THE IMPROVEMENT OF WINTER NAVIGATION WITH RISK-BASED APPROACHES

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ICE DAY

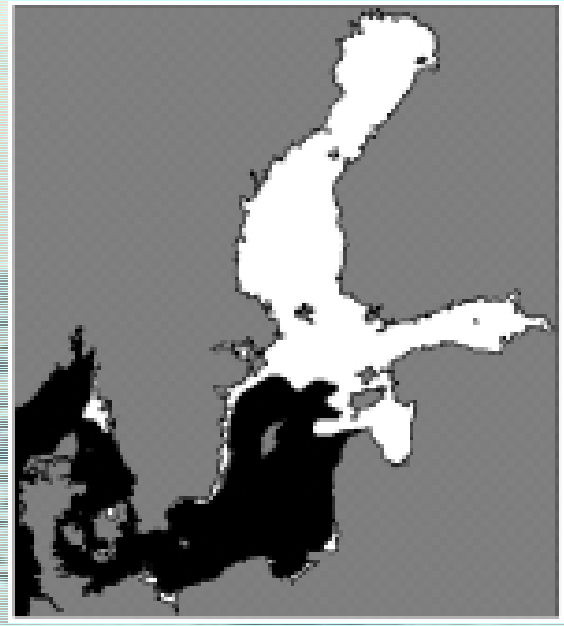
Basics of Winter Navigation in the Baltic Sea

11th and 12th February, 2004

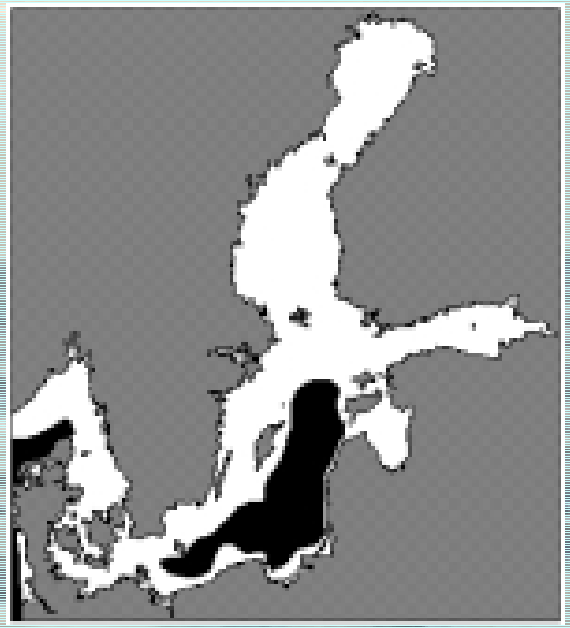
Contents

- Ice conditions on the Baltic Sea
- Risk definition
- Maritime safety
- Winter time accidents
- Formal Safety Assessment method
- Hazard identification
- Why Risk Based Approaches should be used ?

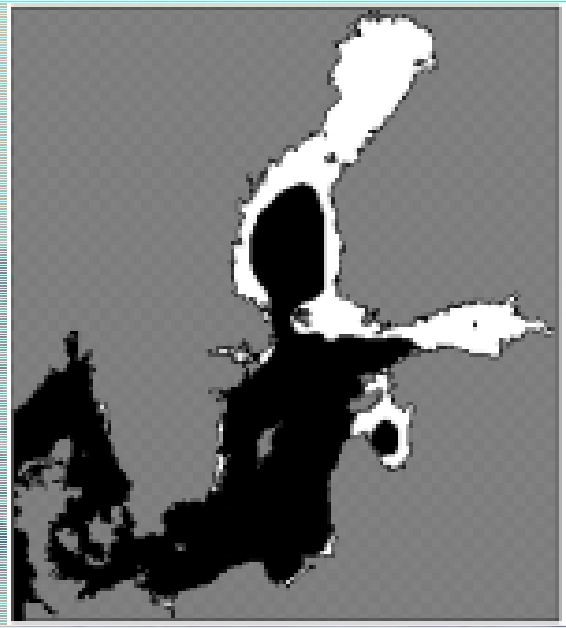
Extent of the ice cover in the Baltic Sea



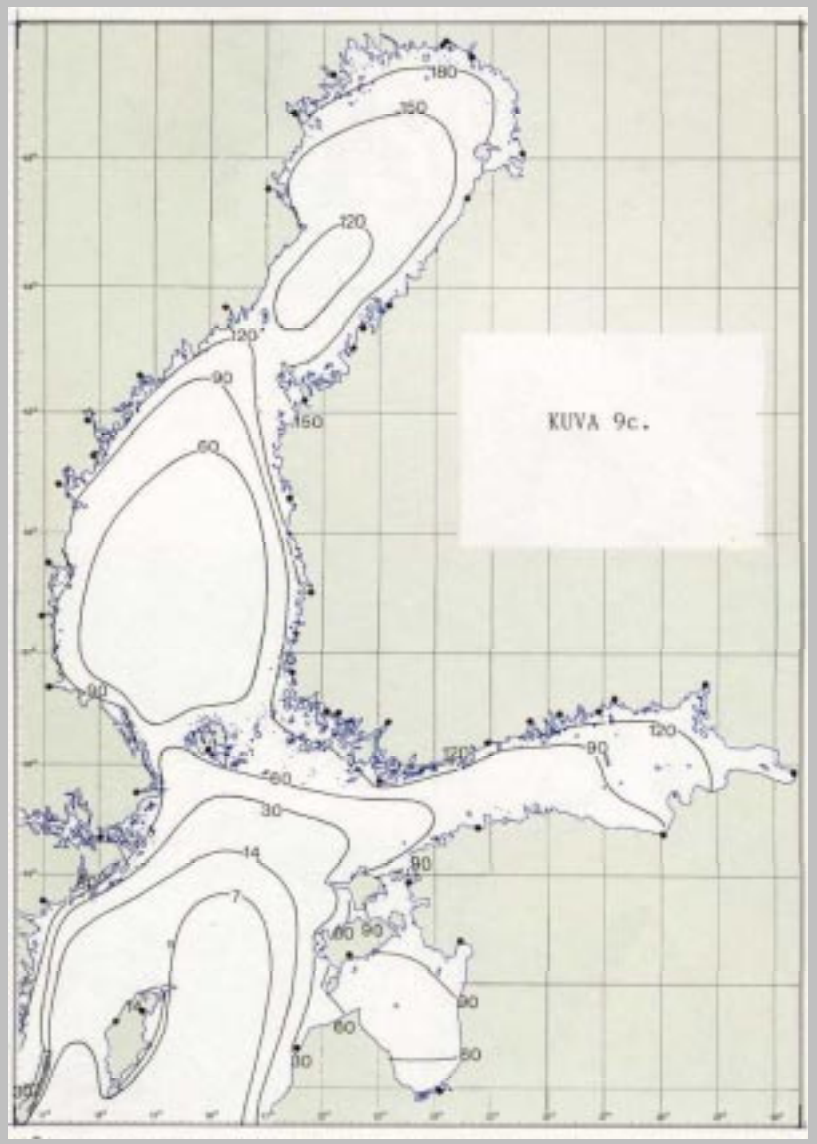
Average winter (1994)
206 000 km^2



Severe winter (1986)
337 000 km^2



Mild winter (1991)
122 000 km^2

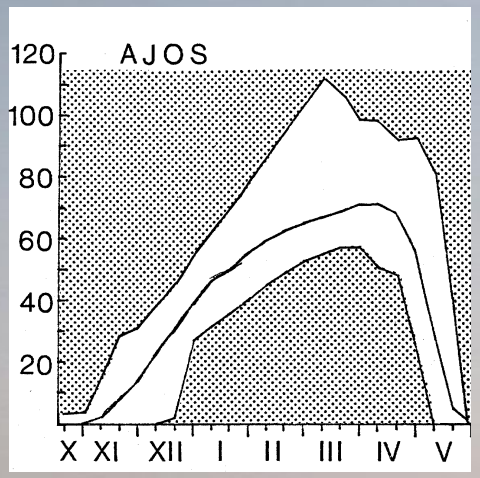


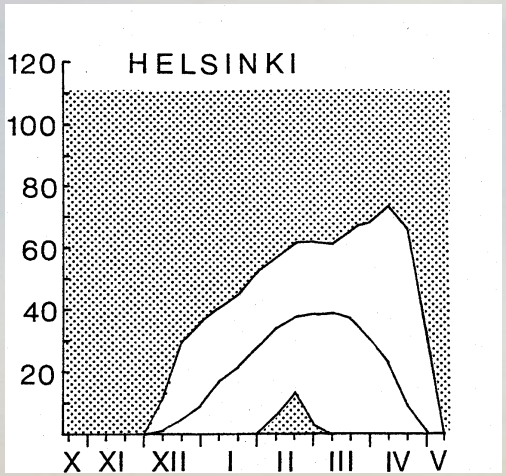
Average length of ice season in the Baltic Sea

