Baltic Sea Icebreaking Report
2011-2012
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FOREWORD

The winter of the last season has been again pretty cold. We can not tell so far whether this is a real global warming or a process of normal alternation of warm and cold winters. Within the limits of a separate historical period we will learn about it later.

Can anyone tell in the affirmative now «Global warming has come, and warm winters are established constantly for long times»? Can anyone assert there is a temporary period of alternation of warm and cold winters? The choice of an appropriate scenario as for a warm or a cold winter approach is certainly the right of every Member State. The real problem is that there is no way to predict authentically the type of winters and ice conditions on long-term basis. We tend to consider that after the period of some warm winters there will come winters with really low temperatures.

It is essential to expect the approach of such a winter and be ready for it in advance. On the wake of some warm winters it might be easy to mistakenly cancel all the Baltic new ice-breaker building plans, send to scrap all outdated ice breakers and cut programs for navigators on sailing in ice conditions.

During the short and warm winters we actually get some additional time to get ready for approach of cold and severe winters and in advance to consider all possible forms of cooperation in our icebreaking efforts as well as to consider the possibility of installation on ice breakers some systems facilitating such a cooperation, which could be, in particular, a question of adoption IB-NET system which has been already tested for a long and has proved its own efficiency.

1. Short history of the Baltic Icebreaking Management

Baltic Icebreaking Management, BIM is an organisation with members from all Baltic Sea states. BIM is a development of the annual meeting between Baltic Sea States icebreaking authorities which have assembled for more than 20 years. The member countries of BIM are Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Norway, Poland, Russia and Sweden.

After the difficult winter navigation season of 2002/2003 a project was started up within the framework of HELCOM, aiming at improving the safety of winter
navigation in the Baltic Sea. The HELCOM – recommendation 25/7 on the safety of Winter Navigation in the Baltic Sea Area was adopted in March 2004.

Within the EU concept Motorways of the Sea, which is one priority project in the trans-European network, the Baltic Sea countries established a working group with the aim of creating more efficient winter navigation by cooperation between the Baltic Sea countries. The icebreaking authorities around the Baltic Sea decided in Helsinki meeting 2004 that this work shall continue within the framework of BIM, were also non EU-member states are taking part. BIM should function all year round and that its strategy should be to develop safe, reliable and efficient winter navigation between the Baltic Sea countries. The overall objective of BIM is to assure a well-functioning maritime transport system in the Baltic Sea all year round by enhancing the strategic and operational cooperation between the Baltic Sea countries within the area of assistance to winter navigation.

January 10th 2007, the Joint Baltic web service on winter navigation www.baltice.org was launched, see appendix 1.

April 11th 2007, the DVD of training in ice navigation for seafarers was launched, see appendix 2.

15th November 2007, HELCOM adopted a new recommendation 28/11. Further measures to improve the safety of navigation in ice conditions in the Baltic Sea, BIM was acting an “ice advisor” in this recommendation.

One important task of BIM is to inform stakeholders in the maritime sector and policy makers about winter navigation and icebreaking. There is a need for information about winter navigation and icebreaking that covers the whole Baltic Sea region. Several Baltic Sea countries prepare information about the winter navigation and icebreaking in their respective national waters. There has been a need to coordinate this country-specific information, improve the information and to distribute it to a wider target group by “Joint Annual Baltic Icebreaking Report” is the second of its kind.
This report gives an overview of the winter navigation season 2011/2012 for the Baltic Sea area. National reports can be found on www.baltice.org. The report will also describe organisational changes in the icebreaking authorities or changes in icebreaking resources and provide a progress report of the Baltic Sea Icebreaking cooperation and the development of BIM.
2. Overview of the icebreaking season (2011-2012) and its effect on the maritime transport system in the Baltic Sea region

According to the Finnish Ice Service of the Finnish Meteorological Institute the Baltic Sea ice season of 2011-2012 could be classified as an average one. The peak of the ice winter was reached on February 11, when ice covered an area of 179,000 km².

Figure 1. The maximum ice extent of the ice winter 2011-2012.
The ice winter 2011-2012 remained average according to the ice extent but otherwise the winter was easy. The winter was shorter than usual because it began exceptionally late and because the last ice disappeared earlier than average. Because of the abundant snow on the ice the ice thicknesses did not reach average readings.

In the sea areas which surround Finland, February was about two degrees colder than average. Towards the end of January the weather cooled. This cold period also made the amount of sea ice increase and the maximum ice situation was reached the 11th of February when ice appeared on an area of 179 000 km² (Fig. 1). This took place two weeks earlier than average.

After this the winds turned to the southwest and the ice area began to get smaller when the winds compacted the ice fields (Fig. 2). When the winds caused strong ice pressure, the ship traffic had to be interrupted at times.

During April the sea ice drifted with the winds. Spring made the ice rot and melt. The Gulf of Finland was ice-free the first weekend of May. In the Bay of Bothnia the coastal ice drifted to the open sea and melted fast. The Bay of Bothnia was ice-free on May

![Figure 2. The area of the ice extent during the ice winter 2011-2012.](Image)
Figure 3. The maximum ice coverage in ice winters 1961-2012. The median of 1961-2011 (51 years) is 186 000 km². Severities of the season are indicated using colours from mild to severe (lightest blue to darkest blue respectively).

