



DAGoB

Safe and Reliable Transport Chains of Dangerous Goods in the Baltic Sea Region



Key Findings of the DaGoB Project 2006 - 2007



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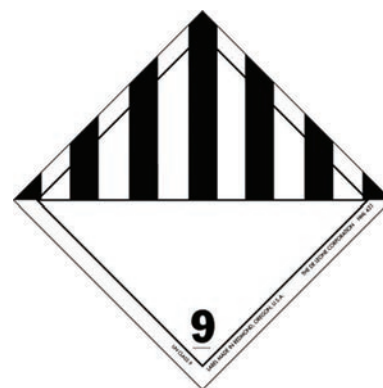
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Summary

The DaGoB project charted for the first time total volume of Dangerous Goods (DG) in the Baltic Sea Region (BSR): the total volume is close to 1,000 million tonnes. This is almost three times the volume that was anticipated when the project was conceptualized. Furthermore, the volume seems to be growing.

At the same time, the number of specialists in Ministries and Competent Authorities dealing with transport of DG in the BSR is very small. Staff working with regulatory issues is around 10-15 in Estonia, Finland, Latvia, Lithuania and Sweden, and 90 in Germany on Federal level. Around 20 staff in Estonia and Lithuania, 60 in Latvia, and around 110-120 in Finland and Sweden deal with control in Competent Authorities. In Germany this figure is over 300 on Federal level; more staff is working in the German States.

Transport of DG is regulated by an identical international framework in EU countries, but considerable national variations in organization and procedures exist especially in domestic transport, but also in international transport. The regulatory framework in Russia differs substantially from that used in EU countries. Russia is, however, a signatory party on the main international conventions for maritime transport.

To highlight the complex network of authorities in the participating countries, DaGoB produced the first comparative study on how DG administration is organized. This information is highly useful for all EU Member States, and to most countries outside the EU.

There are significant variations how statistical data on, for example, transport flows, accidents and incidents are collected. Here, DaGoB has made groundbreaking work in collecting this type of data, and also suggesting ways to harmonise data collection procedures across countries.

Perhaps the most successful part of DaGoB has been the numerous field exercises in six countries and transnational short-term staff exchanges. These amounted to several hundred man-days, enabling DG specialists in operational control duties to effectively exchange experiences and best practice. This has also provided an efficient platform for informal communication and network building, which has considerably increased co-operation and information exchange between professionals in this field.

As the first truly transnational project covering road, rail and maritime transport of DG in this region, DaGoB has had a substantial impact on enhancing safe and reliable transport of DG in the Baltic Sea Region. This had not been possible without the engagement and enthusiasm of our project Partners, and our sincere thanks go for each and everyone that has made their valuable input in this project.

Turku, November 2007

On behalf of the DaGoB –project

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Introduction

This report is the short summary of BSR Interreg III B funded project called DaGoB. It collects the topics which were covered in the Safe and Reliable Transport Chains of Dangerous Goods in the Baltic Sea Region –project into one compact report. DaGoB project duration is 2006-2007.

Background of the DaGoB Project

DaGoB was initiated by TEDIM, a public-private partnership programme that concentrates on eliminating barriers to international trade and business, and promoting better transport links in the Baltic Sea region. TEDIM is a joint organ for ministries responsible for transport in the Baltic Sea Region (www.tedim.com).

Up to 1,000 million tonnes of Dangerous Goods (DG) are transported in the BSR mostly through densely populated areas, imposing real health and safety risks to people and environment. Dangerous Goods transport is regulated in international conventions by modes: RID (rail); ADR (road); Solas (bulk by sea) and IMDG (unitised cargo by sea), supplemented by EU and/or national regulation.

Also a unique Memorandum of understanding on designated Ro-Ro ships is applied in the BSR. Despite formal implementation, DG authorities' operational practices vary substantially between and even within countries, causing safety and other problems.

DaGoB Objectives

DaGoB project aims at improving the co-operations between public and private stakeholders related to Dangerous Goods 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.

The transport of DG is of considerable importance to all commercial and industrial sectors. The strive is towards a safe and profitable transport. The logistic challenges and the global nature of the transport have a large influence on the development of the sector. The geographical positioning of BSR brings severe challenges to the operators working in the area: the national characteristics include cold, icy periods, long distances, a high dependency on sea transport as well as a considerable transport flow to and from the Russia and the CIS countries by rail and by road.

In order to ensure the future development and profitability of the DG transport sector, logistical bottlenecks cannot be allowed to develop either during border crossings or whilst transferring goods from one mode of transport to another.

Safety should be the first and foremost concern of all dangerous goods transport activities. As the transport sector has a global nature, internationally harmonised legislation enhances safety and efficiency.



The requirements of the wide range of operators within the sector are best served through working towards a common set of rules and regulations and through enhancing information exchange and cooperation over and across administrative borders. Establishing common targets and cooperating in working towards achieving these goals will be ever more important in the future. The emphasis of the DaGoB project has therefore been particularly in the enhancing of cooperation between stakeholders.

Purpose of the Report

The recent development of maritime transport in the Baltic Sea Region has been characterised by an increase in shipping volumes and by the use of larger vessels. In particular, there has been a significant increase in oil traffic in the Baltic Sea. For the general public this is probably the most notable part of the transport of dangerous goods, but there are also lots of goods transported by road and rail modes as well.

Units dealing with DG in the BSR ministries responsible for transport usually have only 2-3 person staff preparing national DG legislation. Maritime, Rail and Road Administrations have a similar number of DG specialists in their central administration, and a handful of field inspectors in main ports, rail and road districts. Other DG-related authorities comprise e.g. port authorities, coast guard, customs, traffic police and rescue services. Their exposure to international cooperation is often limited, and best practice is

seldom shared across borders. There is imminent need for better information exchange between DG authorities, and between authorities and the private sector.

DaGoB produced a wide range of publications on the DG transport in the BSR. Field demonstrations and national and international seminars were also essential part of DaGoB. To this report we have collected all the important topics covered, including regulatory framework, safety and security, human factor and many others.

“ There is imminent need for better information exchange between DG authorities, and between authorities and the private sector.”

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Related Publications:

Transport of Dangerous Goods in Finland - Strategy 2006-2015 - Ministry of Transport and Communications Finland

Dangerous Goods Regulatory Framework

Regulations concerning dangerous goods transport are based on international agreements, EU legislation and the national regulation in EU countries.

The most essential regulations of the dangerous goods transport are included in the National Acts on Transport of Dangerous Goods. Dangerous goods transport regulations are constantly being amended to improve safety and to keep up with technical development.

The transportation of dangerous goods is governed by different legal acts for all transport modes. This forms a challenge, especially to multimodal transport. The other challenge is that despite the common EU-legislation and regulation, there are some differences in the national legislation, which results in a situation where the regulations of different countries have to be in relation to international transport chains.

Road Transport

European Union countries are parties to the agreement of the international carriage of dangerous goods by road. The ADR agreement was done under the auspices of the United Nations Economic Commission for Europe. The

rules in ADR agreement have been harmonized with national regulations. The ADR allows bilateral additions between the partners of the agreement.

In addition to the ADR agreement, the European Union is also regulating the transportation of dangerous goods with a separate directive that is based on the agreement. As a follow up for the directive, the EU is also regulating the checks of the transport by a separate directive. To be able to smoothly update the existing regulation, EU has also reserved a right to make changes and grant exceptions to the existing regulation.

Rail Transport

As well as for the road transport, the international transport of dangerous goods by rail is also regulated with a separate code, the RID. Mostly the RID regulation is in line with the domestic regulations. Unlike the other countries of the region, Russia and Estonia do not apply the RID.

Like the road transportation, the rail transportation is regulated on the EU-level with a separate directives that also allow changes and exceptions made by the European Commission.