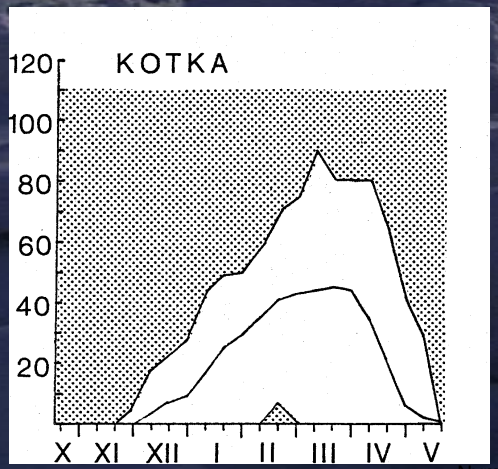
Average length of the ice season in the Baltic Sea

- 180 days in the north
- 120 days in the east

Fast ice thickness in the Finnish coastal waters







- **Variation in ice thickness**
  - in the north (Ajos) 60 -110 cm
  - in the east (Kotka) 10 - 90 cm
  - Outside Helsinki 15 - 80 cm

Collision in ice

Http://www.martechpolar.com

Ice damages in the hull

Photo: Oy Gard Services (Baltic) Ab

Propeller ice damages

Photo: Oy Gard Services (Baltic) Ab

Proposed Recommendations GoF

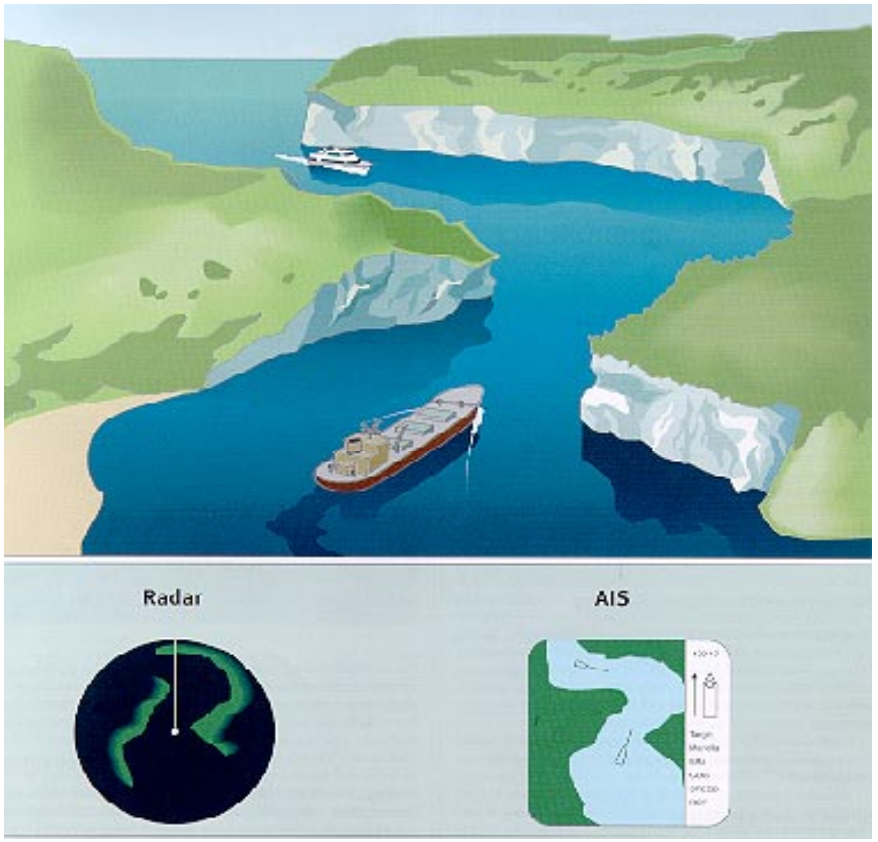
- Risk Identification:
- FSA analyses for the EU scale & Baltic scale,
- Establishment of INCIDENT System,
- Defining electronic failures and developing protocols and redundant systems.
- Operative Risk Control:
- Escort and emergency towing,
- VTS and traffic control,
- Oil combating,
- Traffic restrictions,
- On-line load monitoring systems.

Proposed Recommendations

- Structural means to minimize risks:
- grounding analyses,
- collision analyses,
- stability, leakage,
- winter navigation.

Maritime Safety

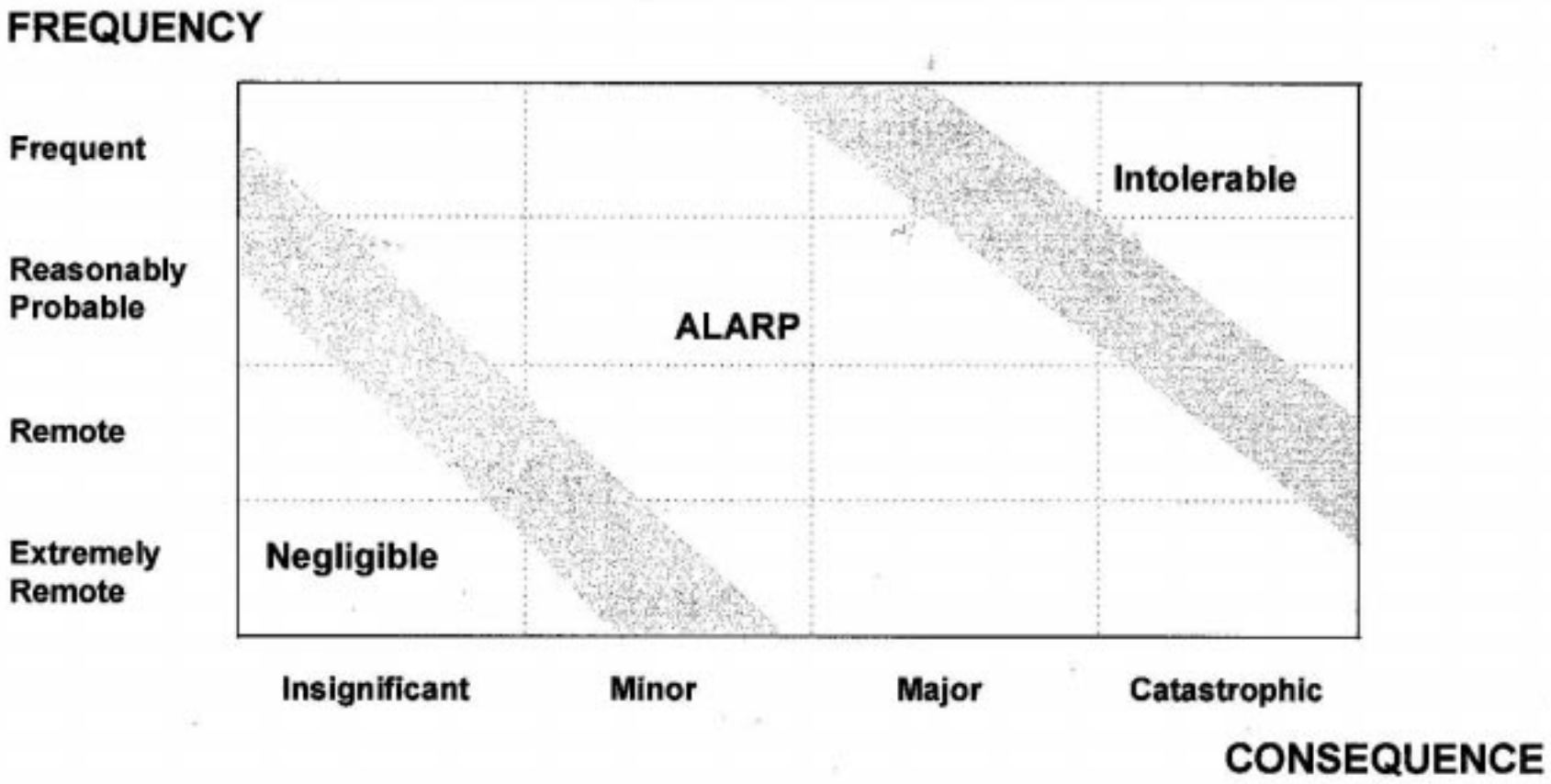
- External Safety (fairways, ships, ports)
- Internal Safety (strength, stability),
- Human Aspects,
- Environmental Impacts.