Traffic restrictions 2010-2011

Figure 5. Dates when traffic restrictions were in force in the different areas.
For safety reasons, the Baltic Sea countries have within HELCOM agreed on a joint policy when traffic restrictions shall be issued. For efficiency reasons, the icebreaking authorities can demand a lowest limit on vessels’ engine power as well.

Figure 6. HELCOM recommendations for traffic restrictions.
Approximate correspondence between ice classes of Finnish-Swedish ice Classes Rules (Baltic classes) and ice Classes of other Classification Societies

<table>
<thead>
<tr>
<th>Classification Society</th>
<th>Ice Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finnish-Swedish Ice Class Rules</td>
<td>IA Super</td>
</tr>
<tr>
<td>Russian Maritime Register of Shipping (Rules 2007)</td>
<td>Arc 5</td>
</tr>
<tr>
<td>Russian Maritime Register of Shipping (Rules 1995)</td>
<td>UL</td>
</tr>
<tr>
<td>Russian Maritime Register of Shipping (Rules 1999)</td>
<td>LU5</td>
</tr>
<tr>
<td>American Bureau of Shipping</td>
<td>IAA</td>
</tr>
<tr>
<td>Bureau Veritas</td>
<td>IA SUPER</td>
</tr>
<tr>
<td>CASPPR, 1972</td>
<td>A</td>
</tr>
<tr>
<td>China Classification Society</td>
<td>Ice Class B1*</td>
</tr>
<tr>
<td>Det Norske Veritas</td>
<td>ICE-1A*</td>
</tr>
<tr>
<td>Germanischer Lloyd</td>
<td>E4</td>
</tr>
<tr>
<td>Korean Register of Shipping</td>
<td>ISS</td>
</tr>
<tr>
<td>Lloyd’s Register of Shipping</td>
<td>IAS</td>
</tr>
<tr>
<td>Nippon Kaiji Kyokai</td>
<td>IA Super</td>
</tr>
<tr>
<td>Registro Italiano Navale</td>
<td>IAS</td>
</tr>
</tbody>
</table>

Figure 7. Table for corresponding ice classes.

Smaller vessels like buoy tenders and tugs with strong engines and hull are used as port icebreakers and for icebreaking mission in waters protected from drifting sea ice. In open sea areas that are affected by drifting sea ice with ridges and ice pressure, big sea icebreaker are required.
According to statistics from the Baltic Sea icebreaking authorities, 10750 vessels received assistance from icebreakers this season.

Figure 8. The total number of icebreakers in operation each week in Baltic Sea during the season 2010/2011

Figure 9. A total of 2432 vessels were assisted by icebreakers during the icebreaking season in the Baltic Sea.
The longest sailing distance in sea ice is to the northernmost ports in the Bay of Bothnia. But due to the big number of vessels in the shorter fairway to the easternmost ports in the Gulf of Finland, the traffic is more affected by sea ice in this area, especially during periods with strong westerly winds when the icebreakers must tow many vessels one by one.

**Maximum sailing distance in sea-ice 2010-2011**

*Figure 10.* Sailing distance from ice edge during maximum ice extension, 11 February 2012: to Kemi 89 nautical miles in thicker than 15 cm ice and to St.Petersburg 175 nautical miles. In addition there was approximately 160 nautical miles of thinner than 15 cm ice in Danish Straits. (Numbers: above – sailing distance in ice covered waters; below – sailing distance in ice thicker than 15 cm.)
3. Accidents and incidents in sea ice

The Technical University of Helsinki collects information on accidents related to navigation in ice. Ship owners and others within winter navigation are requested to report accidents, incidents and damages that are ice-related to icedamage@tkk.fi or to:

Ice Damage Database
Helsinki University of Technology
Ship Laboratory
PL 5300
02151 TKK
FINLAND

Only some minor damages occurred to merchant vessels during assistance of the icebreakers. In comparison, about 100 vessels reported damages due to the severe ice conditions in the year 2011. Reports of accidents are difficult to get because often damages won’t appear until during the next dry docking.

4. Costs of icebreaking services in the Baltic Sea

Winter conditions cause various costs for vessel traffic in the Baltic Sea. The vessels’ fuel costs increase since speed is reduced by even half on average due to ice barriers when proceeding in ice at full effect, and approaching the quay can take hours. The harbour costs also increase, since the basin must be kept open by a harbour tug in order for the vessels to reach the quay.

4.1 Finland

In Finland the costs of icebreakers in period 2011-2012 were 34 million EUR, including stand-by and operational costs. Bunker costs were 6 million EUR. The total amount of operating days was 418. The FTA has also contracts with private tugboat companies for minor operations. The costs of the Finnish icebreaking services vary from 30 to 50 million euros depending on winter.

4.2 Sweden

In Sweden the costs for the stand-by period for our own icebreakers is approximately 12 million EUR, additional operational costs is 5 million EUR, and fuel costs to 2.5-9 million EUR. The total cost for the Swedish icebreaking services
including external recourses varies from 20 to 40 million euros depending on the winters’ severity. The costs this winter are estimated to be 20,7 million euros.

