DaGoB publication

DAGoB

Toolkit

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DaGoB publication

TuTech Innovation GmbH
Jan Prahm and Jens Benecke
Harburger Schlossstrasse 6-12
21079 Hamburg
Germany

website: http://tutech.de
email: prahm@tutech.de
Tel: Jan Prahm +49 40 76629 6363

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Toolkit

Jan Prahm

Jens Benecke

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ABBREVIATIONS

ADN	Accord européen relativ au transport international des marchandises dangereuses par voie de navigation intérieure (European agreement on the international transport of dangerous goods by inland waterways)
ADNR	Accord européen relatif au transport international des marchandises dangereuses par voie de navigation intérieure Rhin (European agreement on the international transport of dangerous goods by inland navigation on the river Rhine)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement on the international transport of dangerous goods by road)
AG	Aktiengesellschaft
Approx.	Approximately
BBS	Behaviour-based safety
BC	Bulk carrier
BCH	Bulk chemicals
BSR	Baltic Sea Region
CACIS	Cargoes and Commodities Information System
CB	Custom Board
CCNR	Central Commission for Navigation on the Rhine
Cefic	European Chemical Industry Council
CIM	Convention international concernant le transport des marchandises par chemin de fer (International convention concerning the carriage of goods by rail)
CIS-countries	Commonwealth of Independent States

COTIF	Convention relative aux transports internationaux ferroviaires (Convention on international railway transport)
DaGoB	Safe and Reliable Transport Chains of Dangerous Goods in the Baltic Sea Region
DG	Dangerous goods
DGSA	Dangerous Goods Safety Advisor
EC	European Community or European Commission
ECE	Economic Commission for Europe
ECTA	European Chemical Transport Association
EDI	Electronic data interchange
EDP	Electronic data processing
EPCA	European Petrochemical Association
ERP	Enterprise resource planning
EU	European Union
FRS	Fartygs Rapporterings Systemet
FSA	Formal safety assessment
GEGIS	Gefahrgut-Informationssystem
GIS	Geographic information system
GmbH	Gesellschaft mit beschränkter Haftung
GPRS	General Packet Radio Service
GPS	Global Positioning System
HABIS	Hafenbahn-Betriebs- und Informationssystem
HSC	Health and Safety Commission
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
IATA DGR	IATA dangerous goods regulations
IBC	Intermediate bulk container
ICAO	International Civil Aviation Organization

ICAO-IT	Technical Instructions for the Safe Transport of Dangerous Goods by Air
ID-Number	Identification number
IGC	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
INF Code	International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships
ISO	International Organisation for Standardisation
IT	Information technology
Ltd	Limited company
MARPOL	International Convention for the Prevention of Pollution from Ships
MSC	Maritime Safety Committee
NGO	Non-governmental organisation
NW Russia	North-West Russia
OCTI	Office central des transports internationaux ferroviares (Central office for international carriage by rail)
OECD	Organisation for Economic Co-operation and Development
OTIF	Organisation intergouvernementale pour les transports internationaux ferroviaires (Intergovernmental organisation for International carriage by rail)
PDG	Packaged dangerous goods
Plc	Publicly controlled company
PLL	Potential loss of life

RIB	Rescue Service's Information Bank
RID	Règlement concernant le transport international ferroviaire des marchandises dangereuses (Regulations on the international transport of dangerous goods by rail)
Ro-Ro	Roll-on roll-off
RSC	Lithuanian Radiation Protection Centre
SCG	Swedish Coastguard
SHE impacts	Safety, health and environmental (SHE) impacts
SQAS	Safety and quality assessment systems
SQL	Structured Query Language
SR	Societal risk
SRSA	Swedish Rescue Services Agency
SSN	SafeSeaNet
SWEDAC	Styrelsen för ackreditering och teknisk kontroll (Swedish board for accreditation and conformity assessment)
TSE	Turku School of Economics
U-AIS	Universal Automatic Identification System
UK	United Kingdom
UN	United Nations
US EPA	U.S. Environmental Protection Agency
VTS	Vessel Traffic Service
WP	Work package
ZMGS	Zentrales Meldesystem für Gefahrgut und Schiffsverkehre der Bundesrepublik Deutschland (central German reporting system for dangerous cargo at sea)