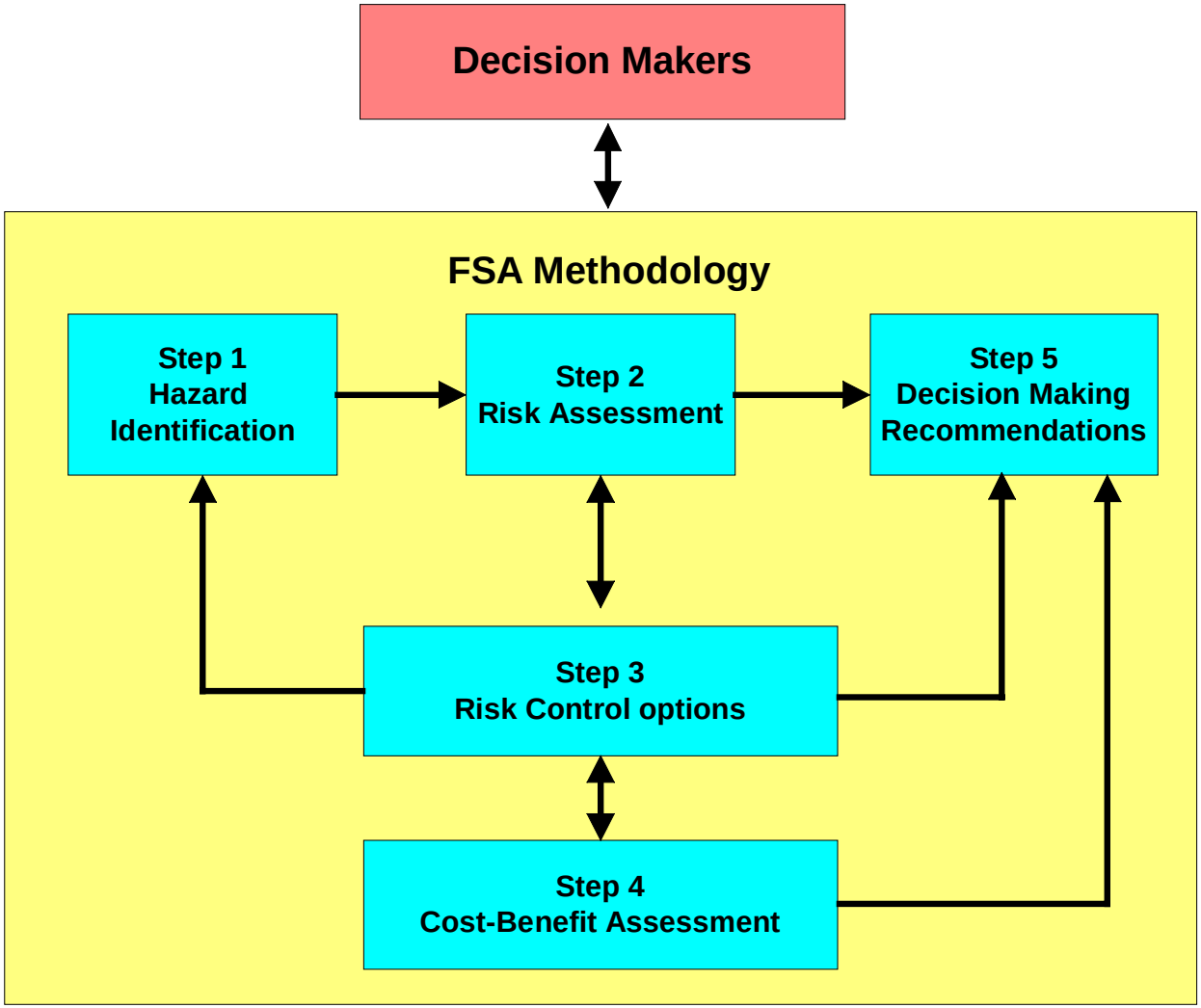
Risk definition

- *Risk can be defined as a combination of probability and consequences.*
- *Risk may be determined by its attributes either qualitatively or quantitatively*

As Low As Reasonable Practicable



FORMAL SAFETY ASSESMENT FSA



FSA Main Steps

1 Defining risks

2 Risk evaluation

Probability and consequenses ?

3 Risk handling options

What can be done to avoid the unwanted event ?

4 Cost - Benefit Analyses

Costs of the risk handling procedures?

5 Recommendations

Legistlative actions?

FORMAL SAFETY ASSESMENT FSA

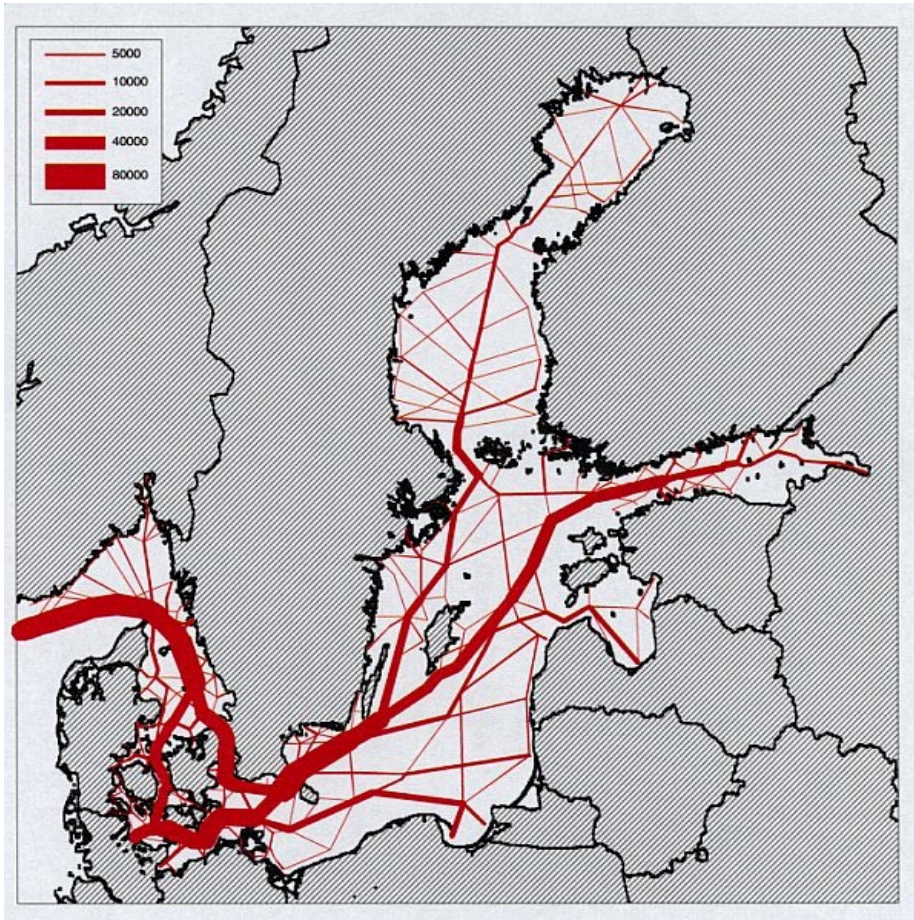
- In the minutes of the Second Meeting of the Maritime Group of the Helsinki Commission (Helcom Maritime) is a draft Helcom recommendation on ”SAFETY OF WINTER NAVIGATION IN THE BALTIC SEA”
- ”The commission recommends further that the Contracting Parties to the Helsinki Convention should take measures to ensure that
  - **compilation of data on accidents and incidents due to ice** conditions will be continued, and that
  - **a Formal Safety Assessment on the safety of winter navigation in the Baltic Sea area is made** in accordance with the Guidelines for Formal Safety Assessment (FSA) for use in the IMO Rule Making Process (MSC/Circ.1023, MEPC/Circ.392 of 5 April 2002)