4.3 Russia

Since June, 12th, 2012 according to the act of Federal Service on Tariffs dd 04.05.2012 № 80-т/3 (corrections to the act of Federal Service on Tariffs dd 20.12.07 №552-т/1) new rates of icebreaking dues in the Russian ports of the Gulf of Finland are established as follows:

Icebreaking dues:

1. Moreover, heating to keep equipment in working order despite outdoor temperatures below -20 ºC adds to the costs. Since it is difficult to estimate other costs, this report comprises only those related to icebreakers. Icebreaking dues are applied for incoming, outcoming or transiting the port area.

2. For the cargo ships engaged in liner services, which are officially declared, to the rates of the icebreaking dues the factor of 0.8 is applied.

3. From icebreaking dues are released:

   • vessels of ice class LU7 (according to classification of the Russian Maritime Register of Shipping or classes of other classification societies corresponding to it);

   • passenger vessels.

4. Upon the announcement by the Harbour Master of winter (summer) navigation before the target date, and also after the prolongation of its duration, icebreaking dues are paid as per corresponding rates from the date of announcement to a date of completion (inclusive), corresponding to the period of winter navigation.
Rates for ships engaged in an international trade rub/1 GT
(for Bolchoy port of Saint-Petersburg)

<table>
<thead>
<tr>
<th></th>
<th>All vessels except Ro-Ro, Ro-Flow, container ships and tankers</th>
<th>Container ships</th>
<th>Ro-Ro, Ro-Flow</th>
<th>Tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The summer rate from May, 1st till November, 30th</td>
<td>5.78</td>
<td>4.04</td>
<td>2.32</td>
<td>6.33</td>
</tr>
<tr>
<td>The winter rate from December, 1st till April, 30th</td>
<td>14.39</td>
<td>10.07</td>
<td>5.53</td>
<td>15.77</td>
</tr>
</tbody>
</table>

During the period from May, 1st till November, 30th the following vessels are released from payment of icebreaking dues:

- arriving to the port from inland waterways of Russia or from the Saimaa canal and sailing back within current year;

- arriving to the port from other Russian ports situated in the eastern part of the Gulf of Finland.

During the period from December, 1st till April, 30th the vessels with ice class LU5 and LU6 (according to classification of the Russian Maritime Register of Shipping or classes of other classification societies corresponding to it) are subject to icebreaking dues multiplied by factor 0.75.
4.4 Estonia

In Estonia, the total cost of icebreaking in the 2011-2012 season amounted to approximately 5.5 million EUR, with about 540 000 EUR accounting for the costs in the Pärnu Bay and 4.96 million EUR for the Gulf of Finland. This is the Governmental costs

4.5. Denmark

The cost of the Danish ice service was approximately 2.3 million EURO. Which is less than half of the cost the previous year (5.3 million EURO). The reason for this was extraordinary maintenance cost for icebreakers DANBJØRN and ISBJØRN in 2010. The cost covers the Danish icebreakers on standby, the running coast for the Ice Service, and charter for tugs participating in ice breaking.

4.6 Norway

During the winter 2011 – 2012, the total costs of ice breaking service in Norwegian waters were approximately EUR 530 000. The tug Bamse Tug was hired for ice breaking and vessel assistance at a cost of slightly EUR 160 000. Local vessels were hired at a cost of approximately EUR 370 000.

4.7. Latvia, Lithuania, Poland, Germany,

There was no cost info for icebreaking operation in this season 2011-2012.

5. Winter navigation in the different parts of the Baltic Sea

5.1. Bay of Bothnia

The first traffic restrictions were initiated on the 14th of January and reached their highest level IA and 4000 dwt, on the 14th of February.

The first icebreaker Ale was put in readiness in Lulea on January the 17th. The first assistance was conducted on January the 20th.
The ice growth started in the end of January and in the end of February the maximum ice extension appeared. At that time there were 6 icebreakers (3 Finnish and 3 Swedish) engaged in accordance with the joint icebreaking plan.

Assistance has been conducted to following ports:

<table>
<thead>
<tr>
<th>Karlsborg</th>
<th>Tornio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luleå</td>
<td>Kemi</td>
</tr>
<tr>
<td>Haraholmen</td>
<td>Oulu</td>
</tr>
<tr>
<td>Skelleftehamn</td>
<td>Raahe</td>
</tr>
<tr>
<td>Kokkola</td>
<td></td>
</tr>
<tr>
<td>Pietarsaari</td>
<td></td>
</tr>
</tbody>
</table>

The icebreakers in the Bay of Bothnia assisted 1328 merchant vessels and 171 towing operations were conducted. These figures can be compared with last season, which was a severe winter, when 4277 vessels assisted and 590 towing’s carried out.

The average waiting time was 2 hours and 32 minutes. 91.17% of all port calls did not have to wait for icebreaker assistance at all, but 4.38% of the port calls had to wait more than 4 hours for icebreaker assistance (so-called long waiting).

The icebreaking season in the Bay of Bothnia ended on the 13th of May. The first traffic restrictions in the northern part of Sea of Bothnia were initiated on the 22nd of January and in the southern part on the 5th of February. The highest level IA and 2000 dwt in the North and II and 2000 dwt in the South were in force from the middle of February until the middle of March.

5.2. Sea of Bothnia

The first traffic restrictions in the northern part of Sea of Bothnia were initiated on the 22nd of January and in the southern part on the 5th of February. The highest level IA and 2000 dwt in the North and II and 2000 dwt in the South were in force from the middle of February until the middle of March.
2 icebreakers were engaged in the Sea of Bothnia when the maximum ice extension appeared. The icebreaker Ale has jointly been used by the Finnish and Swedish Administrations in the Northern Quark.

