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Estonian experience in implementing mandatory dangerous goods notification from ships

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ESTONIAN EXPERIENCE IN IMPLEMENTING MANDATORY DANGEROUS GOODS NOTIFICATION FROM SHIPS

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

In 2003 trade to and from the countries in the Baltic Sea Region (BSR)[1] totalled 1 788 million tons; imports 744 and exports 1 044 M tons. The total volume of maritime transport in 2003 amounted to 731 million tons, of which 178 million tons (25 per cent) was within the Baltic Sea countries, and the rest (75 per cent) extra-BSR trade (Fig.1; Baltic Maritime Outlook 2006).

The European trade pattern shows significantly larger east-west trade volumes than north-south volumes, and the strongest growth in the intra regional trade is expected to take place between the north-eastern and the south-western parts of the BSR. Oil and oil products will dominate the growth. Their share of total exports is expected to increase, while their share of imports is expected to decrease. (Baltic Maritime Outlook 2006)

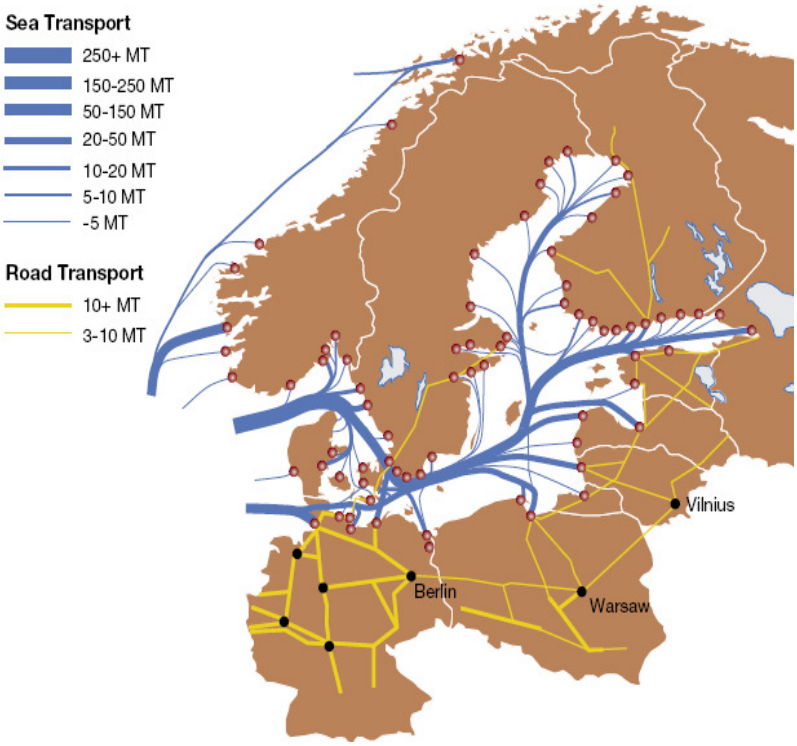

Figure 1 Illustration on key maritime and road transport routes in the Baltic Sea Region. Source: Baltic Maritime Outlook 2006; op. cit. TEN-A Ports, 2003

Apart from Russia, all other littoral states to the Baltic Sea are members of the EU, after Estonia, Latvia, Lithuania and Poland joined the union in 2004 (see e.g. Naula and Ojala 2007).

[1] Denmark, Estonia, Finland, Germany, Poland, Latvia, Lithuania, Russia and Sweden.

More than 300 million tons of Dangerous Goods are transported in the Baltic Sea Region (BSR) annually (www.dagob.info). This means that over 40 per cent of all maritime transport in the region involves cargoes classified as Dangerous Goods.

In spite of formal implementation of uniform international conventions as well as related EU regulations on transport of Dangerous Goods, there are substantial differences in operational practices between authorities involved in DG transport. This applies especially between countries but may also apply within countries (cf. Transport of Dangerous Goods in Finland 2006).

Thus, there is a substantial need to improve the exchange of information between DG authorities and commercial actors, and to coordinate DG processes.

1.1 Estonia as a transit passage for Dangerous Goods

The geographical location of Estonia creates a very suitable passageway for transit. For a further analysis of this and the maritime sector in Estonia see e.g. Ojala et al. 2005, Lautso et al. 2005.