Prioritised list of hazards in relation to winter navigation in the Gulf of Finland

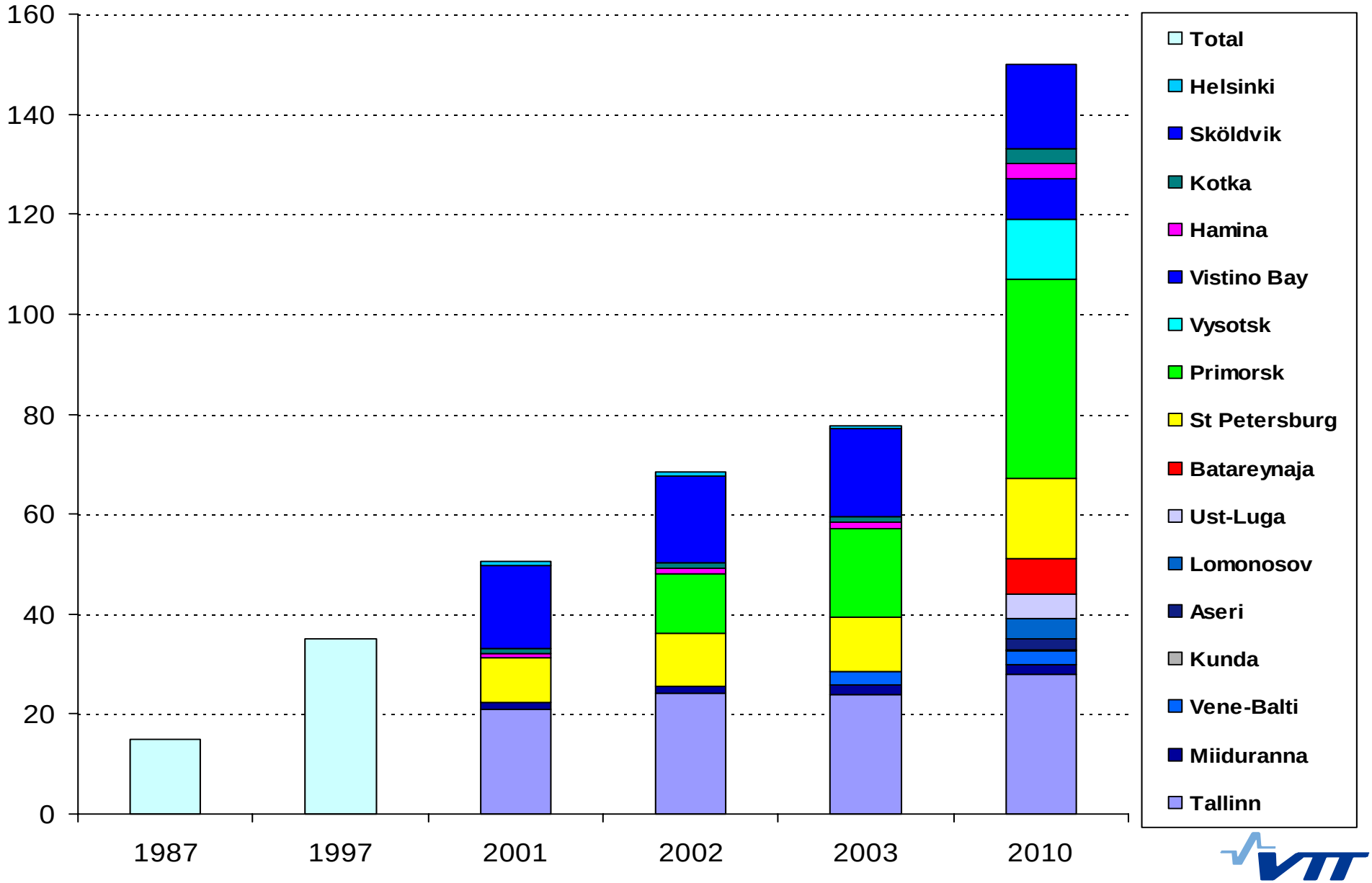
1. Heavily increasing tanker traffic
2. Increasing traffic volumes between Helsinki and Tallinn
3. Single bottom tankers
4. Rescue operations in heavy ice conditions
5. Vessels unable to give way according to regulations because of heavy ice conditions
6. Oil combating measures in ice conditions
7. Crews which are unfamiliar with ice conditions or inexperienced in winter navigation
8. Lack of escort towing
9. Getting stuck in compressive ice
10. Occasional disruptions in icebreaker activities
11. Problems in radio communication
12. Navigation errors, which happen when trying to avoid difficult ice conditions
13. Lack of routing system in ice conditions
14. Cold weather, rapidly changing ice conditions
15. Icing

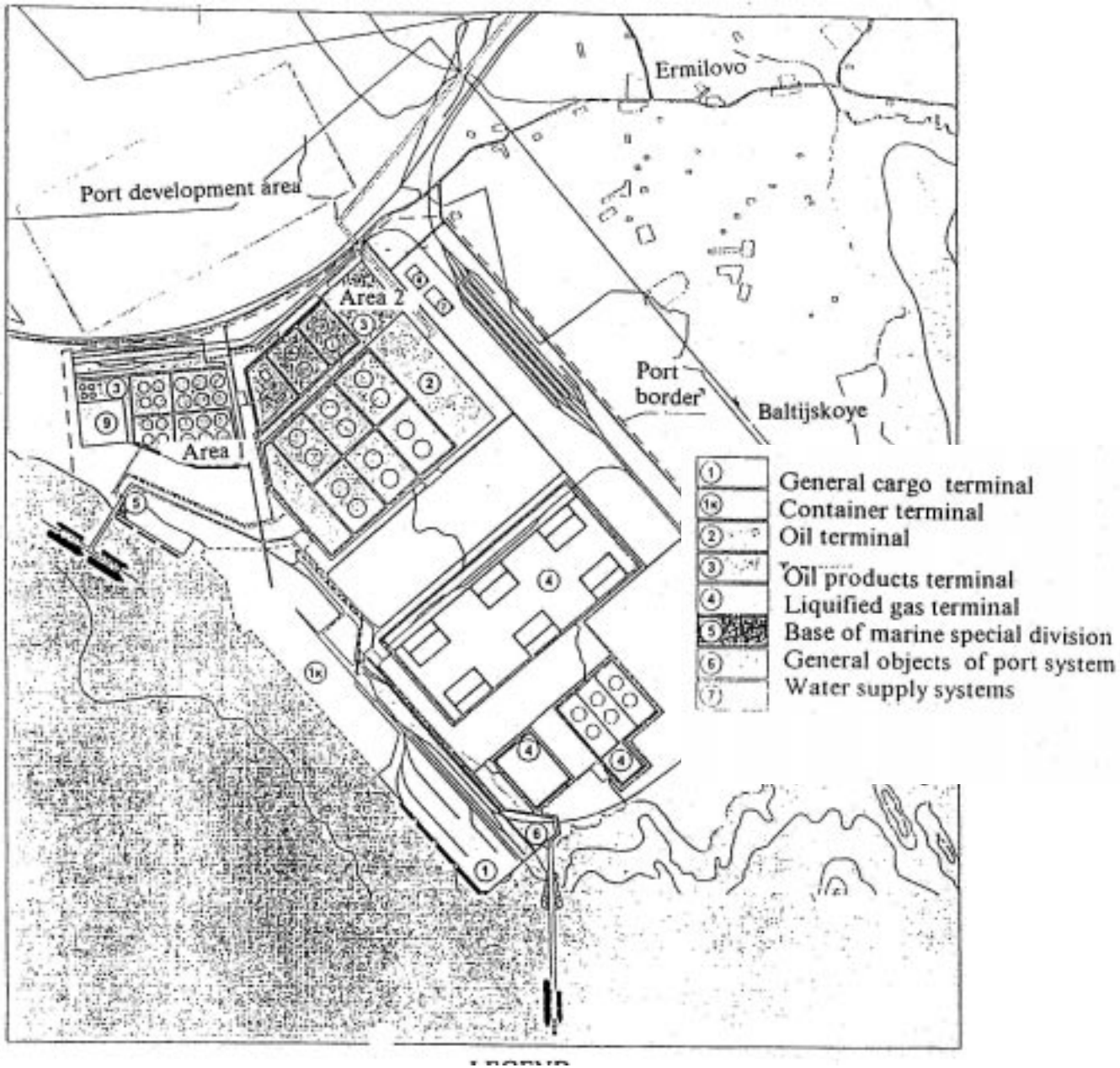
ITEM 1: Annual Ship Traffic (No. of movements) projected to year 2017, all ship categories