Assistance has been conducted to following ports:

Holmsund    Vaasa
Rundvik      Kaskinen
Husum        Mäntyluoto
Rauma
Uusikaupunki
Naantali

The icebreakers in the Sea of Bothnia assisted 71 merchant vessels and no towing operations were performed. The average waiting time was 9 hours and 48 minutes. 83.10% of all port calls did not have to wait for icebreaker assistance at all, but 5.63% of the port calls had to wait more than 4 hours for icebreaker assistance (so-called long waiting).

The icebreaking activities in the Sea of Bothnia ended in the end of March and the traffic restrictions was lifted on the 26th of April.

5.3 Gulf of Finland

Winter was light in the Finnish part of Gulf of Finland.

The first traffic restrictions were initiated on 5th of February, and the highest restriction was from 18th of February till 5th of March. Ice restrictions ended on 12th of April for Finnish ports.

In the Gulf of Finland for Finnish ports icebreakers assisted 183 merchant vessels and 16 towing operations were conducted. The average waiting time was 1 hours and 24 minutes. 98.4% of all port calls did not have to
wait for icebreaker assistance at all, but only 3-vessels of the port calls had to wait more than 4 hours for icebreaker assistance (so-called long waiting).
The icebreaking season in the Gulf of Finland ended on the 25th of March for Finnish ports.

For Estonian part of Gulf of Finland traffic restrictions were initiated on 9th of March for ports of Kunda and Sillamäe. Ice restrictions were ended from 13th of April. For port of Kunda and Sillamäe were assisted 54 ships.

The first traffic restrictions were initiated 27 January in St. Petersburg. The restrictions were cancelled 25 April. For Russian ports were assisted 2273 ships.

All vessels, which needed icebreaker assistance, were bound for Russian ports. During the largest ice cover, the Russians had 6 sea icebreakers and 7 minor icebreakers in use. The icebreaking season lasted from 01 December to 01 May in the Russian territorial water (from 01 December 2011 to 02 May 2012 for seaports Vyborg and Vysotsk).

Ice conditions in the eastern part of the Gulf of Finland in 2011-2012
The ice formation processes in the winter of 2011/2012 were those of an extremely mild winter.
Ice formation in the coastal shallow zone of the eastern part of the Gulf of Finland begins in late December – early January.
By the end of the January 2012, the fast ice 15 to 20 cm thick was in the Nevskaya Guba, in the Gulf of Vyborg, 10 to 15 cm in the Bjorksund passage, 5 to 15 cm in the Luzhskaya and Koporskaya Guba. The edge of drift ice 10–20 cm thick reached the longitude of the Moschny Island.
By the end of the February 2012, the fast ice with thickness 50 – 60 cm was in the Nevskaya Guba (from St. Petersburg up to longitude of Tolbukhin lighthouse). Westward up to longitude of Hogland island was fast ice thickness 25 – 45 cm, in some areas hummocked ice. Westward up to longitude Vaindlo island was floating ice with thickness 20 – 35 cm.
In the Vyborg bay – fast ice with thickness 30 – 45 cm
In Bjerkezund strait fast ice with thickness 30 – 40 cm.
In Luga bay – fast ice with thickness 35 – 45 cm

By the end of the March 2012, the fast ice with thickness 50 – 60 cm was in the Nevskaya Guba (from St. Petersburg up to longitude of Tolbukhin lighthouse). Westward up to longitude of Moschny Island was fast ice thickness 30 – 45 cm, in some areas hummocked ice. Westward up to longitude Hogland island was floating ice with thickness 20 – 35 cm.

In the Vyborg bay – fast ice with thickness 35 – 45 cm

In Bjerkezund strait fast ice with thickness 30 – 40 cm.

In Luga bay – fast ice with thickness 35 – 45 cm

During April 2012, warm weather was observed, with the average monthly temperature within the standard values. The ice cover in the Gulf of Finland was slowly destructed. The thickness of fast and drift ice was gradually decreasing. The destruction of ice was increasing. In the second half of the month, the destruction of the ice cover accelerated. The Nevskaya Guba, as well as all the main navigable fairways, became completely free of ice on April 25.

5.4 Gulf of Riga

The Estonian Meteorological and Hydrological Institute assessed the winter of 2010/2011 as average. The traffic restrictions were initiated 06 February being IC-1600 kW in Pärnu and were cancelled 04 April. The icebreaking season lasted from 31 January to 04 April and 71 ships were assisted. For Latvian port Riga the traffic restrictions for ships with Ice class 1C and Engine power 1600kW and also for barges were announced from 6th of February and cancelled on 21st of March.

Icebreaker Varma was berthed in the port all season, three tugboats with engines power up to 3500kW and Ice class 1A provided assistance for ships entering and leaving Riga port.
5.5. Central Baltic

No traffic restrictions were initiated in Central Baltic this winter.

5.6 South Baltic Coastline

The ice season on the Baltic Sea South coast did not cause difficulties to merchant shipping. In Germany, very local restrictions were set only in sheltered inner waters, but there were no restrictions for seagoing vessels. The icebreaking service was not in force.