The largest port in Estonia is the Port of Tallinn, comprising several harbours, including that of Muuga. It handles about 80 per cent of all maritime transports. In 2006, the Port of Tallinn handled over 41 million tons of cargo (Port of Tallinn, 2007). Other main ports include Pärnu, Kunda, Paldiski and Sillamäe. Sillamäe is situated east of Kohta-Järve in Fig. 2.

Figure 2 Map of Estonia. Source: CIA World Factbook

Most of the traffic volume in Estonian ports comprises Russia's exports of oil and petroleum products. These are mostly transported by rail as shown in Figure 3.

Thanks to the rapidly growing economy, the flows of road transport units (trailers) on ro-ro and passengers ships and containers have also increased rapidly. The main traffic for trailers is to Finland and Sweden. Container shipments rely on feeder vessels in the Baltic Sea or North Sea range. In 2006 the main container port (Port of Tallinn) handled 152,000 TEUs.

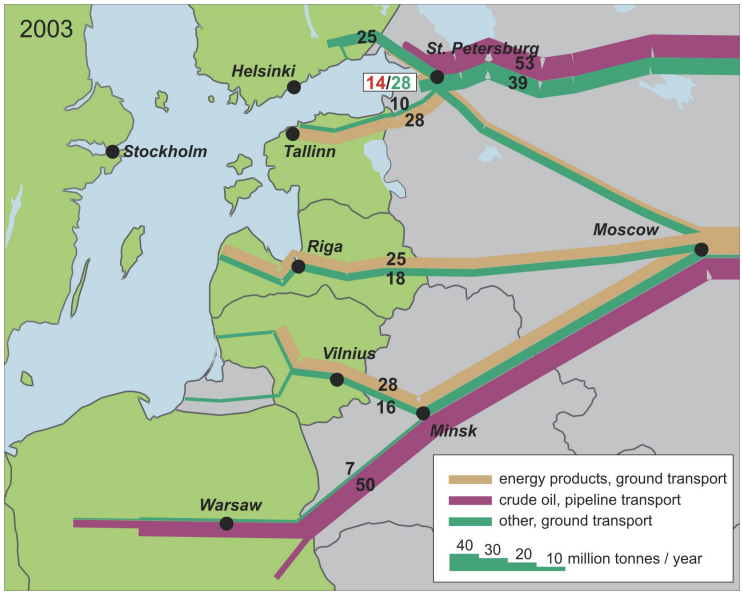

Figure 3 Russia's main transport routes to the west; import, export and transit traffic in 2003, million tons/year. Source: Lautso et al. 2005

Over 33 million tons of dangerous goods (DG), including also hazardous and polluting materials in bulk, are transported by sea annually. This is a great challenge for the maritime authority because most of the ships calling fly foreign flags, particularly bulk carriers and tankers. In order to enhance maritime safety and protection of marine environment, there is a vast need to have a quantitative overview of transported DG in a particular sea area.

1.2 Objective of the paper

The objective of this paper is to share the experience of implementation of mandatory DG notifications from ships in order to use the relevant cargo information for establishing an overview of DG flows. The impact of unreliable or missing safety information about DG on maritime safety has been discussed.

The mandatory DG notifications from ships can be used as a source of information to establish an operative overview of the DG flows at sea. In this respect the substantial issue is the reliability of such information while nowadays there are two different approaches to safety within the domains of industry and transport. Following the DG safety information movement from producer to customer along the supply chain (Fig. 5) makes it possible to detect problems that may affect normal functioning of DG information system.

1.3 Research on the issue in the Baltic Sea Region

Maritime pollution issues in general and related to Dangerous Goods in particular have understandably received considerable research attention.

However, and extensive literature search on multiple electronic archives[2] of research literature using all combinations of search words for “maritime transport”, “dangerous goods”, “authorities”, “risk assessment”, “IMDG”, “IMO”, “Baltic”, or “Estonia” provided only a handful of hits, none of which was directly applicable to the theme of this paper. Notably, operational issues of maritime authorities, such as implementation or data gathering issues of

[2] ABI/Inform (ProQuest), Business Source Elite (EBSCO), JSTOR Business, Science Direct (Elsevier), Emerald Fulltext (Emerald), SocIndex with Fulltext, EJS: Electronic Journals Service (EBSCO), Blackwell Synergy

mandatory declarations appear not to be covered at all. Cf. Rengifo (1997) Gauci (1999), Szyliowicz (2004), Price (2004) and Fabiano et al. (2005)
Apart from the report "Evaluation of EU Policy on the Transport of Dangerous Goods since 1994" (2003; Sections 1 and 2), little research or surveys have been prepared for or by the European Commission (EC)[3].

