The Increase of the Marine Oil Transportation in the Baltic a Developing Environmental Risk

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Contents

• Maritime Transport Figures Now and in the Future
• Development Case: the Gulf of Finland
• Definition of the Risk
• Defining Maritime Risks
• Tools to Identify Risks
• Tools to Control Risks
• Aspects of Winter Traffic
• Improvement of Maritime Safety
• Conclusions and Recommendations
Old oil transport & spill scenarios
Sea borne traffic in the Baltic Sea in 1995 (left) and expected growth from 1995 to 2017 (right)

Source: Eurostat 1995 & COWI.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Total volume of trade (mio tons)</th>
<th>Volume in Baltic Sea (mio tons)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break Bulk</td>
<td>168</td>
<td>29</td>
<td>17%</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>529</td>
<td>61</td>
<td>12%</td>
</tr>
<tr>
<td>General Cargo</td>
<td>159</td>
<td>22</td>
<td>14%</td>
</tr>
<tr>
<td>Liquid Bulk</td>
<td>26</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Oil</td>
<td>550</td>
<td>81</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1432</strong></td>
<td><strong>194</strong></td>
<td><strong>14%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume in Baltic Sea (mio tons)</th>
<th>Estimated future volume in Baltic Sea (mio tons)</th>
<th>Growth from 1995 to 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break Bulk</td>
<td>29</td>
<td>82</td>
<td>186%</td>
</tr>
<tr>
<td>Dry Bulk</td>
<td>61</td>
<td>113</td>
<td>84%</td>
</tr>
<tr>
<td>General Cargo</td>
<td>22</td>
<td>64</td>
<td>186%</td>
</tr>
<tr>
<td>Liquid Bulk</td>
<td>1</td>
<td>2</td>
<td>84%</td>
</tr>
<tr>
<td>Oil</td>
<td>81</td>
<td>112</td>
<td>39%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>194</strong></td>
<td><strong>372</strong></td>
<td><strong>92%</strong></td>
</tr>
</tbody>
</table>

Source: Tacis 1998: Existing and Future Shipping Through the Baltic Sea
Statistics; Port Throughputs
Source: Outlook 2000 (level 1998)/ Swedish Maritime Administration

• Sweden 150 Mton;
  Finland 93 Mton;
  Russia 30 Mton;
  Estonia 27 Mton;
  Latvia 47 Mton;
  Lithuania 15 Mton;
  Poland 50 Mton;

• Germany 57 Mton;
• Denmark 102 Mton;
• Norway 11Mton with
  Germany&Sweden; 2 million
  with Poland&Russia (St.
  Petersburg alone > 24 Mton
  in 2000).
Annual Ship Traffic (No. of movements) projected to year 2017, all ship categories

SUOMENLAHDEN SATAMAT

- toimiva satama
- suunnitteilla tai rakenteilla oleva satama

9.10.1998
Development scenarios

- **St. Petersburg Sea Port** 15.6 million tons in 1998;
- 20.5 million tons in 1999;
- over 30 million tons in 2001?
- oil over 9 million tons in 2001.
- **Vyborg** >2…2.5 million tons;
- several smaller terminals & port improvements,
- Vysotsk, oil terminal 10 million tons in 2003?

- **Tallinn & Muga** > oil 22..24 million tons; total volume over 35 million tons in 2000;
- **Lomonosov**, 2.1…4.5 million tons;
- **Batareinya** 15 million tons;
- **Ust-Luga** 35 million tons;
- **Primorsk**, first phase 12 million tons in 2001, second phase in construction -> 18 million tons, future up to...45 million tons;
Primorsk Oil Terminal
General cargo terminal
Container terminal
Oil terminal
Oil products terminal
Liquified gas terminal
Base of marine special division
General objects of port system
Water supply systems

Energy supply systems
Waste water systems
Motorway
Railways
Pipeline
Boundary of dredged soil
Sanitary zone boundary
Batareinya Bay
GoF Oil Transport 1995 - 2005 (Syke, 2001)

OIL TRANSPORTATION IN THE GULF OF FINLAND THROUGH MAIN OIL PORTS

OIL TRANSPORTATION IN YEARS 1995-2000 AND ESTIMATED DEVELOPMENT 2001-2005

Million Tons

- Tallinna
- Ust Luga
- Batareynaja
- Pietari
- Primorsk
- Porvoo putki
- Porvoo
Maritime traffic in GOF in 2000 (left) and 2015 (right)
Oil transportation in GOF in 2000 (left) and 2015 (right)
Oil tanker movements in 2015
### GDP Development 1995 - 2010