1 Introduction

1.1 Context of the work

The work relating to this report has been carried out as part of the “Safe and Reliable Transport Chains of Dangerous Goods in the Baltic Sea Region” (DaGoB) project funded by the European Union Baltic Sea Region (BSR) Interreg IIIB Neighbourhood Programme. A specific feature of BSR Interreg IIIB is to promote joint solutions to joint problems by trans-national cooperation “in order to reach an increased level of BSR integration and to form a region with sustainable growth prospects”. The DaGoB project contributes specifically to the aim of Action Line 2, “Creating sustainable communication links for improved spatial integration”, by addressing the needs of the transport sector. The goal has been to improve cooperation between involved parties within the Baltic Sea Region and thereby to increase the national and international exchange of experience and information concerning dangerous goods transports. DaGoB comprises partners from several DG authorities, ports, universities and industry associations from Estonia, Finland, Germany, Latvia, Lithuania, Russia and Sweden.

More than 300 million tonnes of dangerous goods are transported every year in the BSR. These transports, often through densely populated areas, represent real health and safety risks to people and the environment. The transport of dangerous goods is not only important economically, but it is also a politically sensitive topic, particularly given the difference in infrastructures in the post-communist member states in the region and the members of EU16. A clear focus of the work has therefore been to establish trust and a common understanding of issues and approaches. Although the transport of dangerous goods is regulated by a variety of extensive regulations, addressing practically every aspect, the operational practices of authorities involved vary extensively between and even within countries. There is a vast need to improve the exchange of information between authorities and commercial actors and to coordinate processes, and this need formed the background to the project.

Work in the project as a whole has been carried out in four work packages:

WP 1 comprises dangerous goods flows and related incidents and accidents,

WP 2 looks at roles and responsibilities of the authorities dealing with dangerous goods,

WP 3 establishes the DaGoB toolkit, based on a synthesis of recommendations from WP1 and WP2, and

WP 4 disseminates and transfers the knowledge acquired from the project.

1.2 Purpose of report

It was a clearly stated intention of the WP 3 managers to work at a very practical level in addressing knowledge sharing. Lasting (sustainable) results from projects such as DaGoB tend not to be the reports and guides (Interreg IIIB projects, according to a Member of the Steering Committee, have produced well over a thousand handbooks and guides) but the relationships developed between people. The focus of the work in WP 3 has therefore been to organise practical interactive workshops based on the declared interests of the stakeholders. This “toolkit of cooperation” introduces key development areas for dangerous goods transport. These include risk assessment methods and ways to avoid health and safety hazards and damage, to improve and target training, to enhance supply chain security and so to maintain the competitiveness of industries working with dangerous goods.

1.3 Structure of report

Before answering the question of which tools or instruments are suited to improving the safety of dangerous goods transport in the Baltic Sea Region, it is helpful to understand the framework in which the DG community is operating. Chapter 2 gives a general picture and provides an essential basis for understanding the problems of this sector.

In the third chapter, a set of resulting instruments to overcome the human aspects of the problems will be presented. This will be done separately for the public and private sectors.

Chapter 4 suggests practical activities and policies for future work. These suggestions, like the tools presented in the previous chapter, are the result of experience and information exchanged within the project.

Chapter 5 draws the main conclusions from the DaGoB toolkit work.

Chapter 6 lists sources to which reference is made in the document, while chapter 7 contains annexes detailing dangerous goods training, management and IT systems in place in the Baltic Sea Region plus a draft agreement on information exchange on dangerous goods transport.

2 Framework of dangerous goods transport in the Baltic Sea Region

2.1 Background

Transport of dangerous goods is of considerable importance to the Baltic Sea Region's commercial and industrial sector. The goal is a safe and profitable transport sector today and in the future. While logistical challenges and the global nature of the transport industry have a large influence on the development of the sector, the geographical position of the BSR confronts operators working in the area with considerable problems: cold, icy periods, long distances, a dependency on sea transport as well as a considerable transport flow to and from the east by rail and road, thinly populated areas in the north of the region and densely populated ones in the south. If the sector's future development and profitability are to be assured, logistical bottlenecks cannot be allowed to develop, either during border crossings or while transferring goods from one mode of transport to another (Ministry of Transport and Communications Finland, 2006).