This may reflect the situation where the EC has no competence on international conventions such as those maintained by IMO for maritime transport. The other main conventions for road (ADR) and inland waterways (AND) are under UNECE, whereas rail convention (RID) is maintained by OCTI and air transport issues by ICAO. Transport of radioactive material is regulated by the International Atomic Energy Agency, IAEA (Fig. 4).

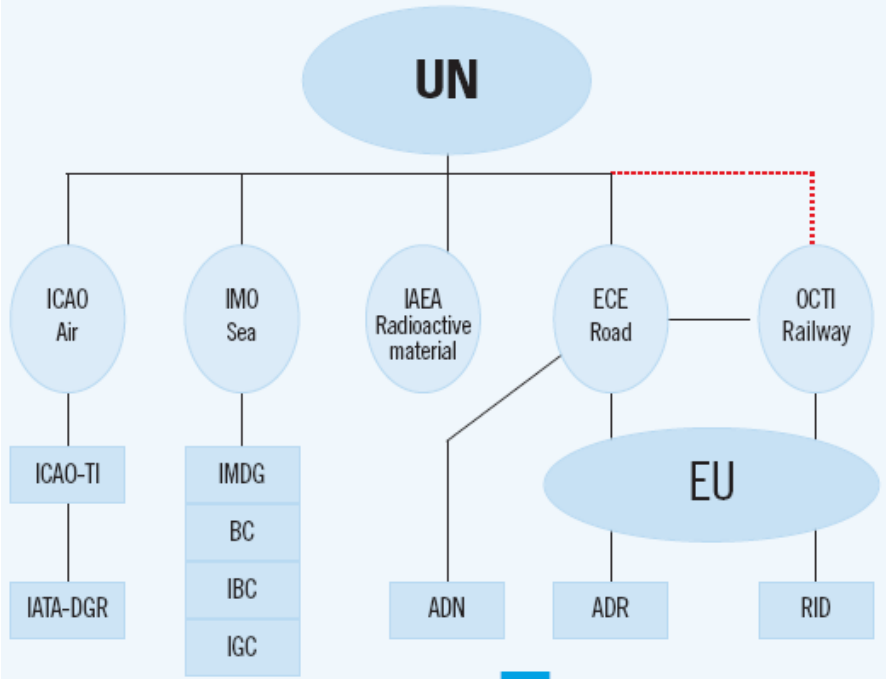

Figure 4 International agreements in transport of Dangerous Goods. Source: Transport of Dangerous Goods in Finland (2006)

Most available reports on the issue have been produced for policymaking purposes. These are typically commissioned by national environmental or maritime authorities. The most relevant ones are discussed below.

Hänninen and Rytkönen (2006) reviewed transport of liquid chemicals by tankers in the Baltic Sea and especially via Finland ports, but there was very little data about Estonian ports.

[3] Transport of DG has not received much attention in EU's Research Framework Programme, either. In FP6, one on-going project is identified. DAGOT project deals with mostly land-based transport of Dangerous Goods in Central Europe. No website is currently available of this project, however.

Some quantitative aspects of oil transport via Estonian ports have also been reported by Hänninen and Rytkönen (2004). Transport of dangerous goods in packaged form in Finland has been reported by Häkkinen (2004; in English, see Suominen, ed. 2006).

A quantitative review of DG transported by ferries from Helsinki to Tallinn in the first half of the year 1995 (Arro, 1996) is available as well. The study supported by Helsinki Commission[4] (1993) undoubtedly has historical value for the Baltic Sea area in general.

In 2005, The Baltic Sea, as well as the Torres Straits, the Galapagos Islands and the Canary Islands, was officially classified by the IMO as Particularly Sensitive Sea Areas (PSSA).

However, there is a lack of authentic and comprehensive data regarding Estonia and that may hinder the development of maritime safety and environment protection in this particular region of the Baltic Sea.