There was no typical ice-breaker available on East Coast area of Poland. Tugs with ice class are in use for ice breaking service. Air and sea water temperatures were above average through all the winter season. No ice formation was noted. No difficulties to the traffic were reported during whole winter season 2010/2011. It was no necessity to use ice-breakers during whole season.

5.7 Western Baltic, Danish waters

The winter 2011-2012 was milder than the previous winter. The icebreakers DANBJØRN and ISBJØRN were on readiness from December 15th. In the beginning of February ice conditions gave problems for minor vessels in Limfjorden and Smålandsfarvandet and in the timeframe February 3-23 a total of 32 vessels were assisted. In the end of February the ice was gone.
The readiness of the Icebreakers ended March 31st.

6. Description of organisations and icebreakers engaged during the season 2010/2011

6.1 Finland

The Finnish Transport Agency (FTA) is the national authority responsible for the assistance of winter navigation, its coordination, development and management nation-wide. The actual icebreaking services have been contracted out.

The FTA develops Finland’s icebreaking policy, taking into account the requirements of its clients (mainly the Finnish industry). Essential for the industry are as short waiting times as possible for traffic. The FTA decides on the length of the assistance period, exemptions and traffic restrictions.

The traffic restrictions are normally made more stringent than the minimum HELCOM safety recommendations, as the objective is, besides safety, to assure an efficient maritime traffic flow. Only vessels fulfilling the criteria of daily traffic restrictions are given assistance.

The icebreaking services are purchased from the Arctia Icebreaking, Svenska Sjöfartsverket, Alfons Håkans Oy, and also from the private companies (mainly tugboat services for ice breaking in light ice-conditions in harbour entrances and in Lake Saimaa).

The main service level is that vessels should not have to wait for an icebreaker for more than 4 hours on an average. Another goal for the Finnish icebreaker service standard is that 90 % to 95 % of vessels navigating in the ice field could get through without waiting for icebreaker assistance.

In Finland no special fee is collected for the icebreaker service. All ships pay fairway fees based on ship size and ice class. The fairway dues are used to cover the costs of fairway maintenance and icebreaking services.
Icebreakers engaged by the Finnish Transport Agency 2011/2012:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>FENNICA</td>
<td>Multi-Purpose Icebreaker</td>
<td>21 000 KW</td>
</tr>
<tr>
<td>NORDICA</td>
<td>Multi-Purpose Icebreaker</td>
<td>21 000 KW</td>
</tr>
<tr>
<td>FREJ</td>
<td>Icebreaker</td>
<td>18 400 KW</td>
</tr>
<tr>
<td>KONTIO</td>
<td>Icebreaker</td>
<td>21 800 KW</td>
</tr>
<tr>
<td>OTSO</td>
<td>Icebreaker</td>
<td>21 800 KW</td>
</tr>
<tr>
<td>SISU</td>
<td>Icebreaker</td>
<td>18 400 KW</td>
</tr>
<tr>
<td>URHO</td>
<td>Icebreaker</td>
<td>18 400 KW</td>
</tr>
<tr>
<td>VOIMA</td>
<td>Icebreaker</td>
<td>12 800 KW</td>
</tr>
<tr>
<td>ZEUS</td>
<td>Icebreaker</td>
<td>6000 KW</td>
</tr>
</tbody>
</table>

6.2 Sweden

Icebreaking operations are managed by the Icebreaking Management of the Swedish Maritime Administration in Norrköping and are based on the Swedish icebreaking regulation (2000:1149). It allocates icebreakers to work areas, issues traffic restrictions, monitors the operational situation and informs the shipping stakeholders of ice conditions and the traffic situation. Sweden controls eight icebreakers, of which the Swedish Maritime Administration owns five and has three on long-term charter from a private ship owner. All icebreakers are manned by a private shipping management company.

Sweden and Finland use a jointly developed IT based on-line system, IB-Net (IceBreaker Net) for coordination of the joint icebreaking operations. IBNet contains information about the weather, ice conditions and traffic situation, and transmits the information between the different connected units (icebreakers, coordination centres, VTS etc.)

In addition to the icebreakers, ice strengthened buoy tenders of the Swedish Maritime Administration and private tugboats are also engaged in the icebreaking service. Helicopters are chartered and used for ice reconnaissance and personnel transport in order to reduce time expenditure for icebreakers. Cooperation with the tugboats in ports is common around the coastline.
The governmental fairway dues cover the costs for the icebreaking operations and no vessel that receives assistance from icebreaker is charged.

Icebreakers engaged by the Swedish icebreaking service 2010/2011:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALE</td>
<td>Icebreaker</td>
<td>3500 KW</td>
</tr>
<tr>
<td>ATLE</td>
<td>Icebreaker</td>
<td>18400 KW</td>
</tr>
<tr>
<td>FREJ</td>
<td>Icebreaker</td>
<td>18400 KW</td>
</tr>
<tr>
<td>YMER</td>
<td>Icebreaker</td>
<td>18400 KW</td>
</tr>
<tr>
<td>ODEN</td>
<td>Icebreaker</td>
<td>18000 KW</td>
</tr>
<tr>
<td>SCANDICA</td>
<td>Buoy tender</td>
<td>2610 KW</td>
</tr>
</tbody>
</table>

During the winter the Administration also has engaged 9 different tugboats for icebreaking operations.