Source: Tacis, 1998: Existing and Future Shipping through the Baltic Sea.



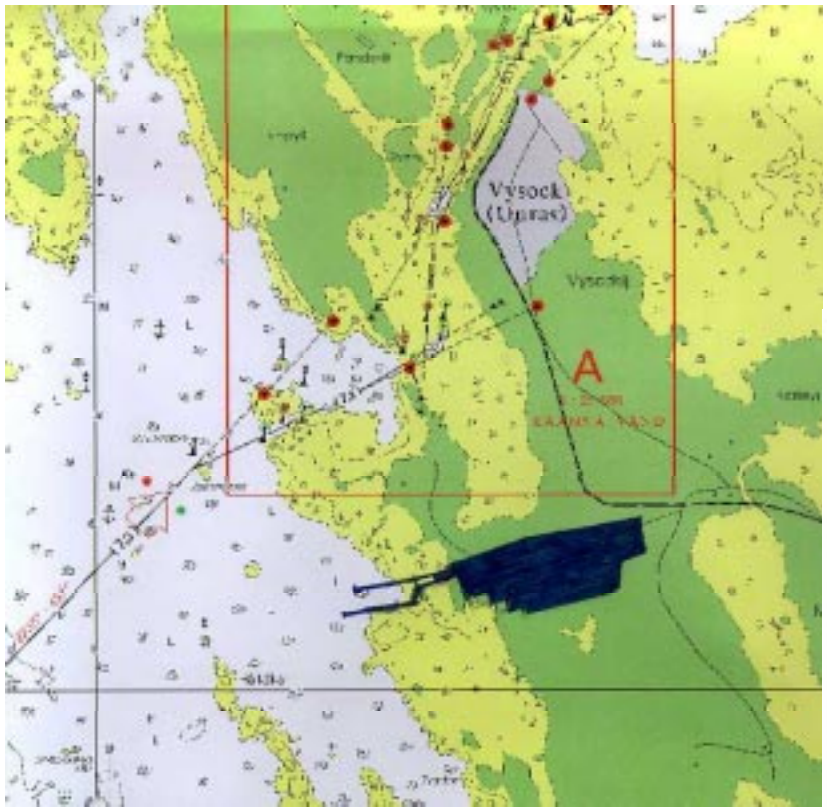
Oil transportation in the Gulf of Finland in 1987-2003 and estimated development by 2010

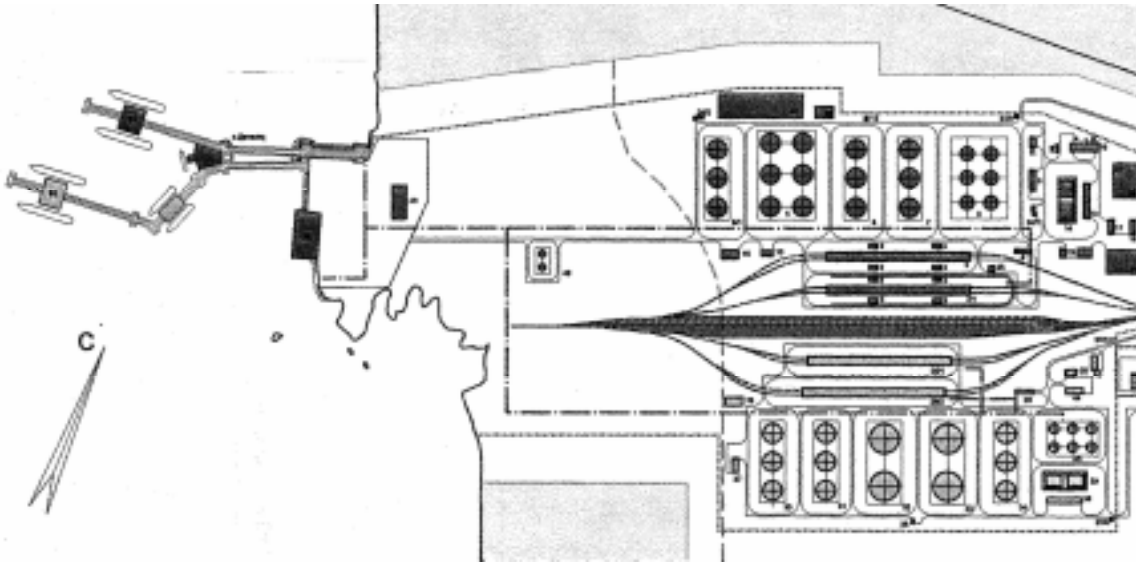



Ermilovo
Port development area
Area 2
Area 1
Port border
Baltijskoye
1 General cargo terminal
1к Container terminal
2 Oil terminal
3 Oil products terminal
4 Liquified gas terminal
5 Base of marine special division
6 General objects of port system
7 Water supply systems
8 Energy supply systems
9 Waste water systems
Motorway
Railways
Pipeline
Boundary of dredged soil
Sanitary zone boundary
ЛЕНМОРНИИПРОЕКТ