One of the on-going activities related to Dangerous Goods in the Baltic Sea Region is DaGoB, an abbreviation for "Safe and Reliable Transport Chain of Dangerous Goods in the Baltic Sea Region". The project is part-financed by the European Union's BSR INTERREG III B Neighbourhood Programme.

The DaGoB project (www.dagob.info) is running in 2006-2007, and it aims at improving the co-operation between public and private stakeholders related to DG transport in the BSR, by connecting the stakeholders on different levels, providing up-to-date information on cargo flows, supply chain efficiency and risks related to DG transport. Its partners are mostly DG authorities and seaports in Estonia, Finland, Germany, Latvia, Lithuania, Sweden and Russia.

Several reports on DG flows and DG risk assessment are downloadable at the DaGoB website (see e.g. Mullai 2006, Railas 2006 and Suominen et al. 2007).

[4] The Helsinki Commission (HELCOM) works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. www.helcom.fi

2 REGULATORY ISSUES ON DG NOTIFICATIONS

The producer in chemical industry is obligated to issue for each product the Material Safety Data Sheet (MSDS) which records safety information to meet the particular needs for safe handling in industry and the companies of customers, and also for safe transport by different means of transport in accordance with the relevant DG code. While for the customer the important safety information is presented in the MSDS, to the shipper the information for safe transport of DG is usually forwarded as a DG declaration.

The declaration is a document that gives the hazard description according to the relevant DG code that stipulates the safe transport rules for this particular type of DG, as the IMDG Code regulates the transport of DG in packaged form. The DG codes are in full compliance with general rules that are stipulated by the international maritime conventions such as the SOLAS 74 (2004) and the MARPOL 73/78 (2006).

The correctly filled out DG declaration is a very important source of information to facilitate a high safety level at sea. The DG declaration shall be submitted to the master by the consignor or his authorised representative before the loading of the ship. The MSDS may be used for issuing the DG declaration if the safe transport information in the MSDS is not in contradiction with that in the appropriate DG code.

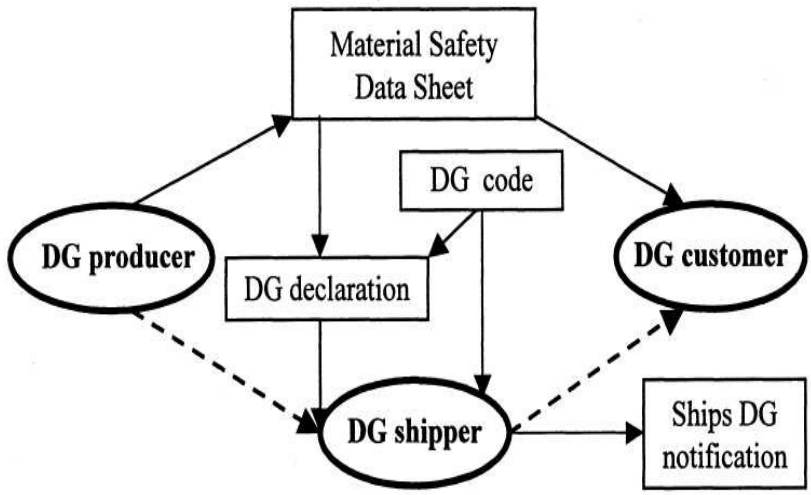

Figure 5 Safety information movement tracks in DG supply chain. Solid lines are of the information, dashed lines are of the cargo.

In Figure 5, the DG Code includes: IMDG Code for DG in packaged form, BC Code for DG in form of solid bulk cargo, IBC Code for DG that is a liquid

carried in bulk by chemical tanker, IGC Code for DG in form of liquefied gas carried in bulk by gas carrier, INF Code for irradiated nuclear fuel and radioactive wastes and MARPOL Annex I for petroleum in any form.

According to the European Commission directive 2002/59/EC, all DG on ships shall be notified to the designated authority before the departure from the berth or in time before the arrival at the port. It is essential that the information concerning DG in the notification is the sum of relevant information in DG declarations submitted to the master before loading. The purpose of DG notifications from ships is to provide land based rescue teams with actual information about DG on board ships in an emergency at sea.