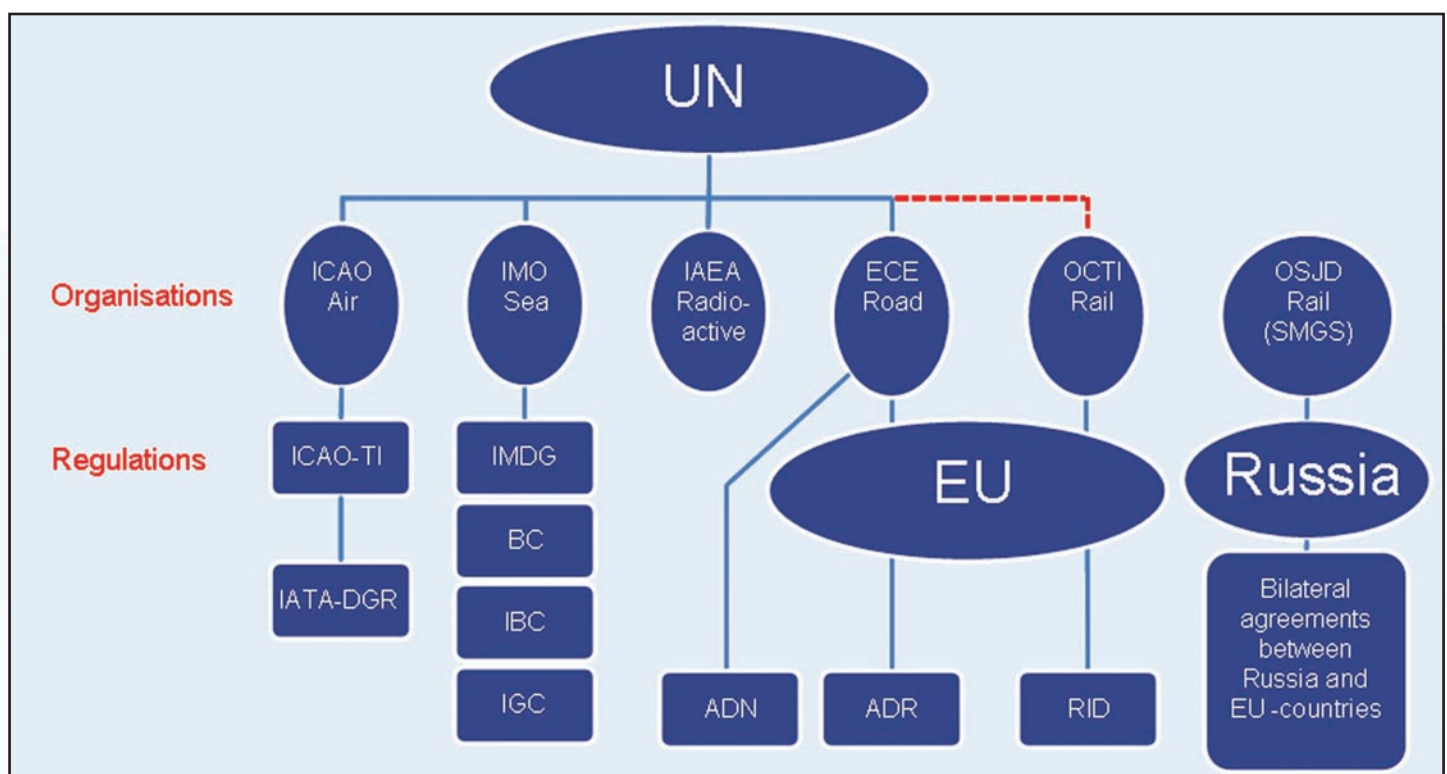


Figure 1 International DG agreements (Source: Ministry of Transport and Communication Finland)

Maritime Transport

Maritime transport is regulated by the International Maritime Dangerous Goods code, that has been in use since 1965, and has been regularly updated in two year intervals to keep in pace with the continuously changing industry. The changes in the code originate from two sources; directly from the member states of the International Maritime Organisation (IMO) and from the United Nations requirements on the Transport of Dangerous Goods.

Themes Outside the DaGoB Project

In air transport, the ICAO-TI, namely the Technical Instructions for the Safe Transport of Dangerous Goods by Air (2005-2006 Edition), (Doc 9284-AN/905) as well as the IATA-DGR, namely IATA Dangerous Goods Regulations are applicable.

Radioactive materials (class 7) remained outside the scope of the project, since the most important transportations of these are always known to the authorities and it is not appropriate to state the volume of these transportations in mass units. There are provisions, concerning radioactive materials, that are included in the modal regulations for the transport of dangerous goods (ADR, RID, ADN, ICAO, IMO).

Transport via pipelines remained also outside the scope of the DaGoB. Natural gas transmission pipelines in Europe are generally natural monopolies, and almost all EU-countries have established regulation of these infrastructures to assure non-discriminatory access at reasonable prices.

REACH is a new European Community Regulation on chemicals and their safe use (EC 1907/2006). It deals with the Registration, Evaluation, Authorisation and Restriction of Chemical substances. The new law entered into force on 1 June 2007.

Recent Updates in Dangerous Goods Regulation

So far the focus of the dangerous goods regulations has mostly been developed from the safety point of view, meaning that the main purpose of the legislation has been to prevent dangerous substances from being released from containment to cause harm to humans, property, or environment.

Recently, due to the terrorist attacks within the past few years, also the security related issues have caught growing attention. A growing effort has been put to work in order to create regulation to prevent the misuse of dangerous goods in wrong purposes. Since 2003, new security measures in line with the UN Recommendations

have been decided, and the transport mode specific regulations have been in use in the ADR and RID-code.

There are fairly new regulations, which include training for security awareness, comprising methods to address, recognise and reduce security risks and actions to be taken in the event of a security breach, as well as awareness of security plans. They also introduce the concept of 'high consequence dangerous goods', i.e. those which have the potential for misuse in a terrorist incident and which may, as a result produce serious consequences such as mass casualties or mass destruction.

For "high consequence dangerous goods" a security plan is required, which comprises security responsibilities, records of dangerous goods concerned, assessment of security risks and measures to control them, reporting procedures, procedures for evaluation, testing and review of security plans, and measures to secure transport information.

Harmonization of Dangerous Goods Regulation

The different directives and regulations have been created to serve a certain purpose, but combined they have created duplication. Since 2004, one of the main objectives of the regulatory work related to dangerous goods has been to harmonize these numerous and often mixed directives.

The objective is to merge the framework directives relating to the ADR and RID together and extend the scope of the directives to include also the AND. This work also includes the reformulation of directives 96/35/EC and 2000/18/EC, that are currently regulating the dangerous goods transportation on road, rail and inland waterways. A first draft of the harmonising project prepared by a working group of Germany, UK and Finland, was published in 2004. If the harmonising project will be approved by the European Parliament and the member states, the new laws, regulations and administrative provisions would be applicable in 2009.

Related DaGoB Publications:

3:2006 Carriage of Dangerous Goods and Law

Authorities Related to Transport of Dangerous Goods

- There is only small number of dangerous goods specialists working in the BSR countries.
- There is a need for further cooperation especially in the field of inspection of dangerous goods.

There is only a small number of dangerous goods specialists working in the BSR countries and the administrative capacity is very limited. This fact is clearly presented in the comprehensive and detailed report: "Dangerous Goods Transport in the Baltic Sea Region: Authorities, Agencies and Regulations", produced as a part of DaGoB project. This report is first of its kind in the BSR.

Control of the Dangerous Goods Transport on Road, Rail and Sea

The number of ministries responsible for the handling of dangerous goods varies from only one ministry to six. In addition to the ministries, several authorities, administrations and competent authorities are named. Although cooperation is already active, it seems that there is a need for further cooperation especially in the field of inspection of dangerous goods.

The carriage of dangerous goods is surrounded by extensive regulations. These regulations are based on international agreements and EU legislation, as presented in the previous chapter.

