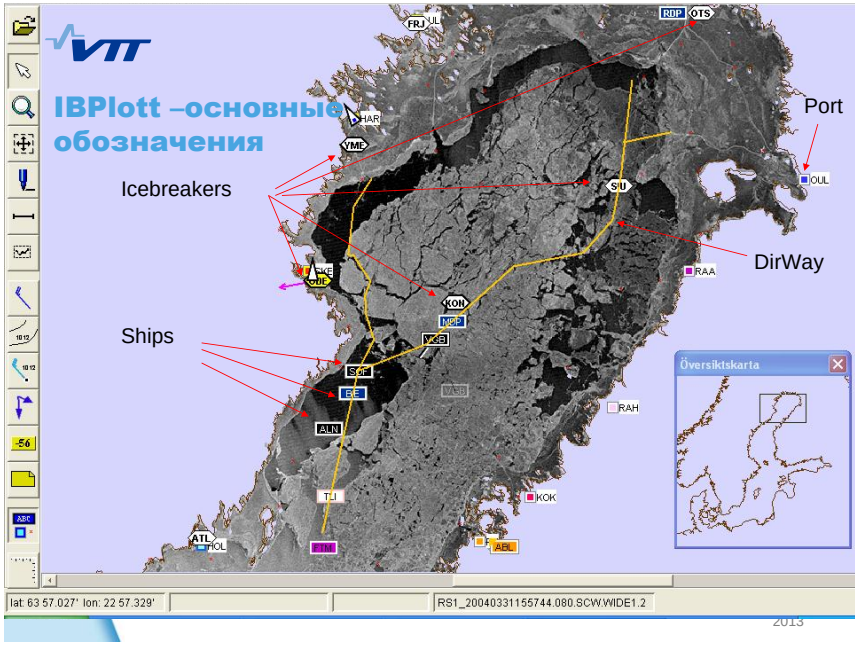

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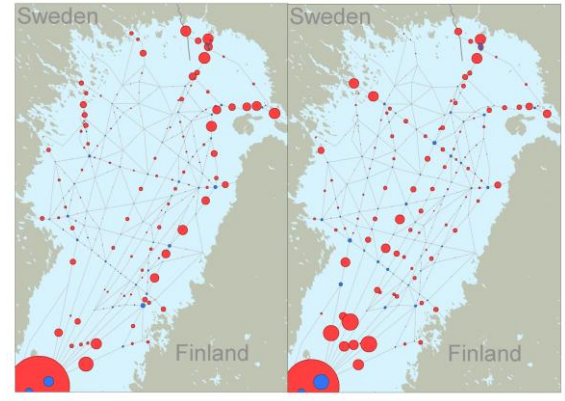
Оценка рисков / BRISK



Риск столкновений в зимний сезон (слева) и в остальное время года (справа) , Ботнический залив

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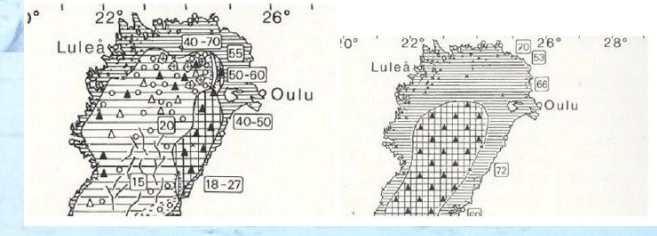
Part-financed by the European Union

Ледовые условия в мягкую зиму (слева) и в суровую зиму (справа) source: Leppäranta, M. 2011. Siikajoen Tuulivoimapuiston vaikutukset jääeroosioon



Ледовые условия в Финском заливе по данным спутника (source: www.Iceadvisors.fi/A. Uusiaho)

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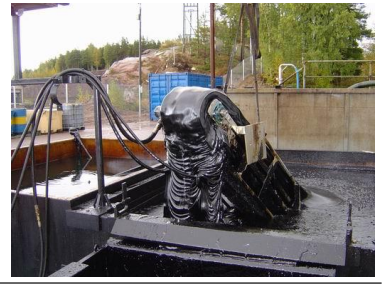
Очистка от нефтезагрязнений в зимних условиях

Difficulties:

- **Location of the oil.**
- **Freesing ambient.**
- **Darkness.**
- **Specialized skimmers and ice going vessels needed.**
- **High viscosity, difficult skimming and pumping.**

Advantages:

- **The window of opportunity may be larger than in open waters –there is more time for response before oil reaches the shore.**
- **Ice prevents the oil from spreading over large distances; it acts as a physical barrier.**
- **Normally no waves.**



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Baltic Sea approach

Рекомедации по нефтеочиске в Финском заливе

The Baltic Marine Environment Protection Convention (**HELCOM**).
Based on **HELCOM recommendations** and the fact that Baltic Sea is already heavily polluted, main response principles in case of marine oil releases are:

- **Prefer mechanical recovery.**
- **Minimization of the use of sinking agents and absorbents.**

Dispersants not used in Finland.