3 DATA COLLECTION METHODS

The Estonian Maritime Safety Act has been amended in compliance with the relevant articles of the Directive 2002/59/EC that requires the mandatory declaration of DG to the masters of the ships and mandatory notification of DG carried on board ships, which shall be done by the operator, master or agent of the ship.

Information provided in all DG declarations and notifications obtained by the Estonian Maritime Administration in 2006 form the basis of the data used in this paper. Key issues in data collection and the reliability and validity of the data are discussed below.

It is considered rational to designate the ship's agent as the first person responsible for the DG notification and collect the DG notifications from ships in one centre in Estonia, that is, the Co-ordination Centre of the Estonian Maritime Administration.

During inspection the master is asked to produce the DG declaration while loading the DG. The DG declaration is an important evidence in the investigation of the incidents in which DG are involved.

All detected cases when the required DG declaration was missing or was not in compliance with the actual parameters of cargo have been recorded and analysed. The relevant MSDS have been obtained and analysed as a part of the general safety information concerning the cargo.

Additional data has also been collected by interviewing ship inspectors, port authorities, consignors, consignees and employees of stevedoring companies involved in DG transport. Special attention has been paid to the infringements with most frequent occurrence.

For the investigation of the correctness of ships' notifications the DG declarations were compared with the relevant DG notifications. To detect any DG cargoes not notified, the selected ship's general declarations and relevant DG notifications have been compared.

Non-compliance between DG declarations and notifications may often occur when, for example, petroleum is carried under trade names. Particular attention has been paid to the address from which detailed information about the cargo can be obtained.

The information in the DG notifications has been processed by a special IT solution for establishing the DG database. This database is linked to the tailor-made general information system that was developed for the service of different maritime purposes in the Estonian Maritime Administration and has access only for designated users having a personal password.

This DG database has an inserted DG list for data processing and links to the ships and ports databases in the general database. The ships and ports databases are updated, respectively, in cases of a newcomer ship or of notifying a new port of destination. The DG list is in Estonian and English languages and has been taken over from the IMDG Code and extended to include some hazardous substances in bulk such as coal, wood pellets and others, using formal code numbers and proper shipping names from the BC Code.

4 KEY FINDINGS

4.1 Implementation of DG information system

Initially, only some ships' agency services started to send the DG notifications correctly on the date of the enforcement of relevant legislation. To facilitate the implementation of mandatory DG notifications from ships many training seminars were organized. Relevant instructions were also made available on the Internet for staff of services not very familiar with the singularities of the DG notification procedures.

Very often only the mail address of the producer from whom the detailed information on the cargo could be obtained was notified in the DG notifications, and there were no other more suitable contacts for emergency. These and other substantial deficiencies detected in ship's DG notifications were handled on an individual basis with the persons responsible.

Attention was focused on the links between the DG declaration and the DG notification. These are usually issued by different persons and the information in the declaration and the notification may differ substantially.

Some liquid bulk terminals indicate the cargo safety particularities according to the relevant DG code in a preloading agreement between shore and ship and in the DG notification simultaneously to avoid such misleading situations. For example, there have been cases when in the cargo documents the name "Petroleum Hydrocarbon" was used, a synonym of regular unleaded gasoline, but in the preloading agreement and in DG notification the cargo was described as "UN1203, GASOLINE, class 3", which is very informative for trained rescue people. Sometimes the information in the MSDS is not the same as in the DG notification. A mixture of shale oil phenols under trade name "Honeyol" was declared and notified as "TOXIC LIQUID; ORGANIC; N.O.S., class 6.1", while in MSDS it was classified as "CORROSIVE SOLID, N.O.S., class 8".

An unpleasant discovery was the fact that many stevedoring companies and port operators have not trained their staff sufficiently to make them familiar with safety information of the DG they are handling.

It took several months to train people to submit correctly completed DG notifications in time and this is an ongoing task only with less intensity today. Much fewer problems have occurred with passenger ferries on international lines, while these companies had experience with the mandatory DG notification requirements before Estonia got EU membership. As a result of

this hard work we succeeded in getting data on DG flows of the year 2006 reasonably suitable for practical purposes.

4.2 Flows of Dangerous Goods in 2006

3,617 port calls were made in 2006 by ships carrying DG (Table 1), which is approximately 35% of the total number of annual port calls. High-speed craft were excluded while those are prohibited from carrying DG.