For the purpose of Directive 2002/59/EC of the European Parliament and of the Council establishing a Community vessel traffic monitoring and information system, several

countries have established a system with the aim of enhancing the safety and efficiency of maritime traffic; improving the response of authorities to incidents, accidents or potentially dangerous situations at sea (including search and rescue operations); and contributing to a better prevention and detection of pollution by ships.

Some countries have developed systems to follow the flow of DG on rail. There are proposals to include requirements into RID on reporting the traffic of DG to the competent authority.

During 2006 the European Commission has started their interest at monitoring transports of dangerous goods on road. The purpose is the same as for Directive 2002/59/EC.

Systems used by the Dangerous Goods Stakeholders

Shippers use different IT-systems for managing the dangerous goods declarations and other documents needed for the safe carriage of dangerous goods.

Transporters use IT-systems for keeping record of shipments and their positions. These systems are often compatible with GPS (Global Positioning System).



Several systems for the rescue services are on the market. The countries often want the system to be in their own language and to suit their own methods.

Number of Dangerous Goods Authorities

This table shows the number of persons working with the regulations at the competent authorities as defined in ADR, RID and IMDG-code and also staff involved in the control.

Table 1 Number of staff working with DG regulations and control in 2006

	Regulation	Control
Estonia	11	22+
Finland	13	122
Germany	90 + states	320 + states
Latvia	6+	60+
Lithuania	11	19+
Sweden	15	110+

Inspections and Infringements According to Mode of Transport in 2005

The information on road transport of dangerous goods is sent to the EU and it has been presented twice in reports from the Commission to the European Parliament and the Council on the application by Member States of Council Directive 95/50 on the uniform procedures for checks on the transport of dangerous goods by road.

Table 2 Number of transport units inspected in 2005

	Road	Rail	Sea
Estonia	N/A	SA	421
Finland	2,400	250	230
Germany	106,000	15,000	N/A
Latvia	420	SA	N/A
Lithuania	260	300	902
Sweden	6,375	141	480

N/A: information not available or easily compiled.
SA: Only Safety Audits are performed

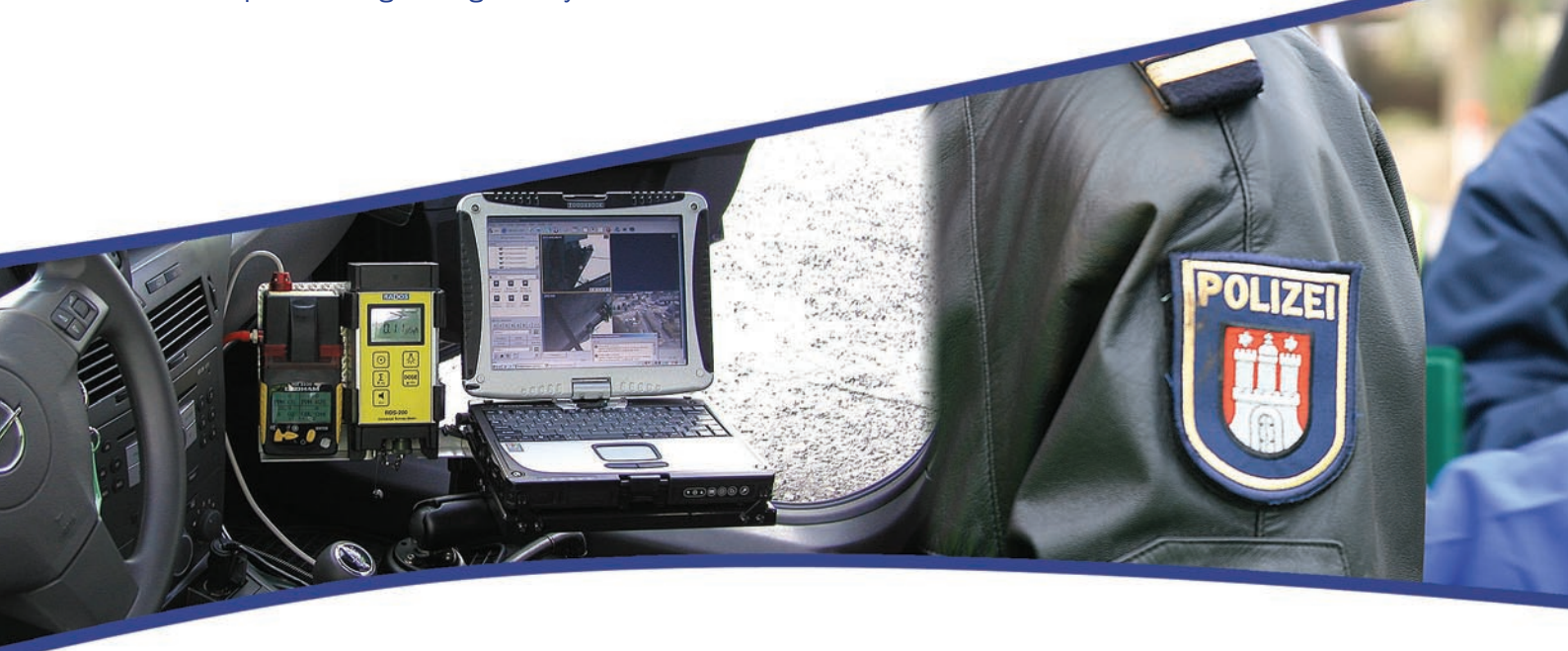
Table 3 Number of infringements according to transport mode in 2005

	Road	Rail	Sea
Estonia	36	SA	20
Finland	912	25	75
Germany	24,000	1,100	N/A
Latvia	79	SA	N/A
Lithuania	114	100	51
Sweden	1,840	10	245

N/A: information not available or easily compiled.
SA: Only Safety Audits are performed

Related DaGoB Publications:

3:2007 Dangerous Goods Transport in the Baltic Sea Region: Authorities, Agencies and Regulations



Dangerous Goods Transport Flows in the Baltic Sea Region

- Up to 1,000 million tonnes of dangerous goods are transported in the Baltic Sea Region, a great share of them in highly populated areas.
- The DaGoB project has performed the first comparative study of the transport volumes on the region.

The amount of dangerous goods transported in the BSR countries varies quite much. This is clearly shown in the Table 4, which has collected the DG flows of DaGoB partner countries. However the data collection in the Baltic Sea Region has not so far been comprehensive and extensive implications from existing data have been impossible to make.

The DaGoB –project has provided the first comprehensive estimate of Dangerous Goods flows transported in the Baltic Sea Region. With estimates of flows of Northwestern Russia, Denmark and Poland, up to 1,000 million tons of dangerous goods are transported in the BSR.

The BSR countries collect the dangerous goods statistics in various ways. Some of them collect the data in more detailed level than others and also various methods of data collection are used. These are the reasons why existing statistics are not totally comparable. The obvious reason for the unclear data seems to be the lack of harmonised reporting and collecting of data. DaGoB –project has contributed the harmonisation of data collection in the Baltic Sea Region with efforts such as the dangerous goods flows survey in Sweden, that was performed in co-operation and funding of the project, and the first comprehensive data collection of the dangerous goods transport flows in Estonia.