- **In situ-burning also only when other means are not available and when greater damages can then be avoided.**

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Main methods for oil spill response in ice

Основные методы очистки в ледовых условиях

- Mechanical recovery, collecting oil mechanically from the water/ice.
- In situ burning.
- Chemical recovery:
  - Dispersants, etc.
- Bioremediation.

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Различные методы очистки в зависимости от ледовых условий

Response method	Open water	Ice coverage 10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
Mechanical recovery:											
- Traditional configuration (boom and skimmer)											
- Use of skimmer from icebreaker											
- Newly developed concepts (Vibrating unit; MORICE)											
In-situ burning:											
- Use of fireproof booms											
- In-situ burning in dense ice											
Dispersants:											
- Fixed-wing aircraft											
- Helicopter											
- Boat spraying arms											
- Boat "spraying gun"											

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Основные механические методы используемые/испытанные в Балтийском регионе, в основном в Финляндии

- Ice bow.
- Oil recovery bucket.
- Vibrating grid.
- Big brush wheel.
- Using of air or propeller flow to steer oil under ice.
- Using of ice barriers and ice dwells.
- Ice saw.
- Vacuum pumps.
- Skimmers operating under ice.

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Ледовый очиститель LORI, носовая часть

Ice bow, LORI Ice Cleaner mounted to the fairway service vessel Letto.

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Ковш для нефтеочистки

Originally constructed for shoreline cleaning.

Photo: J. Pirttijärvi

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Ковш для нефтеочистки, продолжение

Now the mostly used equipment to collect oil in ice.

Brush wheel diameter 800 mm.

Three wheel length, 0.6, 1.6 and 3.0 m.

Photo: J. Pirttijärvi

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Ковш для нефтеочистки на шведском форватерном судне

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Судно Hylje в условиях нефтеразлива

Photo: J. Pirttijärvi

Эстонское судно Valvas и финские суда Halli и Hylje

Photo: J. Pirttijärvi

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Финское судно Seili

Photo: J. Pirttijärvi

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Очистные вращающиеся щетки

- Four collectors installed on the aft deck with container fastenings.
- In collecting mode vessel moves backward.
- Wheel diameter 1.8 m.
- Sweeping width 4x4 m.
- First units to a new Finnish multipurpose vessel.

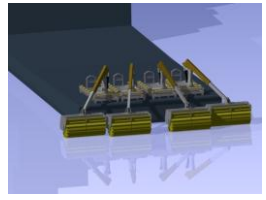

Photo: J. Pirttijärvi

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Нефтеочистители для ледовых условий

Arctic skimmer
skimmer
Lamor

Rope mop
Desmi

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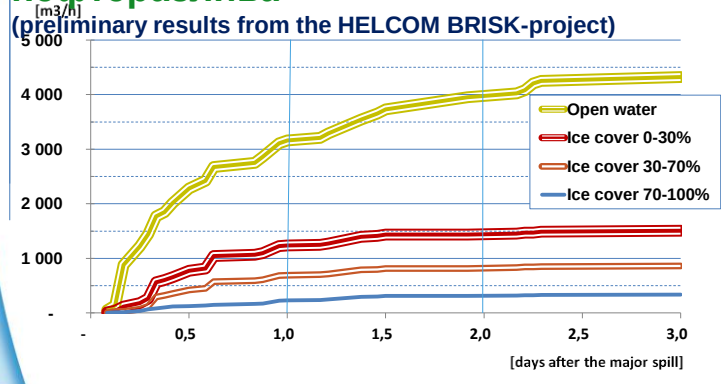
Теоретическая оценка скорости сбора нефти судами HELCOM (м3/ч) в Финском заливе после основного нефтеразлива

(preliminary results from the HELCOM BRISK-project)



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Заключение – Проблемы в условиях Арктики

- Possible to response small spills in ice.
- Promising new methods are being developed.
- To succeed you must have many alternative methods.
- Much work is still needed to develop real operational response methods for large spills in ice.
- Locating of oil under (snow covered) ice is a problem.
- If the oil sinks, it is very difficult to find and collect.
- New sensors for satellites to show oil in ice /snow

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Заключение...

- We must also consider other than mechanical methods for Arctic Sea areas, like
  - In situ burning
  - Enhanced bioremediation
  - Chemical methods (dispersants, etc.).

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This Programme is co-funded by the European Union, the Russian Federation and the Republic of Finland

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Recovery Vessel LOUHI

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