Safety is the paramount concern of all dangerous goods transport activities. Given the global nature of the transport sector, internationally harmonised legislation can deliver improved 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 pursuit of these goals will be increasingly important in the future. The emphasis of the DaGoB project has therefore been laid particularly on enhancing cooperation.

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. This is the aspect of dangerous goods transport most apparent to the general public, yet there are many goods transported by road and rail as well.

More than 200 million tonnes of dangerous goods are transported in the BSR (plus over 100 million tonnes in NW Russia), mostly through

densely populated areas, imposing real health and safety risks on the population and the environment (Suominen, 2006).

The quantity of dangerous goods transported in the BSR countries varies considerably. Germany is in a different category from other BSR countries where the modal split of the transport volumes is different. In Germany, the largest mode of dangerous goods transport is by road, where the annual volume of dangerous goods is about three million tonnes. In other BSR countries, transport by sea is the largest mode. Finland and Sweden are quite similar to one another in terms of the volume of goods transported annually and the modal split. In the Baltic states, rail transport is much more significant than in other BSR countries because of dangerous goods flows from Russia.

2.2 Regulatory framework

The carriage of dangerous goods is a necessary consequence of the scientific and technological development of our times. With the ongoing introduction of new materials, in particular in the chemical industry, the transport system is continually facing new challenges. With regard to the carriage of dangerous goods, it is important on the one hand that technical progress is not hindered and on the other that safety is ensured. After considering all the various points of view, the carriage of dangerous goods must be made possible under manageable conditions unless the risk is so great that it cannot be assumed. This is why dangerous goods regulations are safety regulations governed by public law.

Throughout the world, numerous committees deal with the task of providing rules for the safe transport of dangerous goods. The most important organisations and agreements are described by Ridder (2004) and can be summarised as follows.

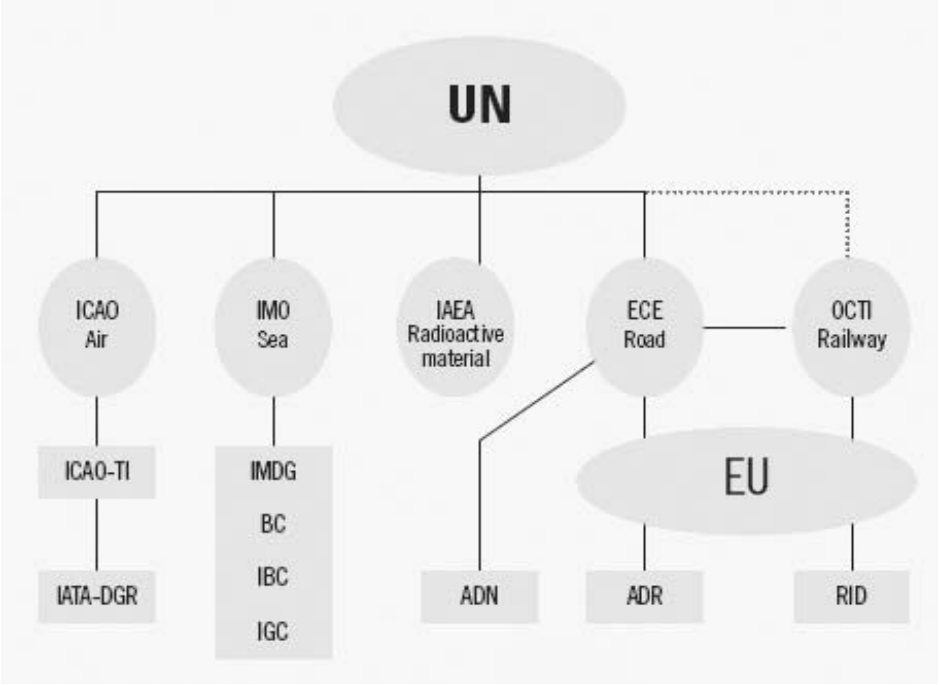

Figure 1: International organisations and agreements for DG transport. Source: Ministry of Transport and Communications Finland (2006)

At world level, the **United Nations** (UN) is tackling the topic of dangerous goods. The UN is drawing up the so-called **UN recommendations**, which are published in the "orange book" and which form the basis for many European dangerous goods regulations.