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Sweden</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Norway</td>
<td>2.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Finland</td>
<td>2.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Germany</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Russia</td>
<td>2.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Poland</td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Lithuania</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Latvia</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Estonia</td>
<td>4.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

### Points v.2000

<table>
<thead>
<tr>
<th>Point</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23388</td>
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<tr>
<td>2</td>
<td>34692</td>
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<tr>
<td>3</td>
<td>46476</td>
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<tr>
<td>4</td>
<td>58500</td>
</tr>
<tr>
<td>5</td>
<td>75696</td>
</tr>
<tr>
<td>6</td>
<td>85296</td>
</tr>
</tbody>
</table>
Definition of Risk

• 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
Frequency-Number of Fatalities
(source: Hooke: Modern shipping disasters 1963 - 1987.)
Maritime Safety Issues

- External safety (fairways, ports, other ships),
- Internal safety (hull, stability, fire protection),
- Human impact,
- Risks to Environment.
Human influence on risks 1

• The increase of foreign flags:
  • poor knowledge on local conditions,
  • competence differences,
  • insufficient training,
  • COLREG-codes - misunderstanding:
    • traffic separation, routing - no actions to follow,
    • bypassing rules unknown.
Human influence on risks 2

• Risks due to the pleasure crafting:
  • rely on electronics - traffic watching secondary, if any,
  • navigation skills insufficient,
  • understanding of the navigability of large vessel ??
• Loss of fairway,
• Long shifts
  • fall asleep & fits,
• Trouble making ships - not following regulations.
External risk factors

• Increase of the maritime transport
  • fast ferries between Helsinki - Tallinn
  • oil & chemical transportation
  • passenger traffic, new lines
  • small crafts
• Difficult weather and seakeeping conditions,
• Loss of deck cargo, especially timber,
Technical risk factors

• The increase of oil transportation - poor & old ships ?
• Single hull tankers,
• Shipping companies with one poor ship,
• Danger of explosion or fire onboard,
• Electronic failures,
• Dangerous and poisonous cargoes,
• Spills due to the technical malfunctions
• Failures in valves or in pipings, structural failures.
Some risk factors

- Collisions, all ships - probability of a bunker oil spill 0.128 [Mehra],
- Collisions of tankers, oil spill probability 0.39 [Mehra],
- Gof statistics [Helcom-95] 28 accidents per year:
  - 1995 0.22 average spill 234 ton (tanker and cargoship collision),
  - 1996 0.40,
  - 1997 0.46.
- Collision of cargo ships - bunker spill up to 700 tons.
FSA procedure - basic steps

1 Identification of dangers
2 Risk assessment
   Probability and consequences?
3 Definition of risk-based approaches
   What can be done to avoid the unwanted event?
4 Cost-benefit analyses
   Costs of the risk handling procedures?
5 Recommendation phase
   Legislative actions?
Case: UK, shipping routes & tanker accidents.
Case: FSA for the Gulf of Finland

- Statistical analyses,
- Fairways, hot spots,
- Accident statistics of the Baltic Sea,
- Oil spills in the Baltic Sea,
- Definition of sensitive areas,
- Environmental conditions,
- Ice problems, winter traffic...
Traffic Separation Schema,
Risk zones for summer period

Source: Tacis, Baltic Pipeline System; Oil Spill Analysis, March 2000.
Winter problems

Ice conditions of the Eastern GOF. Shipping channel leading to St. Petersburg is clearly visible.

The maximum ice coverage in 1997
• Risk Control Options

"Safety of Shipping in Coastal Waters" (SAFECEO) 1995 - 1998:

Establishment of VTS Systems,
Simulator Training, Refreshment Training,
Bridge Management Tools (International Safety Management Code),
Reliability of Propulsion Systems,
Structure Design and Maintenance,
Improvement of Navigation Ability and
Bridge Control Systems (ECDIS, Integrated Control Systems, Nacos etc..)
Risk Control Options

- Structural means,
- **traffic control:**
- pilotage,
- escort towing,
- speed restrictions,
- remote control,
- basic registers,
- AIS,
- VTS & VTMIS,
- distribution of information,
- traffic separation,
- weather limits,
- wind limits....etc
Conclusions and Recommendations

- **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.
Conclusions and Recommendations

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

• Http://www.vtt.fi/val/val3/val34/seastat/seastatkotisivu.htm