Primorsk, January 2004

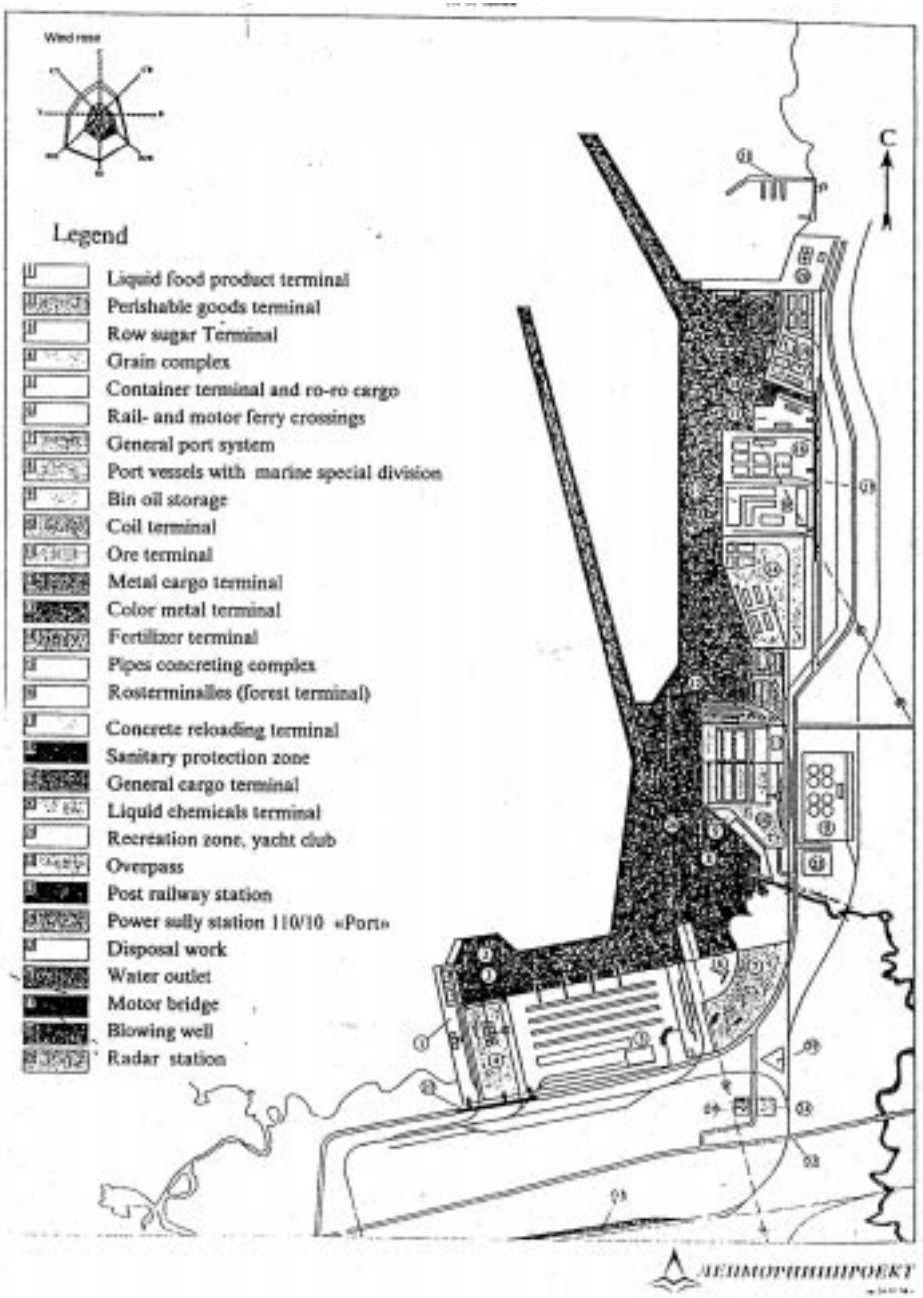
Vysotsk (LukOil) Oil Terminal





Railway terminal September 2003.

Vysotsk under construction, September 2003.



Cargo turnover and terminals

No	Terminal	Turnover th.ton/ year.	Vessels DWT, th/ mooring
1	Liquid food product terminal	250	9/1
2	Perishable goods terminal	300	10/1
3	Row sugar Terminal	500	40/1
4	Grain complex	3000	70/1
5	Container terminal and ro-ro cargo	4500	30-60/4
6	Rail- and motor ferry crossings	2700	Mukran type/2
7	Constructions of general port system		
8	Port vessels (base)		/4
9	Bin storage		/2
10	Coil terminal	8000	70/1
11	Ore terminal	2000	70/1
12	Ferrous metal and metal scrap reloading terminal	3200	16-50/4
13	Color metal terminal	1000	16-25/1
14	Fertilizer terminal	5700	16-70/3
15	Pipes concreting complex		20/1
16	Forest terminal	1000	10/3
17	Concrete and MCM reloading terminal	350	30/1
18	Sanitary protection terminal		/1
19	General cargo terminal	1500	10-20/3
20	Liquid chemicals terminal	1000	25/2
	Total	35000	

Item 3. Accelerated phase-out for single-hull tankers

Under a revised regulation 13G of Annex I of MARPOL, the final phasing-out date for Category 1 tankers (pre-MARPOL tankers) is brought forward to 2005, from 2007. The final phasing-out date for category 2 and 3 tankers (MARPOL tankers and smaller tankers) is brought forward to 2010, from 2015.

Under the revised regulation, the Condition Assessment Scheme (CAS) is to be made applicable to all single-hull tankers of 15 years, or older. Previously it was applicable to all Category 1 vessels continuing to trade after 2005 and all Category 2 vessels after 2010. Consequential enhancements to the CAS scheme were also adopted.

http:// www.imo.org

ITEM 3: IMO (Dec 2003)

- Category 1
- 5 April 2005 for ships delivered on 5 April 1982 or earlier,
- 2005 for ships delivered after 5 April 1982.
- Category 2 and 3
- 5 April 2005 for ships delivered on 5 April 1977 or earlier 2005,
- 2005 for ships delivered after 5 April 1977 but before 1 January 1978,
- 2006 for ships delivered 1978 and 1979,
- 2007 for ships delivered in 1980 and 1981,
- 2008 for ships delivered in 1982,
- 2009 for ships delivered in 1983 and
- 2010 for ships delivered in 1984 or later.
- Under the revised regulation, the Condition Assessment Scheme (CAS) is to be made applicable to all single-hull tankers of 15 years, or older ans all Category 2 vessels after 2010.

ITEM 6: Oil Combating / Response - Key Parameters

- the long-term drift behaviour and fate of oil,
- the dynamics of interactions between oil, slush and brash ice,
- oil spreading in broken ice.

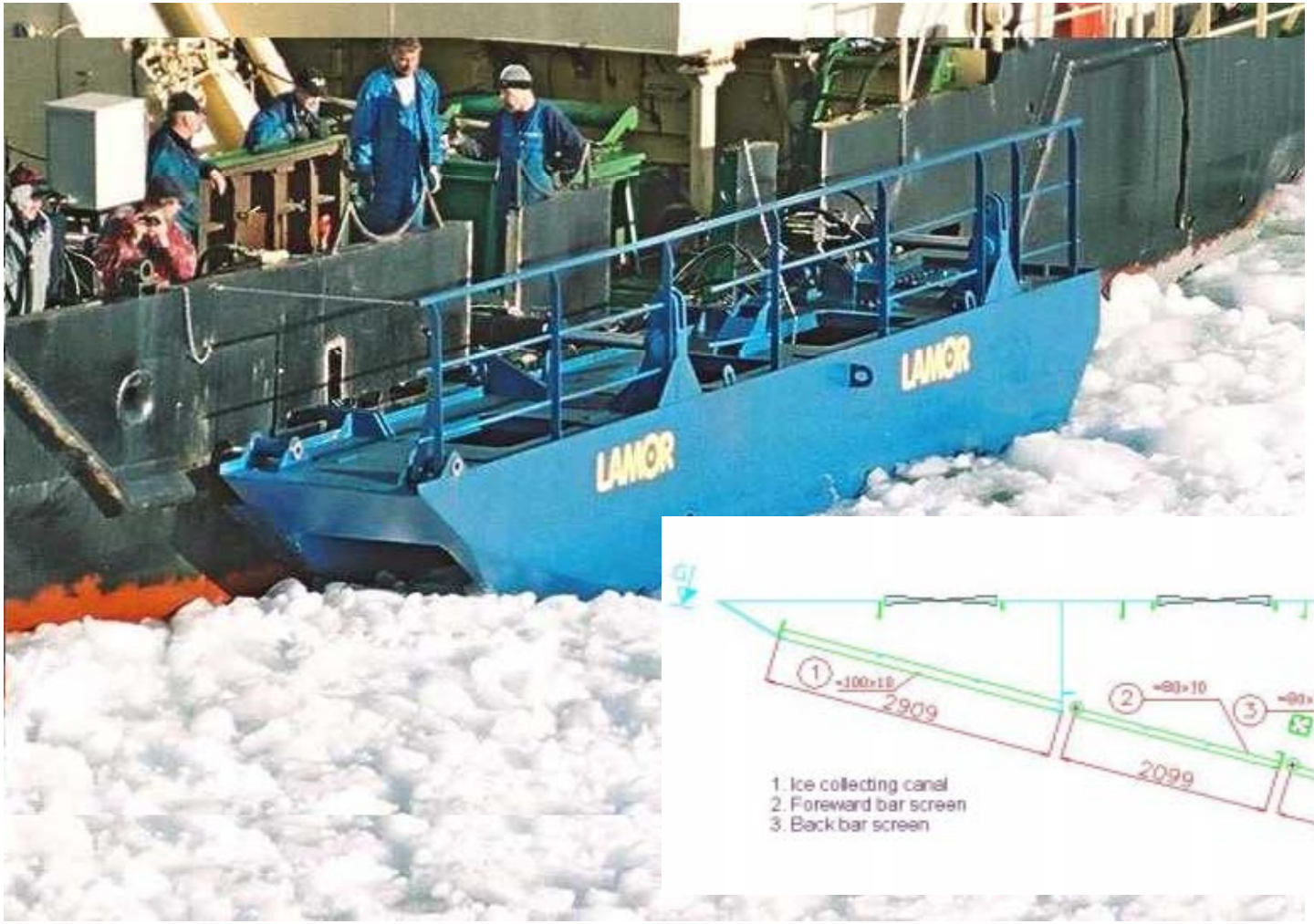
ITEM 6: Oil Combating / Response - Key Parameters