Since 1977, the **International Civil Aviation Organization** (ICAO) has been concerned with the carriage of dangerous goods by air. To some extent dangerous goods are today transported by air in accordance with the regulations of the **International Air Transport Association** (IATA). But the IATA regulations were not universally recognised and so the ICAO initiated a special annex to the ICAO Convention which is now called the Technical Instructions for the Safe Transport of Dangerous Goods by Air (abbreviation: **ICAO-TI**) and came into effect worldwide in 1984.

The **International Maritime Organization** (IMO) draws up recommendations for the safe carriage of dangerous goods in maritime shipping traffic. These recommendations are expressed, for example, in the **IMDG Code** and in the chemical tanker and gas tanker codes.

For the specialised area of the carriage of radioactive materials, the **International Atomic Energy Agency** (IAEA) drew up

recommendations, which – with constant further development – are taken into account in the regulations for road, rail and ship transportation in Europe. The **IAEA recommendations** are contained in the UN recommendations “for information only”.

The **Economic Commission for Europe** (ECE) assumed responsibility for drawing up an international agreement for the carriage of dangerous goods by road (Abbreviation: **ADR** – original designation: Accord européen relatif au transport des marchandises dangereuses par route – European agreement concerning the international carriage of dangerous goods by road). To date, 43 countries apply the ADR for cross-border transport and it is under continual development. In 1997, Annexes A and B to the ADR were designated as the basis for the cross-border carriage of dangerous goods in accordance with EC Directive 94/55/EC. This represents the largest step towards the harmonisation of legal regulations within Europe to date.

The ECE also recognised the need for comprehensive regulations for inland waterway transportation and has accordingly compiled a draft European agreement concerning the international carriage of dangerous goods by inland waterway (**ADN**).

The **Intergovernmental Organisation for International Carriage by Rail** (OTIF) ensures uniform application of the convention on international carriage by rail (COTIF – Convention relative aux transports internationaux ferroviaires). The EU is going to incorporate ADN into the directive framework of inland transport of dangerous goods. This new directive will be in force in middle of 2009. The actual legal regulations for the carriage of dangerous goods by rail are contained in Appendix C to COTIF, the so called **RID** (Original designation: Règlement concernant le transport international ferroviaire des marchandises dangereuses; English designation: Regulations Concerning the International Carriage of Dangerous Goods by Rail).

An additional agreement with high importance for the Baltic Sea Region is the **Memorandum of Understanding** (MoU) by eight countries regarding the transportation of packed general goods on board roll-on roll-off vessels in the Baltic Sea (Suominen et al., 2007). The MoU has been subject to yearly amendments. The ship owner can apply the rules of the MoU in the Baltic Sea, including the Gulf of Bothnia and the Gulf of Finland, in short-sea ro-ro traffic, where the requirement established in the MoU regarding matters such as the training of crew and personnel are satisfied. The MoU contains special

provisions relating to the carriage of dangerous goods within the scope of ADR and RID agreements.

In the countries participating in the DaGoB project, national and regional parliaments are responsible for incorporating the aforementioned agreements and additional regulations into national law. Parliaments also charge central governments and other executive authorities, such as the ministries of transport, ministries of economic affairs or road, rail and maritime administrations, with the duty of issuing and enforcing regulations as and when required (Zetterström, 2007)[1].

International and national harmonisation of safety regulations has been attempted for many years. Despite the many national interests and the large amount of work involved, particularly in respect of coordination, the harmonisation of regulations governing the various means of transport has been largely successful.

2.3 Enforcement of legislation

The organisational structure concerning the enforcement of the dangerous goods transport legislation differs markedly between the countries within the Baltic Sea Region. There are several authorities involved in this process. These are, for example, ministries of transport and their subordinate road, rail and maritime administrations, regional and national police, border guards, coastguards, customs, port authorities and the armed forces[2]. Depending on the local, regional or national level and on the mode of transport, other authorities may be responsible for enforcement. In additional to these public sector bodies, safety advisors in private companies play a role in enforcing these regulations.