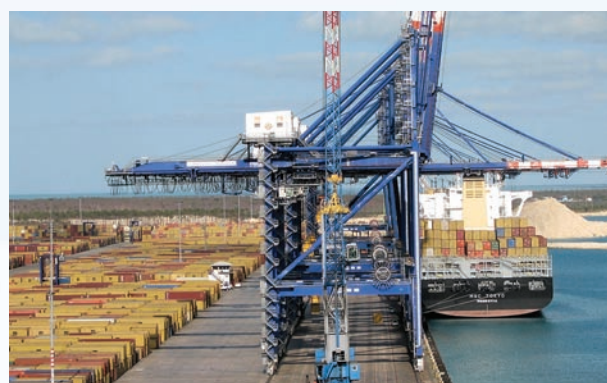
Table 4 Dangerous goods transport flows in the DaGoB partner countries (in million tonnes) (Source: Competent authorities and ministries in the Baltic Sea Region)

	Road	Rail	Sea	Total	Data for year
Estonia	2.0	31.3	33.2	66.5	2005/6
Finland	12.3	6.1	39.2	57.6	2002
Germany	156.2	53.9	124.0 ⁽¹⁾	334.1	2004
Latvia	1.2	19.4	25.0	45.6	2005
Lithuania	2.0	14.9	16.0	32.9	2005
Sweden	12.5 ⁽²⁾	2.1	55.0	69.6	2004/5/6
Total	186.2	127.7	292.4	606.3	

⁽¹⁾ Including inland waterways

⁽²⁾ Only Swedish registered lorries

“ The DaGoB project has provided the first comprehensive estimate of DG transported in the BSR.”



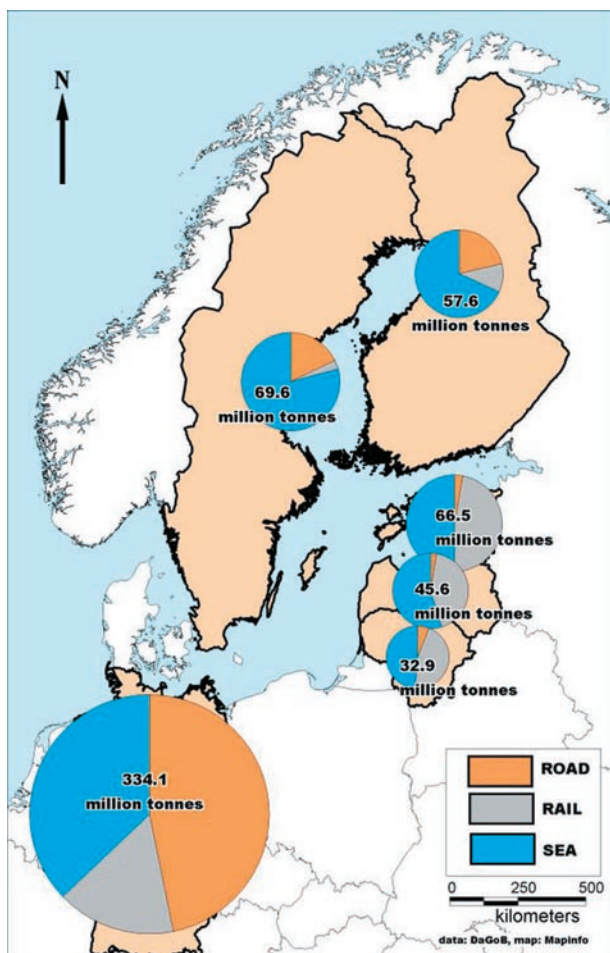


Figure 2 Annual dangerous goods transport flows and modal split in the DaGoB partner countries (Data from years 2002-06) (Source: Competent authorities and ministries in the Baltic Sea Region)

Germany is in different category than other involved BSR countries, and the split between transport modes is also markedly different. However we must keep in mind that only Northern Germany is part of the Baltic Sea Region. In Germany, where the annual dangerous goods transport volume is about 334 million tonnes, the largest transport mode is the road transport. In other DaGoB countries the sea mode is the largest transport mode. Finland and Sweden have quite similar volume of DG transport by road and rail, but the volume of sea transport is



significantly larger in Sweden than in Finland. In the Baltic states the rail transport is much more significant than in other BSR countries because of the dangerous goods flows from the Russia. For example Estonian Railway Inspectorate reports that 71% of their total railway transport is in fact dangerous goods transport.

The Baltic states occupy a strategic location as transit centers for Russia's northern oil exports. This is the reason for their high share of dangerous goods transport, which is clearly shown in the Table 5, Russia holds large natural gas and oil reserves. Russia is also the world's largest exporter of natural gas and the second largest oil exporter.

From the transport figures presented here, we can see that the transport amounts of dangerous goods are significant in the Baltic Sea Region. The share of dangerous goods compared to goods transport in total is especially large on sea mode, but also on rail. Dangerous goods share on road transport is instead very small.

Table 5 Dangerous goods share of the total transport flows in the DaGoB partner countries (Source: Competent authorities and ministries in the Baltic Sea Region)

	Road	Rail	Sea	Data for year
Estonia	7 %	71 %	67 %	2005/6
Finland	4 %	15 %	42 %	2002
Germany	5 %	17 %	25 %	2004
Latvia	2 %	32 %	42 %	2005
Lithuania	4 %	30 %	57 %	2005
Sweden	4 %	3 %	33 %	2004/5/6

Related DaGoB Publications:

- 1:2006 Transport of Dangerous Goods in Finland in 2002
- 4:2007 Transport of Dangerous Goods in Sweden - September 2006
- 5:2007 Transport of Dangerous Goods in the Baltic Sea Region



Dangerous Goods Transport Markets

- Transport infrastructure in Europe is becoming increasingly congested.
- Factors affecting cost efficiency need to be addressed in order to secure the competitiveness of the industry.
- There is dangerous goods driver shortage in Europe.

Transport infrastructure is becoming increasingly congested, fuel and labour costs are rising, downstream supply lines are lengthening, customers are demanding shorter order lead times and environmental and safety controls on the distribution of chemicals are steadily tightening.

National governments and the EU are also committed to internalising more of the environmental cost of freight transport in higher taxes. The resulting increases in transport costs will impact more heavily on those sectors, such as chemicals, which are relatively transport-intensive, rely heavily on road transport, specially in the central Europe, and spend an above-average share of sales revenue on transport.

Logistics Services

Most of the logistics service providers serving the chemical industry are nowadays small businesses that can deliver a reliable service at reasonable cost, but often lack the resources, expertise and incentive to provide innovative supply chain solutions.

Future trends in the dangerous goods transport markets seem to be globalization and concentration. It seems that in the future there will be much less operators in the markets. The size and the turnover of these operators would be even larger than today, and they would operate internationally. These transport companies have to provide more individualized services and at the same time know the customers business activities more thoroughly. However these transport services have to be also more standardized.

Given the enormous contribution that the chemical industry makes to the European economy in terms of output, employment, downstream linkages and international trade, the EU and national governments have a vital interest in ensuring that the distribution of chemicals remains competitive. They can assist this process through the continued liberalisation of freight markets, particularly for rail, short-sea shipping and inland waterways, enhanced support for intermodal transport, the standardisation of equipment and ICT networks and the upgrading of transport infrastructure.



Dangerous Goods Driver Shortage

One of the problems related to the growth of the chemical industry, and especially the transport companies close to it, is that the difficulties in finding competent personnel for different purposes are becoming increasingly common. Especially this problem seems to touch the road transportation of goods. The profession of truck drivers is not tempting for younger population entering the work force. This has already caused, and in the future will cause even more severe driver shortage in road transport overall.

The situation in the dangerous goods transportation seems to be even worse. The downsides of the profession are the same as in all the other road transport, and in addition the requirements of the personnel are higher due to the special nature of the transported substances.

The DaGoB –project has together with ECTA (European Chemical Transporters Association) taken a step to address this question by launching a survey targeted to companies transporting chemicals and other dangerous goods by road. The purpose of the survey is to find out if the hypotheses of driver shortage is in fact correct, and to find out what are the reasons of the shortage, as well as to find out what kind of consequences the companies expect to follow from the shortage. The results of the survey will be presented in another DaGoB –report published in the end of 2007.

Trade Logistics

Trade logistics, or the capacity to connect to international markets to ship goods, is critical for countries to improve their competitiveness, reap the benefits of globalization in an increasingly integrated world. This is vividly illustrated in a joint World Bank Group and Turku School of Economics survey released in November 2007.