The gross import of DG was 3.9 million tons and export 29.2 million tons. Altogether 337 individual substances or materials as DG were notified.

Table 2 gives an overview of how the DG goods have been divided between different hazard classes. The total amount of organic peroxides (class 5.2), infectious substances (class 6.2) and radioactive materials (class 7) was negligible: 15.4 tons, 10 and 4 kg respectively.

Table 1 Number of port calls by ships carrying different types of DG in the year 2006

Cargoes	Number of ships Involved		Goods, million tons
	Import	Export	
Dangerous goods in packaged form*	858	951	0.68
Solid bulk cargoes	28	697	8.08
Chemicals in bulk	65	60	0.54
Oil in bulk	258	700	23.88
Total	**1,209**	**2,408**	**33.1**

* No. of parcels imported 5,100 and exported 2,700.

Table 2 Review of DG flows classified according to the IMDG Code (in thousands of tons) via Estonian ports in the period 01.01.2006 - 31.12. 2006

Hazard class and description		Import	Export
1	Explosives	0.5	0.3
	Gases:		
2.1	- flammable	0.4	0.1
2.2	- non flammable, non toxic	16.4	17.8
2.3	- toxic	0.3	-
3	Flammable liquids*:		
	- flashpoint =< 23 °C	1,607.9	5,415.5
	- flashpoint > 23 °C	1,438.4	16,006.5
4.1	Flammable solids	17.7	0.4
4.2	Substances liable to spontaneous combustion	0.1	1.2
4.3	Substances which, in contact with Water, emit flammable gases	0.1	0.3
5.1	Oxidising substances	29.5	227.9
6.1	Toxic substances	11.4	42.8
8	Corrosive substances	25.8	6.9
9	Miscellaneous dangerous substances and articles:		
	- environmentally hazardous liquids**	146.4	25.3
	- others	11.1	112.9
MHB	Materials hazardous in bulk	583.4	7,323.4
All total		**3,889**	**29,181**

* Flammable liquids in bulk are included.

** Petroleum products that are out of scope of the IMDG Code classification instead of high flashpoint are included.

4.3 Lack of cargo safety information and occurrence of accidents

On 20 May 1999 a fire broke out on the car deck of a passenger ferry after the departure from the port some hours earlier. Charcoal on a lorry had

ignited spontaneously and the fire patrol noticed the fire because burning paper bags were smelled. At that stage smoke detectors had not yet detected the fire. The crew of the ship managed to extinguish the fire in one hour as there was a free passage to the lorry in fire. No one was injured. The lorry was loaded with 5,500 kg of charcoal for barbecues (shall be declared as UN1361, CARBON, cl. 4.2, PGIII) and 50 kg of matches (shall be declared as UN1944, MATCHES; SAFETY, cl. 4.1, PGIII) which were not declared as DG.

Many cases have been detected when fertilizer with high ammonium nitrate content (NPK 32-5-0) was not declared as a DG. On 24 November 2001 a ship was detained in Liverpool, while among other deficiencies there was the problem that the cargo was not declared as DG, the packaging was not relevant to the cargo and the IMDG Code on board was out of date. There has been a reversed case, when packaging with hazard labelling and marking for ammonium nitrate (UN2067, class 5.1) was used for non-hazardous cargo.

On 27 March 2002 coal in bulk loaded in the Port of Muuga ignited spontaneously on a barge at sea. According to the BC Code coal is hazardous when carried in bulk. No DG declaration had been imparted to the master, only the quality certificate of coal was available stating that the humidity and the content of fines of coal were within limits. Very often coal has been taken as a non-hazardous cargo, even in cases when a pile of coal under loading has open flames on the other side of the pile. This was precisely the case on 20 December 2000, when the master had no DG declaration.

5 DISCUSSION

According to the data in Table 1, half of the ships that carried DG in 2006 were involved in transport of 8,000 parcels of DG while the weight share of this type of cargo was only 2% of the total flow of DG. This is very close to the 1.9% that was the share of the same type of cargo in Finland in 2002 (Suominen 2006).