Although the international agreements are in place in the individual countries, this multitude of players causes problems when it comes to implementing the rules. There is a lack of communication, information exchange and cooperation, both vertically and horizontally, within and especially between countries. Members of authorities often do not know

[1] More detailed descriptions regarding the legal structures in countries within the Da-GoB project can be found in the DaGoB WP 2 report Zetterström B (2007) Dangerous Goods Transport in the Baltic Sea Region:Authorities, Agencies and Regulations, Turku

[2] A detailed report on this issue is DaGoB WP 2 report Zetterström (2007): Dangerous Goods Transport in the Baltic Sea Region: Authorities, Agencies and Regulations

where to go to report or obtain information about international and national transports. This can make it difficult to inform others about the hazards of a specific shipment or to get information about a shipment from the foreign authorities at the other end of the transport chain.

Another problem is the variance across the BSR in the standard of handling dangerous goods and of the controls of them. This results from differences in individual regions and countries not only between training systems for the separate transport modes but also in the knowledge of the relevant standards that those handling dangerous goods have.

Improved cooperation between countries, particularly lower down the hierarchy than ministerial level, seems essential if this problem is to be solved. Information exchange is vital to increased safety and can lead to a better harmonised dangerous goods transport system in the whole Baltic Sea Region.

2.4 IT infrastructure in the public sector

An important part of the infrastructure of dangerous goods transport is the IT systems used for data collection.

A survey of IT systems used for collection of dangerous goods data in six Baltic ports (Tallinn, Hamburg, Riga, Klaipeda, Stockholm and Helsinki) shows that, as a rule, several port stakeholders make use of the systems, which typically collect information such as notifications about the vessel, its timetable, its crew and cargo, arrival time, storage requirements, the departure time of cargo or vessel and information necessary for reporting and statistics. The main users are the police, customs and other law enforcement agencies, plus stevedoring companies for the planning of loading, unloading and storage of the dangerous goods.

Access to these systems varies. Some can be accessed from any computer with an Internet connection, while others can be accessed from certain terminals only. The level of integration with other port systems differs, too. In some ports, the dangerous goods information system is integrated with the invoicing tool, so that the port authority can issue a bill for port fees using data already in the system and so avoid re-entering data manually. In other cases, each port activity has its separate system.

Port IT-systems in major Baltic Sea Region ports are a fragmented and diverse area, with various functions or departments in the port often having developed their own systems in isolation.

The apparent incompatibility of the systems and concern about the amount of work involved in overcoming the problem can dampen ports' enthusiasm for developing integrated systems.

A major factor hampering progress is that system developers are seldom involved in handling the logistics process, while intensive users lack experience of system development. Users are unaware that the current software could be altered, and administrators do not know what kind of improvement is required. This issue can be easily resolved by increasing the dialogue between the two groups, but in a fragmented organisation users and developers may not know one other.

The most obvious benefits for inter-organisational data exchange in this industry are the avoidance of delay and mistyped information.

All the ports studied are at least developing their current systems to some degree, though many are waiting for SafeSeaNet to become obligatory; the process of combining systems between ports has thus not developed as fast as it could have. The EU directive which requires the use of Safe Sea Net (SSN) is not yet in force, but current forecasts expect SSN to be operational in early 2008, with full software implementation in 2011. Latest innovations take SSN into account, meaning that organisations can avoid major changes when implementation day arrives.

For comprehensive information on the IT systems in use for dangerous goods in the main Baltic ports, interested readers are referred to Annex IV, which contains an extract from Raitio J, (2007) Comparison of the ICT-systems of monitoring and surveillance of the movements of dangerous goods in the ports of Baltic Sea area countries, Masters Thesis, Turku School of Economics.

2.5 Organisation of the private sector

Logistics service providers need to have management systems in place to ensure that the risks arising from the transport of chemicals have been fully identified and are being properly controlled and managed.

The European organisations ECTA, EPCA and Cefic have compiled recommendations on safe management practices which address the

different elements of the management systems that chemical logistics service providers should have in place in order to ensure that the transport and associated handling of chemicals is unlikely to have adverse safety, health and environmental (SHE) impacts.

Implementation of these recommendations should result in a continuous improvement in the safety and environmental performance of the logistics service providers.

These recommendations apply to the transport of chemicals by the different modes of transport. They also apply to other distribution activities associated with the transport of chemicals carried out by logistics service providers, such as storage, loading and unloading, and to any subcontractors working for them on a contract basis.