According to the study, “Connecting to Compete: Trade Logistics in the Global Economy”, which includes a Logistics Performance Index (LPI), all developed countries turned out to be top performers. For example, Germany ranks 3rd, Sweden 4th, and Finland 15th out of a total of 150 countries covered. Russia, for instance, rank 99th. In other words, there are large differences in trade logistics performance in the BSR. The study and the data is available at www.worldbank.org/lpi.

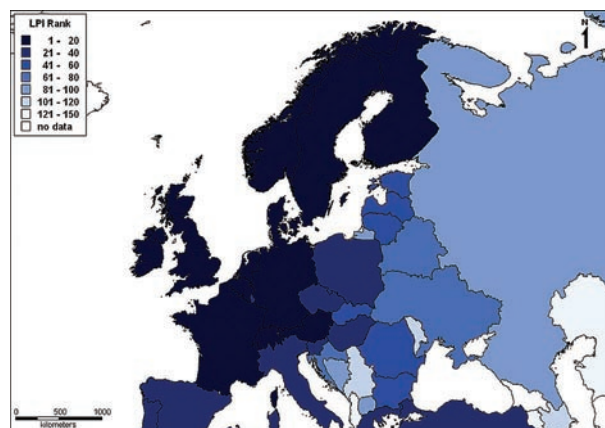


Figure 3 Logistics Performance Index rank in Europe (Source: World Bank)

Related Publications:

Connecting to Compete: Trade Logistics in the Global Economy - World Bank Group and Turku School of Economics

Dangerous Goods Transport from the Shippers Perspective

- The European Chemical industry is facing intensified pressure from global competitors.
- Preventive measures are essential in increasing the safety of DG transport.

Cost Savings through Supply Chain Efficiency

The chemical industry plays an extremely important role in today's European economy representing the largest chemical block in the world. However, prof. A. McKinnon states in the "Supply Chain Excellence in the European Chemical Industry" –report, that the European chemical industry's share of the global market is likely to decline as a result of the rapid growth of chemical production in Asia-Pacific countries and the Middle East. McKinnon also says, that the intensification of competition in the global chemical market will force European producers to find new ways of improving efficiency and service quality. As the scope for further efficiency gains in the production process will be limited, the supply chain is likely to become the main source of future cost savings. These savings will nevertheless be difficult to secure because, at the same time, there are several inflationary pressures that are affecting supply chain costs.

Multiple Case Study

DaGoB project provided dangerous goods supply chain information on shippers perspective by producing a multiple case study of multimodal transport chains. It provides an insight on how international supply chains of dangerous goods work with an overview of problems which the actors are faced. The data covers border-crossing transport chains in the Baltic Sea Region, which means that all movements involve a maritime transport leg in one form or another. The objective of the study was to describe DG transport chains as processes in order to identify bottlenecks or problems in operations, by applying a uniform process framework for all cases.

A number of transport- and terminalrelated service providers were involved in the process. The nodes in between the commercial actors were called interfaces. The number of interfaces varied from case to case. The interest areas of the study were: communication process, authority involvement, documentation process, liability process, and time consumption.



The main emphasis was put on operations rather than costs in order to find out how effective, efficient and professional the operations are in the various phases of the supply chains. The empirical case-data was collected by interviewing managerial level employees from the participating chemical industry companies in late 2006. Cases highlight the most voluminous DG classes using multimodal transport; including few bulk transports.

Regulatory Implications

- There exists differences in regulations across modes.
- DG transports call for an effective control system of operations, up-to-date equipment, well-trained personnel and an approved quality system.
- Especially in the summer, the number of passengers on ro-ro / ro-pax ferries limits the amount of DG cargo.
- No major problems occurred in the DG transport chains analysed in this study comprising 14 cases of well-known trading partners and logistics providers.

“ Better coordination of safety authorities is needed”

Managerial Implications

- MoU works well in the BSR; to be applied elsewhere??
- Better coordination of safety authorities is needed.
- Decision-makers should be actively supplied with accurate information on DG transport.
- Maritime & port IT systems not well enough connected.
- Regulations should be adapted to BSR conditions when possible.
- The human factor can be affected by up-to-date training, knowledge and the use of modern equipment.
- Work to improve safety of DG transport needs to continue with emphasis on preventive measures.

Related DaGoB Publications:

1:2007 Supply Chain Analysis of Dangerous Goods in the Baltic Sea Region - Multiple Case Study of 14 Supply Chains

Related Publications:

Supply Chain Excellence in the European Chemical Industry - Prof. A McKinnon, Heriot-Watt University, Edinburgh



Safety and Security

- The project has co-operated with a doctoral thesis project on risk management of maritime transportation of dangerous goods..
- The project has through practical exercises created a discussion platform for professionals dealing with safety and security of dangerous goods transport.

There are numerous risks related to transportation of dangerous goods. Different kind of risks include risks to human health and safety, such as deaths, injuries, acute or chronic illness and other health effects, risks to environment, such as contamination of water or land, risks to property, and other type of risks.

Risks related to dangerous goods may result from various sources. These sources may be divided into two main categories, namely safety related and security related sources. Safety related issues may be defined so that the regulations and operating procedures are well defined and followed, but despite the right procedures something happens. Security related issues may be defined in a way that regulations and operating procedures are deliberately not followed or ignored, thus causing an accident or incident to happen.

The Academic Answer to Safety and Security

These themes have been addressed in the DaGoB project both on the academic level through various reports and co-operation with the doctoral thesis project in Lund University, and on the practical level through various field

exercises and events organized amongst the project partners and other stakeholders.

Within the framework of the project, a large number of studies have been conducted to increase knowledge about the current status of the dangerous goods transportation chains. During 2006, an analysis of 14 different dangerous goods supply chains was conducted, giving in depth view on the possible bottlenecks and potential risks on different parts of the transport chain.

The Complex Network of Regulations and Regulators

One of the main problems on the safety –related issues of the dangerous goods transport chain is the fact that the Baltic Sea Region consists of several countries with differing authorities, rules and regulations. The first problem is that although most of the countries in the region belong to the European Union, and thus should at least in theory follow the same EU-level regulations, the real situation is not as clear. There is still a great need in fitting together the EU-level international rules and regulations related to dangerous goods transportation, and the national level legislation.

The other issue is the complex network



of authorities and agencies working with the dangerous goods related questions. It is almost a paradox that the number of dangerous goods experts in different countries of the Baltic Sea is relatively low, but still the few experts are scattered in different organisations. There is also not a common policy within the region, which authorities are responsible of dangerous goods related issues. These two factors together have created a complex network of authorities and agencies one has to know in order to be able to get a clear picture of the situation. The DaGoB project has also contributed this issue by performing a study where the regulations of different countries have been collected together, as well as the authorities and agencies in different countries have been listed together to create a better understanding of this field.

The Practical Aspect of Safety and Security

In dealing with the safety and security-related issues, the DaGoB –project has also contributed in a practical level. Within the project numerous field exercises have been organised to collect together the different authorities and agencies dealing with the dangerous goods transports. These field exercises have worked as presentations to view the group of experts and the different practises and procedures in different countries to give ideas to be transferred into the practices of their respective organisations.

Another main contribution of the exercises has been that they have formed a platform and a place for brainstorming sessions between the experts and authorities of the participating countries to compare the differing practices,

harmonise them and create possible best practices to be used in different situations.

Also, one must not forget the human factor of these exercises. Once the experts and authorities have been brought together in an informal environment, the level of both formal and informal contacts has been lowered, and the level of co-operation is increased.