6.3 Russia

The icebreaker assistance in the eastern part of the Gulf of Finland is regulated by the Harbour Master of the Port of St. Petersburg (according to Direction of Agency of Transport AD-270-p, 18.08.2011). The Harbour Master of the Port of St. Petersburg has the power to impose shipping restrictions in the area for the traffic bound to or from Russian ports, based on actual ice conditions (according to article Nos. 74 & 76, Russian Federal Law No. 81-FZ, Russian Merchant Marine Code, 30.04.1999).

The ice navigation assistance is conducted by the state-owned icebreakers and covers the sea ports: Bolchoy port of St. Petersburg, Primorsk, Vyborg, Vysotsk and Ust-Luga. The state-owned icebreakers assist the inland transit navigation via Saimaa Canal both ways.

The icebreaker fleet consists of the following icebreakers:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Let Pobedy</td>
<td>Icebreaker</td>
<td>75 000 kW   (03/02/2012 -07/03/2012)</td>
</tr>
<tr>
<td>Russia</td>
<td>Icebreaker</td>
<td>75 000 kW   (07/03/2012-18/04/2012)</td>
</tr>
<tr>
<td>ERMAK</td>
<td>Icebreaker</td>
<td>30 400 KW</td>
</tr>
<tr>
<td>CAPTAIN SOROKIN</td>
<td>Icebreaker</td>
<td>18 300 KW</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Power</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>--------</td>
</tr>
<tr>
<td>CAPTAIN NIKOLAEV</td>
<td>Icebreaker</td>
<td>18 000 kW</td>
</tr>
<tr>
<td>MOSKVA</td>
<td>Icebreaker</td>
<td>16 000 kW</td>
</tr>
<tr>
<td>SAINT-PETERSBURG</td>
<td>Icebreaker</td>
<td>16 000 kW</td>
</tr>
<tr>
<td>TOR</td>
<td>Icebreaker</td>
<td>10 000 kW</td>
</tr>
<tr>
<td>MUDYUG</td>
<td>Icebreaker</td>
<td>9 100 kW</td>
</tr>
<tr>
<td>KARU</td>
<td>Icebreaker</td>
<td>6 450 kW</td>
</tr>
<tr>
<td>SEMION DEZHNEV</td>
<td>Icebreaker</td>
<td>4 000 kW</td>
</tr>
<tr>
<td>IVAN KRUZENSTERN</td>
<td>Icebreaker</td>
<td>4 000 kW</td>
</tr>
<tr>
<td>YURI LISYANSKY</td>
<td>Icebreaker</td>
<td>4 000 kW</td>
</tr>
<tr>
<td>CAPTAIN ZARUBIN</td>
<td>Icebreaker</td>
<td>4 650 kW</td>
</tr>
<tr>
<td>CAPITAN M. IZMAILOV</td>
<td>Icebreaker</td>
<td>3 940 kW</td>
</tr>
</tbody>
</table>

The icebreaker assistance, as a rule, is conducted as follows:

1. Independent ice navigation following icebreaker recommendations and strictly under her supervision.
2. Icebreaker assistance in a convoy.
3. Individual icebreaker assistance behind an icebreaker.

Icebreaker assistance is given to the ships which do not fall under the acting restrictions in the ports of their destination. Icebreaker assistance for the traffic coming from the sea is conducted from the point where the convoy is formed to the inner road of the port, and the ships leaving the port are assisted from the inner road to the area next to the convoy forming point (CFP).

All the ships coming from the sea are prohibited from entering the ice east of the convoy forming point (CFP) without permission of the icebreaker. The Masters of the ships sailing independently upon receiving the permission of the icebreaker are to report to the icebreaker while passing the established control points of the recommended route and inform of the ice situation in the area. If such a ship gets stuck, the icebreakers are to release them and correct their recommended route or get them in the convoy for further motion. The Masters of the ships are not recommended to rely on data regarding recommended routes received from other ships and not confirmed by the Master of the icebreaker.
When the ice thickness over the approach fairways leading to Russian ports in the eastern part of the Gulf of Finland becomes considerable, the Harbour Master of sea port imposes restrictions on ships the ice class and the main engine capacity of which are not sufficient for navigation under prevailing circumstances.

6.4 Estonia

The responsible organization for icebreaking in Estonia is the Estonian Maritime Administration. The Director-General of the Estonian Maritime Administration decides on traffic restrictions and directives on winter navigation. The icebreaking coordination centre consisted of 11 members in 2011, chaired by the Head of the Maritime Safety Division of the Maritime Administration, and acts as an advisory board for the Director-General in icebreaking issues.

Ports that are serviced by state ice-breakers are Muuga Harbour, harbours of Tallinn and Kopli Bay, Paldiski North Harbour, Paldiski South Harbour, Kunda Harbour, Sillamäe Harbour and Pärnu Harbour.