Implementation of the current recommendations on SHE management practices will fulfil most of the requirements of the Safety and Quality Assessment Systems (SQAS) developed by Cefic[3].

Both the chemical industry and its partners in the transport industry have great concern for all aspects of safety. The chemical industry considers safe transportation of its products as an integral part of the responsible care initiative. Continuous efforts to improve road transport safety are therefore part of the overall aim to improve safety performance of both the chemical and transport industries.

Chemical federations and individual chemical companies have for years been involved in promoting projects with the transport companies, aimed at improving road transport safety. Over the past 15 years, transport companies working for the chemical/petrochemical industry have invested heavily in documented management systems and procedures, improved equipment and extensive training programmes, leading to a significant decrease in the number of road transport accidents. The introduction of the Cefic Safety and Quality Assessment System (SQAS) in 1995 further improved the safety performance of chemical transport operations.

However, this trend has halted in the past few years, with the annual accident statistics of individual companies and federations showing signs of stabilisation or even an increase in the number of road transport accidents.

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[3] For the complete recommendations please see the following reference: Recommendations on Safety, Health and Environmental Management Practices for Logistics Service Providers, ECTA, EPCA, Cefic, April 2002

Due to increases in transport volume and work pressure, and also because of general behavioural changes, the demands on drivers of heavy goods vehicles are now much more complex and pressing than in the past. In the short to medium term, substitution of road transport on a significant scale by other modes is not envisaged.

In order to provide a new stimulus for further reducing the number of road transport accidents during chemical transports, Cefic and ECTA took the initiative of promoting the wider implementation of the principles of behaviour-based safety (BBS) in the safe driving of road freight vehicles.

A number of individual transport companies have already developed management systems and training programmes with clear links to the philosophy of behaviour-based safety. In order to come to a more standardised and consistent approach across both industries towards BBS, a joint Cefic/ECTA working group, with representatives from chemical and transport companies, made a review of existing systems and programmes used by transport companies and training institutes in Europe. This resulted in the present guidelines, providing a framework based on the best practices established during this review.

These guidelines are intended to give a clear and concise outline of how to improve a company's road transport safety performance through BBS, while also demonstrating that safety and economic interests go hand in hand for all parties involved.

The BBS is described in chapter 3.2.1 Behaviour-based safety guidelines of this document.

2.6 Regulations for the private sector

The implications of the public regulatory framework for the private sector have not yet been explicitly described. This chapter deals with two issues which are indicative of the consequences of the regulatory framework and have a significant impact on the internal organisation of private companies –the Dangerous Goods Safety Advisor and the training of drivers of dangerous goods vehicles.

DGSA – Dangerous Goods Safety Adviser

Under EC Directive 96/35, all companies involved in the transport, distribution, loading and unloading of dangerous goods consigned by road, rail or inland waterway have been required since 31 December

Duties of a Dangerous Goods Safety Advisor (DGSA) in companies:

- monitoring compliance with the requirements governing the carriage of dangerous goods;
- advising his undertaking on the carriage of dangerous goods;
- preparing an annual report to the management of his undertaking or a local public authority, as appropriate, on the undertaking's activities in the carriage of dangerous goods. Such annual reports shall be preserved for five years and made available to the national authorities at their request.

  The adviser's duties also include monitoring the following practices and procedures relating to the relevant activities of the undertaking:
- the procedures for compliance with the requirements governing the identification of dangerous goods being transported;
- the undertaking's practice in taking account, when purchasing means of transport, of any special requirements in connection with the dangerous goods being transported;
- the procedures for checking the equipment used in connection with the carriage, loading or unloading of dangerous goods;
- the proper training of the undertaking's employees and the maintenance of records of such training;
- the implementation of proper emergency procedures in the event of any accident or incident that may affect safety during the carriage, loading or unloading of dangerous goods;
- investigating and, where appropriate, preparing reports on serious accidents, incidents or serious infringements recorded during the carriage, loading or unloading of dangerous goods;
- the implementation of appropriate measures to avoid the recurrence of accidents, incidents or serious infringements;
- the account taken of the legal prescriptions and special requirements associated with the carriage of dangerous goods in the choice and use of sub-contractors or third parties;
- verification that employees involved in the carriage, loading or unloading of dangerous goods have detailed operational procedures and instructions;
- the introduction of measures to increase awareness of the risks inherent in the carriage, loading and unloading of dangerous goods;
- the implementation of verification procedures to ensure the presence on board the means of transport of the documents and safety equipment which must accompany transport and the compliance of such documents and equipment with the regulations;
- the implementation of verification procedures to ensure compliance with the requirements governing loading and unloading;
- the existence of the security plan indicated in 1.10.3.2.