Russian DG Transport Issues Handled in DaGoRus

In addition to the complex network of different actors and regulations inside and between the countries of the region, there is one more factor to be considered. Practically all the countries in the region have trade relations with Russia, that is also part of the Baltic Sea region, but is the only country outside the European Union. Whereas the regulatory framework for the other countries is determined in the European level, and will be harmonized with the national legislation, the Russian regulations and practices are, and will most likely be different at least to some extent. This challenge is also taken into account in the DaGoB project. When the DaGoB project will end at the end of 2007, an TACIS funded extension called DaGoRus will take over and continue the work the DaGoB project has started. One of the key objectives of the DaGoRus is to study the differences in the regulations and practices in between the EU-level regulations, the national level regulation of the EU-countries, and the national level regulation of Russia, and to provide tools and answers how to harmonize them.



Related DaGoB Publications:

- 4:2006 Maritime Transport and Risks of Packaged Dangerous Goods
- 5:2006 Risk Management System - Risk Assessment Frameworks and Techniques

Incidents and Accidents

- DaGoB has collected the data on incidents and accidents of dangerous goods, which have happened in the Baltic Sea Region.
- Higher accident risk can be observed for passenger ships than cargo vessels.

All transport modes bear the risk of accidents and significant consequences. When serious accidents occur, it is vital that investigations are carried out and that data concerning the causes, consequences and contributory factors are collated for analysis with the aim of minimising the number and seriousness of accidents in the future. On that basis, trends and risks can be identified, recommendations made and appropriate measures implemented.

“Consequences in DG accidents can be significant”

During the project duration DaGoB has collected the data on incidents and accidents of dangerous goods, which have happened in the Baltic Sea Region. This kind of data on dangerous goods accidents in the BSR, including road, rail and sea modes has never been summarised before. There have been reports e.g. on national DG road accidents and reports on shipping

accidents in the BSR in general, but not a report like this.

The DaGoB incident and accident report has collected the incident data from the international magazine called Hazardous Cargo Bulletin (HCB), which covers the transport and handling of oils, gases and chemicals. The magazine is keeping up an incident log database, which includes hazardous materials transport and storage incidents from the whole world. The data is collected from different sources including international and national newspapers and magazines as well as news agencies. HCB also gets direct hints about some accidents. What DaGoB has done is the data collection of the incidents that have happened in the BSR in 2000-2006.

Maritime Accident Reporting

According to the agreed procedure all accidents, which have taken place in territorial seas or European economic zone of the contracting party and involved tankers over 150 gross tonnage and/or other ships over 400 gross tonnage, irrespectively if there was pollution or not, are reported.



The IMO regulation requires Automatic Identification System (AIS) transponders to be fitted aboard all ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages and all passenger ships irrespective of size. The AIS enables the identification of the name, position, course, speed, draught and cargo of ships and displays all available data over a common background map.

Types of Vessels Involved in the Baltic Sea Accidents

According to HELCOM report on shipping accidents in the BSR, cargo vessels are the main group of ships involved, followed by passenger vessels and tankers. This proportion more or less reflects the amount of different vessel types making up the Baltic Sea traffic, however the slightly higher risk can be observed for

passenger ships and slightly lower for tankers and cargo ships.

Security During Transport of DG

Companies that are engaged in the transportation of dangerous goods by all modes of transport should take into account the security provisions included in the UN Recommendations on the Transport of Dangerous Goods. For transport of dangerous goods by road, rail and inland waterway the modal security provisions should also be taken into account. The new security provisions that will be included in the modal regulations for the transport of dangerous goods (ADR, RID, ADN, ICAO, IMO) must be implemented when they will enter into force.

Companies that are engaged in the transportation of High Consequence Dangerous Goods by all modes of transport should in addition develop a Security Plan that addresses at least the elements specified in the UN Recommendations.

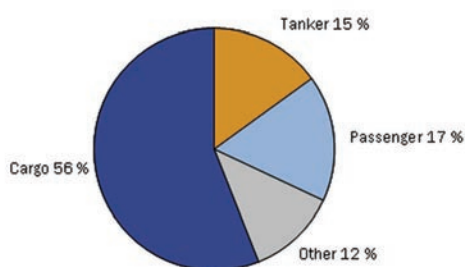


Figure 4 Types of ships involved in all shipping accidents in the Baltic Sea during 2006 (Source: HELCOM)

Related DaGoB Publications:

Upcoming - 7:2007 Dangerous Goods Related Incidents and Accidents in the Baltic Sea Region



The Human Factor

- **Staff exchange of authorities has been a positive experience.**
- **Practical exercises have proven to be a valuable form of informal information exchange.**

Up to 1,000 million tonnes of dangerous goods are transported in the Baltic Sea and on the roads of the Baltic Sea countries. In case of an accident, these substances may be a threat to people and the environment. In order to avoid dangerous situations and major accidents, the official supervision of the area is now being standardised and improved. Networking and new equipment makes these control activities more effective.

The question is, above all, about the safety of the people and the environment. Common working methods and smooth cooperation beyond borders facilitate the supervision work of the authorities, whose goal is to avoid serious accidents.

Transport is always associated with human risk factors that cannot be completely excluded. Authorities try to minimise possible damages with common rules. For example, everyone can imagine how important it is during an accident to know what was loaded onto the car. We must quickly find out whether the cargo contains explosive, corrosive, radioactive or flammable substances. The relevant notes immediately tell the authorities what the question is about.

Positive Experiences from Staff Exchange of Competent Authorities

In the regularly held workshops of the DaGoB project, the transport of dangerous goods is approached from as many points of views as possible based on the experience of DaGoB authorities and experts. How to cooperate in practice has been refined in common exercises organized in Sweden, Germany, Finland, Latvia and Estonia.

The project also included staff exchange. Involved organizations were The Finnish Traffic Police, Hamburg Waterways Police, Swedish Coast Guard, Estonian Railway Inspectorate, Finnish Railway Agency and Federal Railways in German. The working methods of the authorities are already now quite similar, but there is still to learn. The Germans were surprised by the smooth and close cooperation between Finnish Police, Customs and Border Guards. The Finnish Police paid attention to the driver's card reading devices of the digital plotter used by the Germans. The digital plotters save, for example, the exact driving distances and break durations. The driver's state of alertness significantly affects driving safety.



The formation of an individual network of contacts is one of the best results of the project and there is a good reason to maintain this cooperation.



Human Error is a Main Cause of Many Dangerous Goods Accidents

It has been reported that human error is in fact the most common individual cause of dangerous goods related accidents. An analysis of the European Community's database on road transportation of dangerous goods found that almost half of the accidents are caused by a human error, or at least human error was a major contributor for the accident, whereas at the same time only some 8 per cent of accidents were caused by a technical failure.

Human errors may be caused by a number of different factors such as poor training, carelessness or indifference. The large share of human caused accidents can be seen as a potential improvement, since the human factor

may be affected by more efficient education and training, as well as enhancement of the existing safety culture and attitudes towards potential risks in the human behavior.

The European Union has addressed the subject by issuing new and updated, rather specific requirements for course content and structure, basic courses and refreshment training for professionals in the transportation of dangerous goods on the road. At the moment, the requirements for rail transport are not specified on the same level.

An example of a widely used Formal Safety Assessment (FSA) in risk management is the following flow chart indicating the steps in IMO's FSA.

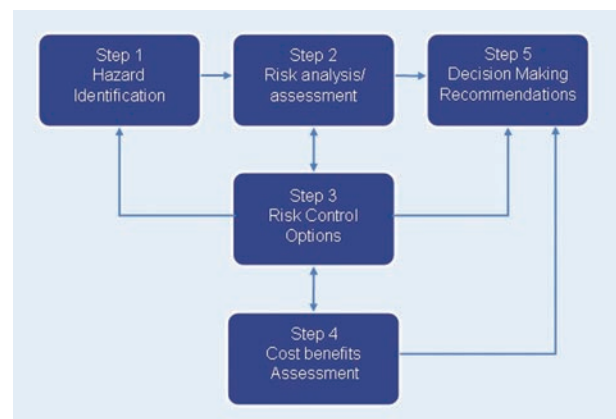


Figure 5 Flow chart of the IMO's Formal Safety Assessment methodology (Source: IMO)



IT Systems and Equipment

- The IT Systems used in BSR ports found to be very fractured.
- The IT Systems used in BSR ports found to be very fractured.
- SafeSeaNet will assess the DG data exchange in the future.