- Oil spreading behaviour over a wide range of ice conditions:
- - under solid ice,
- - oil on ice,
- - oil in leads,
- - oil encapsulation and migration.

ITEM 6: Oil Combating / Response - Key Parameters

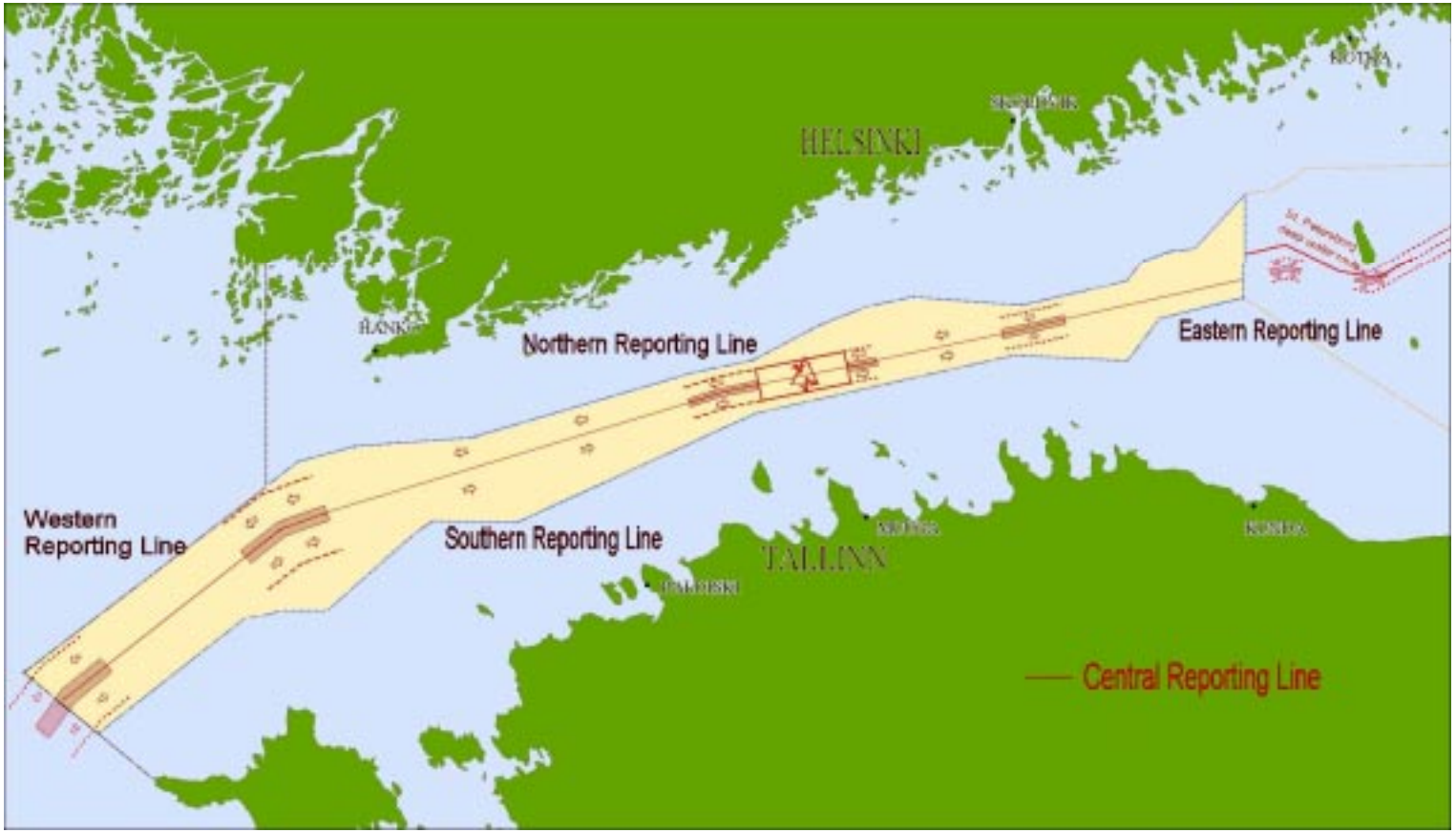
- Oil weathering,
- detection of oil:
- remote: ground penetrating, radar, infrared, IR/UV combined, passive microwave radiometers, gas sniffers, acoustics, lasers, fluorosensors…
- on-site: divers, ROV's, sampling wells, visual….

ITEM 6: Tests of the Ice Vibrating Unit



ITEM 8: lack of escort towing

ITEM 13: SRS GOF



DEFINITIONS

Symbol	Frequency	Description
F1	Very rarely	Less than once in 50 years
F2	Rarely	More than once in 50 years but less than once in 10 years
F3	Sometimes	More than once in 10 years but less than once in every year
F4	Often	More than once a year

Symbol	Consequences	Explanation		
		Oil spill (a)	Human (b)	Material (c)
C1	Insignificant	0–10 ton	Minor injuries	No damages to vessel
C2	Moderate	10–1000 ton	Major injuries	Minor damages to vessel
C3	Considerable	1000–30000 ton	Few casualties	Major damages to vessel
C4	Catastrophic	>30000 ton	More than few casualties	Vessel lost

Risk matrix for ship collision due to ice for the Gulf of Finland Based on expert opinion

Frequencies	C1	C2	C3	C4
F4	5-a 5-b	5-c 11-1c		
F3	2-1b 2-2b	2-2a	2-1a 2-1c 2-2c	
F2	13-2b	13-2a	13-2c	
F1		15-2a	15-2b	2-3a 2-3b 2-3c