Currently, Estonia has one icebreaker, TARMO, to operate in the Gulf of Finland area, and the multi-purpose vessel EVA 316 to operate in the Pärnu Bay. Icebreaking to the port of Pärnu was carried out by multi-purpose vessel EVA 316 and tug CASTOR. Icebreaking for Gulf of Finland was carried out by IB TARMO and IB VIDAR VIKING

Icebreakers engaged by the Estonian Maritime Administration 2010/2011:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>TARMO</td>
<td>Icebreaker</td>
<td>10 000KW</td>
</tr>
<tr>
<td>EVA 316</td>
<td>Multi-Purpose Vessel</td>
<td>3 x 1 717 KW</td>
</tr>
<tr>
<td>VIDAR VIKING</td>
<td>Icebreaker</td>
<td>13 440 kW</td>
</tr>
<tr>
<td>CASTOR</td>
<td>Tug</td>
<td>3728 kW</td>
</tr>
</tbody>
</table>

6.5 Latvia

Latvia has three international sea ports: Riga, Ventspils and Liepaja. There is one icebreaker, the VARMA, which is owned and operated by the Port of Riga, for approximately 10 years. VARMA mainly operates in the Irbe Strait. The icebreaking
in Ventspils and Liepaja is carried out by tugboats. There are plans to replace the VARMA with a new icebreaker. 

The estuary to the Port of Riga is affected by silting and maintenance dredging is essential to keep the depth in the fairway. A combined icebreaker/dredger should be a good solution when such investment is useful every year.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARMA</td>
<td>Icebreaker</td>
<td>10 165 KW</td>
</tr>
</tbody>
</table>

6.6 Lithuania

The port of Klaipeda is the northernmost ice-free port in the eastern Baltic coast. Klaipeda State Seaport Authority (KSSA) is the responsible organisation for icebreaking in Klaipeda harbour waters. The Lithuanian fairways are open all year round. 

There are no demand and necessity for icebreaking service in the Lithuanian coastal waters, to the border to the port area or in Butinge Terminal. During severe winters, private tugboats carry out icebreaking. In total, 11 tugboats operate in the port of Klaipeda.

6.7 Poland

WEST COAST AREA (SZCZECIN and SWINOJSCIE)

1. The buoyage was partly removed and replaced by special winter buoys on the approach to Świnoujście and on the main fairway Swinoujście -Szczecin shortly before winter season.

2. The winter began later than usually. The first ice formation appeared on the last days of January 2012 and on the 4-th of February 2012 there was 100% coverage of ice in the area within ports of Swinoujście and Szczecin. The ice thickness was abt 10 cm in the beginning and up to 25 cm later on.

The navigation in the area was the most difficult between 10 and 17 of February 2012, when due to the strong winds from the North the ice has been ridged and heaped up.

In the third decade of February 2012, due to the warmer weather the ice started to melt and on 12 March 2012 the ice disappeared.
3. Actions taken

As the first ice formation appeared, on 31 January 2012, VTS Szczecin started publishing in internet the ice statements for regions: Zatoka Pomorska, Swinoujscie, Dziwnow, Zalew Szczecinski and small ports of Zalew Szczecinski and port of Szczecin. These „ice news” contained:
- percentage of ice covering
- thickness / rafting of ice
- ice restrictions

The publishing of ice news ended on 12 March 2012.

Ice restrictions, issued by Harbour Masters of Swinoujście / Szczecin, in their area of responsibility.

From 02 February 2012 till 25 February 2012 as follows:
- the main fairway Swinoujscie - Szczecin and port of Swinoujscie and Szczecin were available for vessels with ice class L-3 PRS (or equivalent of another Class) and main engine power above 1700KW.
- then from 06 February the fairway Swinoujscie — Szczecin and Port of Szczecin was available for vessels with ice class L-3 PRS and main engine power above 2000KW.
- then from 15 February for vessels with ice class L-3 PRS and main engine power above 3500 KW — the engine power was lowered again to 2000 KW on 16 February 2012 - and on 25 February 2012 restrictions were suspended.

Additionally:
On 02 February one way traffic was established on fairway between Gate No I and port of Szczecin. Also timber logs rafting was suspended on 25 February.
-From 02 February till 25 February - tug service exemptions were suspended.
-From 02 February till 22 March 2012, when the buoyage was replaced again, pilot exemption certificates were suspended.

4. Ice breaking

Generally the traffic was organized in convoys as one way traffic was established. The convoys were leaded, when it was necessary, by strong tugs as ice breakers.

The first ice breaking was on 10 February the last on 17 February 2012.

Total working time of ice breakers was 33 hours.
EAST COAST AREA (GDANSK and GDYNIA)

1. Prolonged low temperatures at the end of the month of January 2012 caused the first ice formation to appear. This covered only small part of the port and road waters without creating any serious difficulties for shipping.

On the 31st January 2012 all ports were obligated to report ice situation twice a day.

Another wave of low temperatures in the beginning of February 2012 resulted in systematic growth of ice formation on the road areas and in the harbours. The thickness of sea ice was from 10 to 25 centimetres at places.

2. The ice breaking action for inner areas of Gdynia and Gdansk started on 11th February 2012.

The action for Gdansk was suspended on 14th February and for Gdynia on 15th February 2012 and was finally cancelled on 12th March 2012.

Freezing of the inner port waters and roads did not constitute greater obstacle to large ships, which fared well in the existing ice conditions. Smaller ships used waterways where the ice was crushed by everyday movements of bigger and stronger vessels.

Inside the ports the ice had been crushed by port tugs when necessary.

3. There was no ice breaker available for crushing ice in shallow waters: Dead Vistula River from the Siennicki bridge in Gdansk to the mouth of the Vistula Smiala, as well as in the ports of Wladyslawowo and Hel.