Seaports are important links of DG logistics in the Baltic Sea Region since the majority of export and import is transported by sea. The increase in cargo flows during the past years has also set new demands for capable information management. Efficient IT Systems and proactive IT development are crucial elements to meet the requirements of safe and reliable transport flows. A DaGoB survey was made to examine and evaluate the current status of the used port IT Systems in six Baltic Sea countries.

The survey was made in 2006-2007. The studied ports were Helsinki, Tallinn, Riga, Klaipeda, Hamburg and Stockholm. One finding of the study was that some ports, especially in liner traffic, co-operate with each other, but IT Systems are mainly country-specific and/or developed inside each port.

Among the key results was also the finding that the systems are fragmented, and the level of system development differs very much in

“ SafeSeaNet is estimated to become mandatory 2009 ”

each country or port. The concrete level of co-operation between BSR ports in ICT Systems and ICT infrastructure is very low. The European platform for maritime data exchange: the SafeSeaNet (SSN), is going to be a mandatory centralized database for DG-cargo information in the next few years. Not many of the studied port IT Systems were compatible to meet the SSN requirements and the prevailing atmosphere was that larger IT projects were put on hold until the European Commission finalizes the regulations concerning SSN.

European Platform for Maritime Data Exchange: SafeSeaNet

The SafeSeaNet system has been designed and developed in response to the requirements of EU maritime safety legislation (Directive 2002/59) and is linked to port waste reception and Port State Control initiatives. The SSN Central Index acts as a secure “yellow pages” type of index, which supports the exchange of data between users who are either identified as data providers or as data requesters. The Local Competent Authorities i.e. port, VTS, coastal station, MRCC, as data providers, should notify SSN, as a data requester, when information has been received on a particular ship. Messages are exchanged by XML format and secured by two-way SSL-protocol which provides secure communications over the Internet and other data transfers.

The data stored in the SSN-system contains information about ships and their movements, estimated times of arrival in ports and cargoes. The index-server works as a transmitter of the detailed data between ports, which are sent by AIS-messages. The AIS messaging is an efficient tool to track the movements of the ships at sea.

SafeSeaNet became operational in October 2004 after a development and deployment phase. This phase was carried out by the Commission with the participation of the Member States. There are 15 Member States that are actively involved at present, with 11 having achieved operation, and 4 already commissioned and ready to enter the system. At the moment the use of SafeSeaNet is not mandatory and the final implementation date has not been set by the European Commission. The current estimations for complete initialization is 1.1.2009.

Further Development of IT Systems

Greater harmonisation and integration of IT systems in the BSR countries' will be necessary in the future, since they are currently very fragmented. Not only discussions between the ports across the borders need to be improved, but the system users and system developers need to be integrated as well. In the future, joint workshops between users and developers should be held, with the aim being to achieve harmonised development of the systems. These efforts should be coordinated with the development of SafeSeaNet as the central database for emergency incidents. All developments should guarantee a compatibility with SafeSeaNet.

A Seeing, Hearing and Sniffing Car

A quite ordinary-looking station wagon conceals a complete arsenal of top-level technology inside itself: computers, calculation programs, cameras, odour detectors and radiation gauges. It is the first mobile command centre on wheels, which is benefiting from the newest broadband mobile technology in the Port of Turku's safety surveillance system.

Previously, supervision has been based on stationary monitoring points. Now information can both be sent and received from a motor vehicle. In practice all ten cameras in the port area can be monitored and even controlled from the car. In addition to the cameras, the car comprehensively observes its environment otherwise. It is capable of identifying oxygen, carbon monoxide, toxic gases and 80 varieties of hydrocarbons. Moreover, radioactivity can also be exposed and measured by means of the vehicle.



Various calculation programs make it possible to identify dangerous substances and assess their rate of distribution and area rather precisely through the aid of the wind and air flow data on

the computer's map grid. This being the case, the evacuation measures can be initiated instantly.

Utilizing this vehicle, it is possible to describe the damage from a distance. A camera can also be taken from the car and carried along, in which case the camera image is wirelessly transmitted from the base station in the vehicle to the port's Wimax radio network and onwards to, for example, the rescue authorities. The versatile data systems also enable the exchange of information in real time between various authorities.

Similar mobile command centres are not yet found elsewhere. This prototype has been constructed as part of the DaGoB project, in which new methods, for instance to supervise the transport of dangerous substances, are being sought.



First and foremost, the supervision and safety of the port is anticipation: there is an attempt to prevent dangerous situations such as the outbreak of fires and oil spills. However, it is not always possible to avert damage and losses entirely. By monitoring the vehicle's data sources, there is knowledge at all times about what is happening.

Related DaGoB Publications:

Upcoming - 8:2007 IT Systems and Control of Dangerous Goods in the Baltic Sea Region ports

The Way Forward

- The data collection is scattered and needs to be harmonized in order to create a credible view of the situation on the region.
- Project has initiated discussion between different actors in order to create an understanding of future development needs on the maritime transportation -related IT-systems.

The aim of the project was to approach the field of dangerous goods transportation from all the directions, including the actors of private sector as well as the public sector, and taking into account both the infrastructure related issues and the human factor. The figure below describes the different aspects of the project and the interrelations between them.

The Human Factor

Through various field exercises and staff exchange between the authorities in partner countries, the project has been able to build a platform for both formal and informal information and knowledge exchange and lowered the boundaries for co-



Figure 6 DaGoB framework

On all fields mentioned before, the project has achieved some results, as well as gained valuable information about the future development needs.

operation between the authorities of respective countries. The expectations of positive impact of this kind of events will remain in the future and

it is seen important to ensure the possibilities for future staff exchange and different forms of informal communication as well.

It was also recognized that in the respective regions there are numerous different authorities dealing with the transportation of dangerous goods, and that the authorities in different countries are responsible for different issues. It is seen as essential to bring together the authorities that are dealing with similar type of issues.

Private Sector Domain

Within the project, an analysis of the dangerous goods transport chains was performed in order to identify bottlenecks or problems in operations, by applying a uniform process framework for all cases. As a result a number of problematic issues from the business point of view were identified and recommendations for enhancement were given. It is safe to assume that in this field as well there is a lot to be done in identifying the problems faced by the companies and creating safe and secure ways of solving them.

Public Sector Domain

One of the goals of the DaGoB project was to study the wide and complex field of authorities and regulations related to dangerous goods transportation in the Baltic Sea Region. One of the findings was that although most of the countries in the BSR act under the same EU-regulation, there are still many differences between the practices and operating procedures.

In order to harmonize the procedures and to increase the dialogue and information exchange between the national level authorities, the differences have to be recognized. The right actors in different countries have to be identified and brought together.

One of the findings of the project was that the professional requirements and training of dangerous goods professionals such as inspectors differs from region to another. In order to harmonize the regulations and requirements it is also seen as necessary to identify the differences and to aim for a more unified training of the professionals.

Infrastructure and Equipment

The main contribution of the DaGoB –project on the infrastructure and equipment has not been on the physical infrastructure, but on the electronic infrastructure such as information systems and information networks of the different actors related to the transportation of dangerous goods. Within the project some deficiencies and overlap as well as some potential points of improvement were identified. With the ever growing information requirements and need for up to date information, the development needs on this field are remarkable.

Conclusion

The aim of the DaGoB project was to increase the safety level of dangerous goods transports in the Baltic Sea Region by enhancing the cooperation between competent authorities.