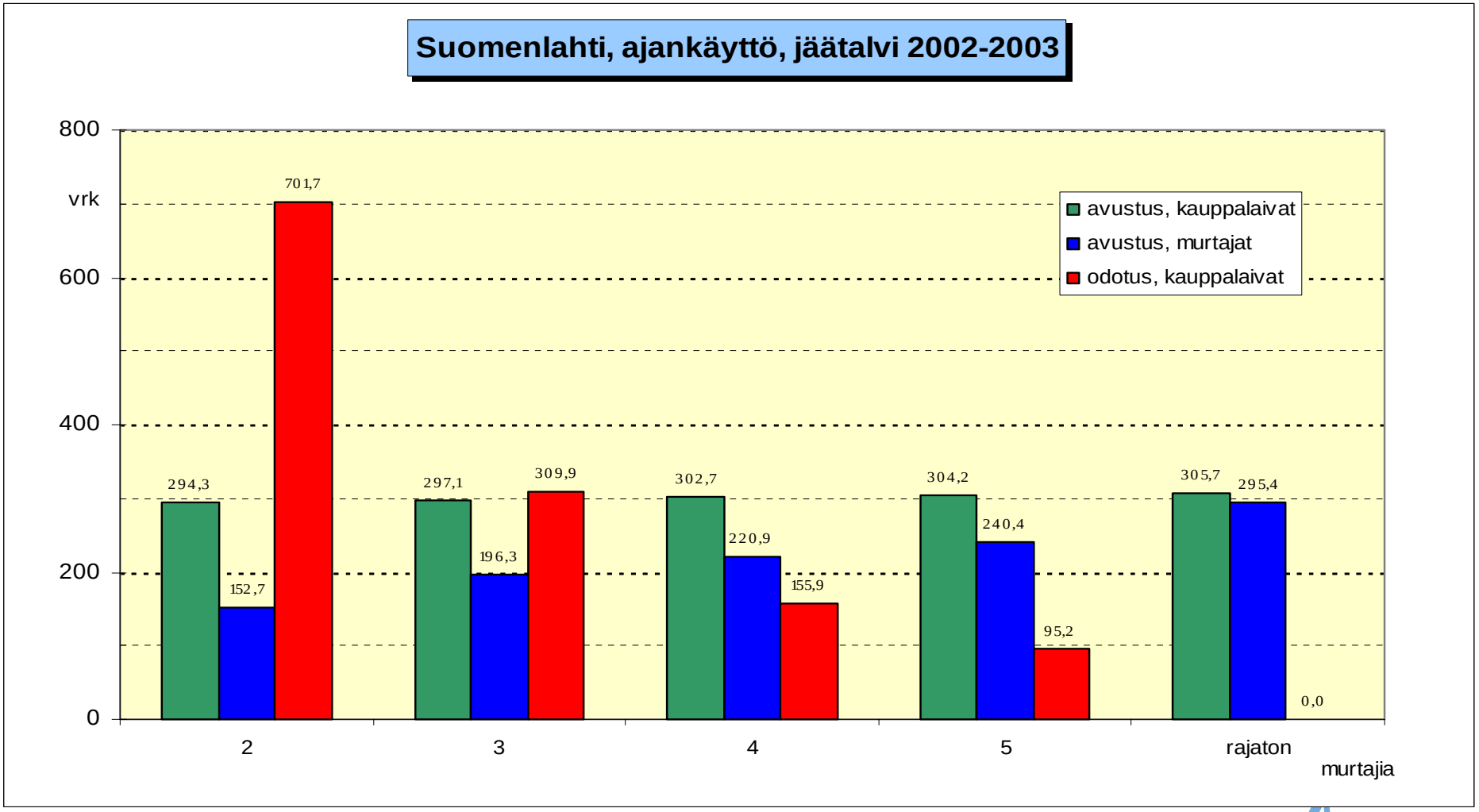
Consequences


Why to use FSA ????

Tools for Risk Handling

- Examples such as,
- traffic control,
- pilotage,
- escort towing,
- ice breaking assistance,
- speed limits,
- traffic control,
- ship registers, PortNet, IbI IbPlot,
- AIS, Helcom AIS
- VTS & VTMIS,
- routeing
- weather limits
- wind limits,
- etc……

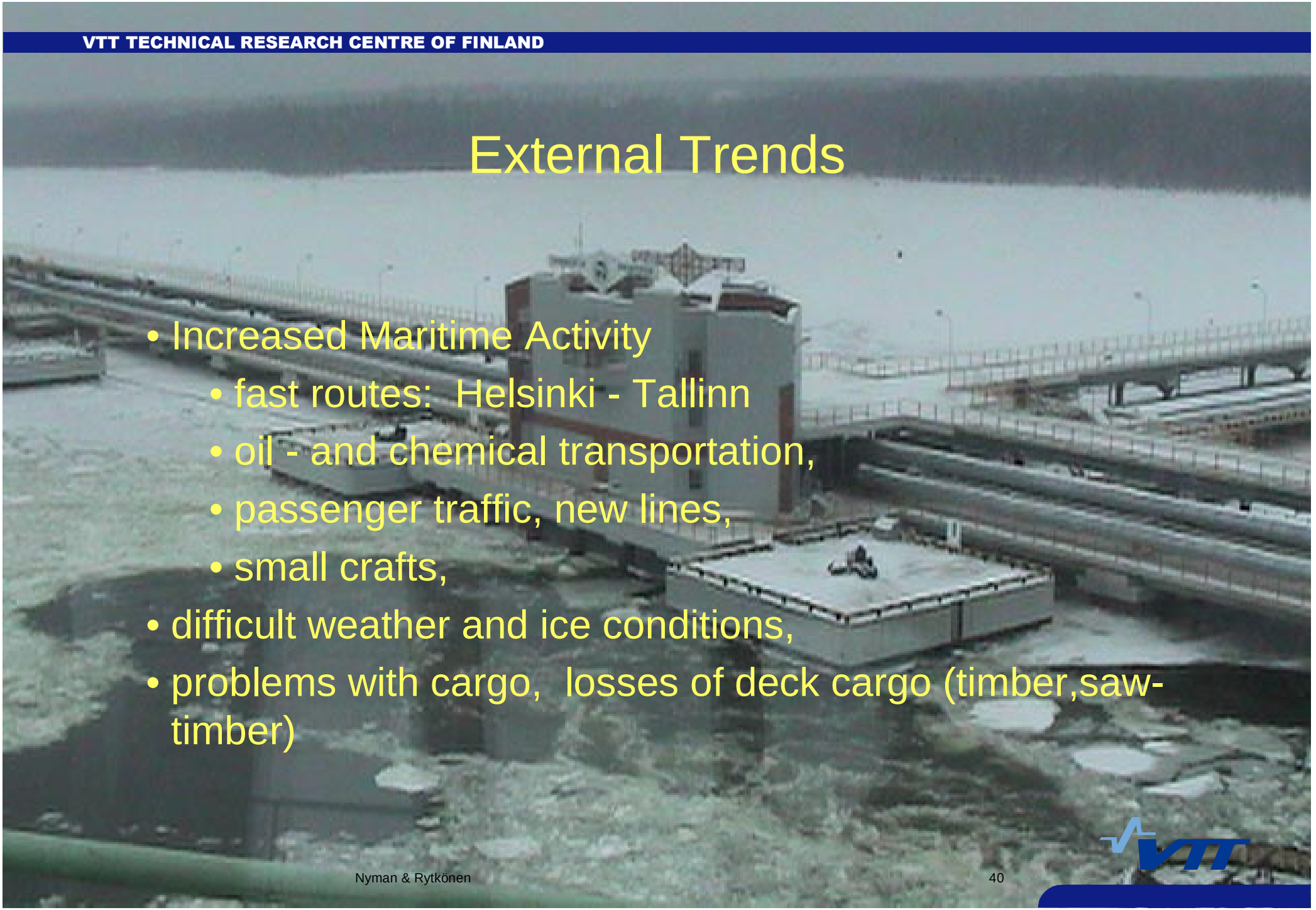
Ice breaker assistance in the Gulf of Finland



Human Impact on Risks

- out-flagging:
  - poor local knowledge,
  - differences on the professional level ,
  - differences on the education,
  - language
  - COLREG-rules - misunderstandings:
    - traffic separations, routeing - wrong behaviours observed,
    - unknown rules for passing by,
- long shifts,
- problem ships - obey no rules.

External Trends



- Increased Maritime Activity
  - fast routes: Helsinki - Tallinn
  - oil - and chemical transportation,
  - passenger traffic, new lines,
  - small crafts,
- difficult weather and ice conditions,
- problems with cargo, losses of deck cargo (timber,saw-timber)

Technical Risks

- increased oil transportation - old and poor ships ?
- single-hull tankers,
- ship-owners with one ships,
- danger of explosion or fire,
- electronic failures,
- dangerous & hazardous goods,
- spills due to technical failures
- damages, structural damages .

Data needed for quantitative risk analyses

- Accident statistics,
- Monetary values for accident consequences,
- Statistics for icing situations.

WWW-pages

- http://www.mintc.fi/www/sivut/dokumentit/liikenne/merenkulku/merenkulkufin.htm
- http://www.vtt.fi/val/val3/val34/seastat/seastatkotisivu.htm
- http://www.vtt.fi/tuo/34/indexe.htm