During the whole ice season no tugs for ice breaking on the roads and approach channels were used.

THE SUMMARY:

Winter season 2011/2012 for Polish Coasts can be defined as medium, causing not significant difficulties to navigation.
6.8 Germany

The Waterways and Shipping Directorate North (WSDN) coordinates according an overall plan the icebreaking service for the harbour entrances, coastal- and sea regions in the German part of the Baltic Sea.

The German ice service plan is set up annually by the responsible authority, listing all available vessels which are able to break ice, giving information on the respective areas of icebreaking service, the expected ice situation, etc.
For missions of icebreaking on the coastal and sea area different vessels are available:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine power</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEUWERK</td>
<td>Multi-Purpose Vessel</td>
<td>8 400 KW</td>
</tr>
<tr>
<td>MELLUM</td>
<td>Multi-Purpose Vessel</td>
<td>6 620 KW</td>
</tr>
<tr>
<td>ARKONA</td>
<td>Multi-Purpose Vessel</td>
<td>3 700 KW</td>
</tr>
<tr>
<td>BÜLK</td>
<td>Emergency Tug</td>
<td>2 320 KW</td>
</tr>
</tbody>
</table>

In addition to that, a number of smaller tugboats and river-icebreakers are available for the inner coastal waters and harbours.

As a result of the meteorological conditions during the last winter, at the German Baltic coast only one ice period occurred.
This continued in the internal waters up to 30 days.
The largest thicknesses of the flat ice were reached in the sheltered coastal waters in middle of February.
The chart below shows the different thicknesses varied from the 10-40 cm. In the Bay of Greifswald fast ice was formed only in the bays and on the north coast. In the central part the ice remained drifting.
The ice drift led to ridges of ice and rafted ice.
Depends on the wind direction the sea ice was more concentrated on the east coast of Rügen (see map), where it forms to a compact area on the mid of February.
In the fairways of Greifswalder Bodden and Peenestrom the navigation was hindered by locally 0.5 m to 1 m high ice pressures. Between the 6. to the 24. February icebreaker support was given of the entrance and the port of Stralsund and the ports in the southern Bay of Greifswald (Lubmin Vierow, Ladebow).

The Multi Purpose Vessel “Arkona” and two smaller icebreakers (Grömitz” and “Ranzow” were in service nearly during the whole period.

The Wolgast harbour was only suitable for vessels with an ice class 1C and higher and a minimum engine power of 1000 KW. The northern approach to Stralsund and the Bodden West were closed for three weeks for all vessels.

The main entrances to the large ports could be maintained ice free with help of larger tugs.

Overall, there were no extraordinary disabilities for the ships traffic in the German part of the Baltic Sea due to ice in the last winter. Other large icebreakers than the governmental Multi Purpose Vessel ARKONA were not needed for maintaining the service.
6.9 Denmark

The Danish Navy presently operates 2 icebreakers referred to as navy icebreakers as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Built</th>
<th>Engine Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANBJØRN</td>
<td>1965</td>
<td>8 700 KW</td>
</tr>
<tr>
<td>ISBJØRN</td>
<td>1966</td>
<td>8 700 KW</td>
</tr>
</tbody>
</table>

DANBJØRN and ISBJØRN are expected to be in service until 2015, while THORBJØRN is in a laid-up position. Apart from its own icebreakers the Ice Service also makes use of tug boats which are hired on a case to case basis. For icebreaking on the Limfjorden west of Aalborg the Ice Service has an agreement with a Danish tug boat company who keeps a tug boat on 24-hour notice during the period from 15 December to 31 March. The 2 navy icebreakers are kept on 5 days alert. Apart from a small maintenance crew the navy icebreakers are not fully manned continuously. If they are activated they will be manned by naval personnel.

The winter 2011 – 2012 was milder than the previous winter, so the Icebreakers were not activated.

7.0 Norway

The Ice winter in Norway was mild, and only very thin ice formed in the fjord of Halden and Drammen. Although there was made contracts with several local ice breakers, it turned out that they ended up being st.by.e. Contracts were made for Drammen Arendal, Kragerø, Tønsberg, Moss and Halden. But only for the area of Drammen, Kragerø and Halden there where sporadic use.

The buoy tenders Villa and Hekkingen were not used for ice breaking at all. The Norwegian Coast Guard did not conduct any ice breaking or assistance. Governmental vessels with ice breaking capacity in Norway
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Engine capacity</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villa</td>
<td>Buoy tender</td>
<td>1.250 bhp</td>
<td>Norwegian Coastal Administration</td>
</tr>
<tr>
<td>Hekkingen</td>
<td>Buoy tender</td>
<td>1.250 bhp</td>
<td>Norwegian Coastal Administration</td>
</tr>
<tr>
<td>Svalbard</td>
<td>Coast Guard vessel</td>
<td>18.000 bhp</td>
<td>Norwegian Coast Guard</td>
</tr>
</tbody>
</table>

Some port authorities still operate tugs that are used for ice breaking in the harbour area and their approaches. This is mainly old tonnage which has undergone only minor renewals during the last years. As a consequence of the above mentioned revised legislation, it is likely that this trend will continue, hence that the fleet of harbour ice breaking tugs will grow older.