It can be noted that the legislation in this area is well developed and it covers all the relevant issues adequately. Regulations are drawn up largely at an international level and harmonisation of the legislation can therefore be considered successful. However, differences in implementation and enforcement of the regulations exist in the different countries.

One of the most important results of DaGoB is the significantly increased level of cross-border cooperation between the authorities involved. It is now at a much higher level than it was before this project.

In addition to participation at seminars and workshops, the staff exchange can be singled out as a most efficient instrument for bringing those who work with dangerous goods together and increase their knowledge and confidence concerning the cooperation with other countries.

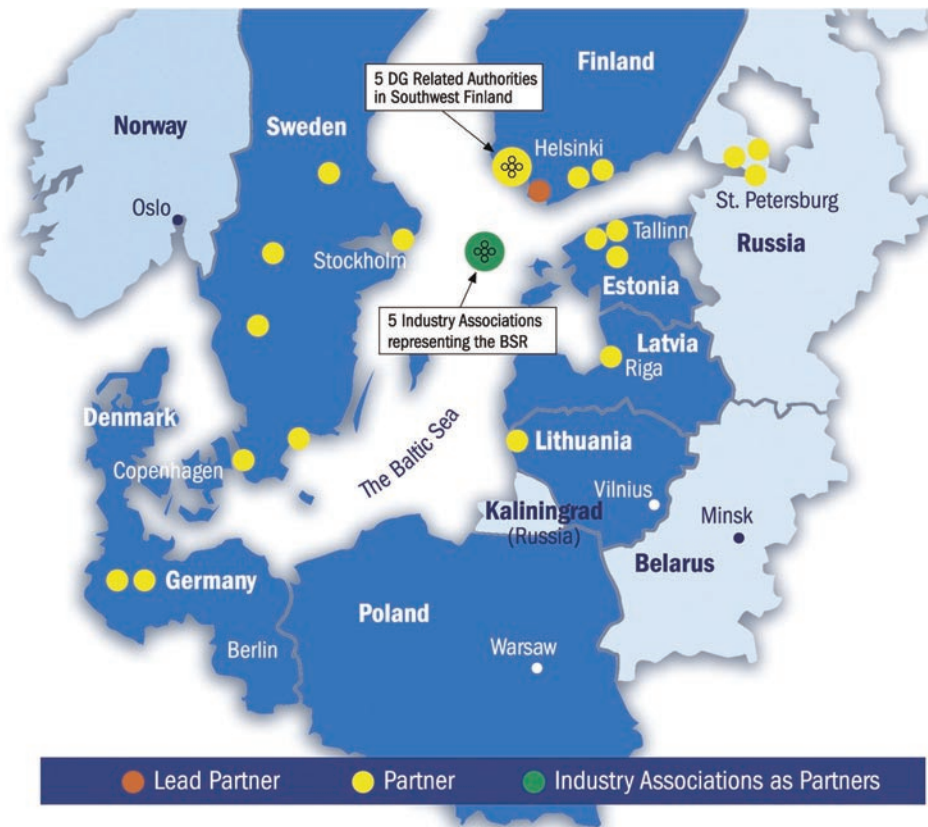
Concrete suggestions for further activities as a direct result of the developed instruments have been made. This is very important in order not only to maintain the level of cooperation and knowledge achieved, but also to extend it.

Abbreviations

ADN	The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	The European Agreement concerning the International Carriage of Dangerous Goods by Road
AIS	Automatic Identification System
BSR	Baltic Sea Region
CIS	Commonwealth of Independent States
DaGoB	Safe and Reliable Transport Chains of Dangerous Good in the Baltic Sea Region
DaGoRus	Safe and Reliable Transport Chains of Dangerous Good in the Russian-EU Logistics Chain
DG	Dangerous Goods
EC	European Commission
ECTA	European Chemical Transporters Association
EU	European Union
FSA	Formal Safety Assessment (IMO)
GPS	Global Positioning System
HCB	Hazardous Cargo Bulletin
IATA	The International Air Transport Association
ICAO	The International Civil Aviation Organization
ICT	Information and Communications Technology
IMDG Code	International Maritime Dangerous Goods Code (IMO)
IMO	International Maritime Organization
MARPOL	International Convention for the Prevention of Pollution from Ships (IMO)
MRCC	Maritime Rescue Coordination Centre
MoU	Memorandum of Understanding for the Transport of Packaged Dangerous Goods on Ro-Ro ships in the Baltic Sea
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SOLAS	International Convention for the Safety of Life at Sea (IMO)
SSN	SafeSeaNet
VTS	Vessel Traffic Service
UN	United Nations

DaGoB Project Partners

DaGoB partners comprise a wide selection of relevant central administrations, port authorities, industry associations and academic partners covering the Baltic Sea Region.



Project partners in Estonia

- Estonian Maritime Administration
- Estonian Railway Inspectorate
- Port of Tallinn

Project partners in Finland

- Turku School of Economics
- Finnish Environment Institute
- Finnish Maritime Administration
- Port of Turku
- Finnish Customs
- Finnish Traffic Police
- West Finland Coast Guard District

Connections to industry associations in the Baltic Sea Region and to relevant European associations will be maintained through the following Finnish partners:

- The Association of Finnish Technical Traders
- Chemical Industry Federation of Finland
- Finnish Port Operators' Association
- The Finnish Port Association
- Finnish Transport and Logistics – SKAL

Project partners in Germany

- TuTech Innovation GmbH

Project partners in Latvia

- Freeport of Riga Authority

Project partners in Lithuania

- Klaipeda State Seaport Authority

Project partners in Sweden

- Swedish Rescue Services Agency
- Lund Institute of Technology, University of Lund
- Swedish Coast Guard
- Swedish Rail Agency
- University College of Borås

Regional organisations as advisory partners

- The TEDIM programme represented by the Ministry of Transport and Communication Finland (TEDIM is a joint body of the Ministries of Transport around the Baltic Sea)
- Baltic Ports Organisation

The Russian project partners of the TACIS funded extension of DaGoB, the DaGoRus coordinated by Technical Research Centre of Finland, VTT

- Saint-Petersburg Government Committee of Transport-Transit Policy
- North Western Russia Logistics Development and Information Centre
- Non profit training and research center of adult education “Protey”

For contact details of the partners see www.dagob.info



DaGoB Publication List

- 1:2006 Summary of Evaluation of EU Policy on the Transport of Dangerous Goods since 1994
Editor: Mikko Suominen
- 2:2006 Transport of Dangerous Goods in Finland in 2002
Editor: Mikko Suominen
- 3:2006 Carriage of Dangerous Goods and Law
Author: Lauri Railas
- 4:2006 Maritime Transport and Risks of Packaged Dangerous Goods
Author: Arben Mullai
- 5:2006 Risk Management System – Risk Assessment Frameworks and Techniques
Author: Arben Mullai
- 1:2007 Supply Chain Analysis of Dangerous Goods in the Baltic Sea Region – Multiple Case
Study of 14 Supply Chains
Authors: Mikko Suominen, Markku Häikiö, Paula Lehtinen, Lasse Metso, Tuire Pernaa,
Lauri Ojala
- 2:2007 Estonian Experience in Implementing Mandatory Dangerous Goods Notification from
Ships
Authors: Jaak Arro, Lauri Ojala
- 3:2007 Dangerous Goods Transport in the Baltic Sea Region: Authorities, Agencies and
Regulations
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- 4:2007 Transport of Dangerous Goods in Sweden – September 2006
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- 5:2007 Transport of Dangerous Goods in the Baltic Sea Region
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- 6:2007 Safe and Reliable Transport Chains of Dangerous Goods in the Baltic Sea Region –
Key Findings of the DaGoB project 2006-2007
Authors: Lauri Ojala, Sirpa Nummila, Mikko Suominen, Tomi Solakivi, Johannes Raitio



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