However, the share of liquid chemicals in Table 1 is lower (13%) and that of oil and solid bulk cargoes is higher (19% and 67% respectively) than reported by Suominen (2006). The distribution of DG flows between hazard classes is quite different in case of import and export. The data in Table 2 also differs from the data reported by Hänninen and Rytkönen (2004).

The comparison with the data of DG in packaged form reported by Helsinki Commission (1993) for the Gulf of Finland in 1990 shows that the corresponding figures in Table 1 reduced to one month are more than two times higher, that is, 21.5 versus 56.3 thousand tons.

Some problems have arisen because the hazard classifications system based on the IMDG Code is not very clear for untrained people in respect of many cargoes. For example, the danger level of ammonium nitrate based fertilisers depends on the content of ammonium nitrate and other components and their chemical properties as well. Very often this cargo is not declared and notified as DG while the nitrogen content in the fertilizer is taken as the actual content of ammonium nitrate in the fertiliser. The fact that ammonium nitrate and related fertilisers are complicated DG and therefore require professional handling and adequate safety information on cargo to maintain a high safety level on board the ship is affirmed by many accidents in the history of shipping.

In September 2002, during the loading of a cargo vessel with nitrate-based fertiliser (NPK 15-12-24, ~43% of ammonium nitrate), highly irritant smoke as a product of decomposition of cargo escaped from the front hold of the vessel. The crew was not familiar with precautions in the BC Code and this type of cargo properties. The incident was discussed by the IMO in the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers meeting in 2003 [DSC 8/4/2].

When a particular piece of DG cargo is not directly named in any DG code, the appropriate generic name with the extension “not otherwise specified (N.O.S.)” shall be used for issuing the DG declaration. The list of suitable options is exhaustive and criteria in the IMDG Code to find out the

right generic name are sufficiently clear; however, it often occurs that the same substance is classified differently by different producers.

A good example is potassium dichromate that is produced in Kazakhstan and distributed to the customers all over the world by a broker in Estonia. The producer classifies this substance for transport as “UN3087, OXIDIZING SOLID, TOXIC, N.O.S., hazard classes 5.1(6.1)”, while many customers in other countries require hazard description as “UN3086, TOXIC, SOLID, OXIDIZING, N.O.S., hazard classes 6.1(5.1)” or “UN3288, TOXIC SOLID INORGANIC, N.O.S., hazard class 6.1”, and packaging and labelling accordingly, which has caused problems in supply chain.

The investigations of accidents on ships carrying DG have revealed that in many cases there was a lack of safety information about cargo or the information was incorrect. The charcoal fire described in paragraph 4.3 is a good example in this respect. It should be mentioned that the European Agreement Concerning the International Carriage of Dangerous Goods by Road exempts transport of charcoal from several requirements on roads, and that may cause serious misconceptions on ferries and consequently increase fire risks at sea.

Burgess (2006) has referred to a fire caused by undeclared organic peroxide on board a containership in August 2003. The massive fire on a container ship in October 2003 caused by undeclared DG, believed to have been calcium hypochlorite, has been reported by Hazcheck Systems (See Hazcheck 2007).

IMO has discussed a study on 35 incidents on tankers in the past 25 years [MSC 81/8/1, 2006] in its Maritime Safety Committee meeting, distinguishing one safety incident caused by the wrong MSDS information. All this clearly indicates the obvious correlation between accidents involving DG and incorrectly submitted or missing DG declarations.

6 CONCLUSION

The establishment of only one centre for management of the DG notifications from ships on the administrative level has been the rightful decision for a small country like Estonia both from the point of view of survey and of enhancing maritime safety. The DG notifications from ships can be successfully used to get actual quantitative and qualitative information about the DG import and export via our ports and about related risks.

There is ample evidence that unreliable safety information or lack of such information on DG may lead to an emergency on board. Frequently, the reason is that the cargo owner or his representative responsible for the submission of the DG declaration is not familiar with relevant instructions of safe transport of DG.

The volumes of Dangerous Goods transported via Estonia are already high. Furthermore, it is estimated that DG volumes in the Baltic Sea Region as a whole continue to grow rapidly. This is especially the case with oil and petroleum products.

These developments underline the importance of reliable processes in handling the cargo and the related information flow as well as the way in which relevant authorities work. In this work, access to reliable statistics is very important.

The apparent lack of research interest in DG transport issues is also worrying, with regard to the safety and security issues involved.

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