(Chapter 1.8.3 ADR 2007)

1999 to appoint a Dangerous Goods Safety Adviser (DGSA). The job of the DGSA is to advise companies on the requirements for the prevention of risks inherent in activities in relation to people, property and the environment. The directive requires DGSAs to pass an approved examination and be issued with a vocational training certificate before taking up their duties. There are no “grandfather rights” – every DGSA must pass the exam.

DGSAs may be on a company’s permanent staff or work independently as industry consultants for a number of smaller companies. Duties include advising the company on the type of packaging required, positioning of goods in the warehouse, ensuring that drivers have the correct training and ensuring that documentation, such as accident paperwork, is correct.

The DGSA is responsible for the legal and administrative aspects of health and safety measures governing dangerous goods haulage. If anything were to go wrong with a consignment, the DGSA would be the first point of contact, although any legal action resulting from an incident would be taken against the company.

Drivers of dangerous goods transports

The transport of dangerous goods is a highly specialised sector of the transport industry. In addition to a normal driving licence, drivers require a vocational training qualification to drive a vehicle transporting dangerous goods. Drivers must pass an examination to obtain the ADR certificate, which they must carry with them whenever they transport dangerous goods.

General requirements concerning the training of vehicle crews are defined in chapter 8.2.1. of the ADR:

General requirements concerning the training of drivers

8.2.1.1 Drivers of vehicles carrying dangerous goods shall hold a certificate issued by the competent authority or by any organization recognized by that authority stating that they have participated in a training course and passed an examination on the particular requirements that have to be met during carriage of dangerous goods.

8.2.1.2 Drivers of vehicles carrying dangerous goods shall attend a basic training course. Training shall be given in the form of a course approved by the competent authority. Its main objectives are to make drivers aware of hazards arising in the carriage of dangerous goods and to give them basic information indispensable for minimizing the likelihood of an incident taking place and, if it does, to enable them to take measures which may prove necessary for their own safety and that of the public and the environment, for limiting the effects of an incident. This training, which shall include individual practical exercises, shall act as the basis of training for all categories of drivers covering at least the subjects defined in 8.2.2.3.2.

8.2.1.3 Drivers of vehicles carrying dangerous goods in fixed tanks or demountable tanks with a capacity exceeding 1 cbm, drivers of battery-vehicles with a total capacity exceeding 1 cbm and drivers of vehicles carrying dangerous goods in tank-containers, portable tanks or MEGCs with an individual capacity exceeding 3 cbm on a transport unit, shall attend a specialization training course for carriage in tanks covering at least the subjects defined in 8.2.2.3.3.

8.2.1.4 Drivers of vehicles carrying substances or articles of Class 1 (see additional requirement S1 in Chapter 8.5) or certain radioactive material (see special provisions S11 and S12 in Chapter 8.5) shall attend specialization training courses covering at least the subjects defined in 8.2.2.3.4 or 8.2.2.3.5.

8.2.1.5 By means of appropriate endorsements on his certificate made every five years by the competent authority or by any organization recognized by that authority, a vehicle driver shall be able to show that he has in the year before the date of expiry of his certificate completed refresher training and has passed corresponding examination. The new period of validity shall begin with the date of expiry of the certificate.

8.2.1.6 Initial or refresher basic training courses and initial or refresher specialization training courses may be given in the form of comprehensive courses, conducted integrally, on the same occasion and by the same training organization.

8.2.1.7 Initial training courses, refresher courses, practical exercises, examinations and the role of competent authorities shall comply with the provisions of 8.2.2.

8.2.1.8 All training certificates conforming to the requirements of this section and issued in accordance with the model shown in 8.2.2.8.3 by the competent authority of a Contracting Party or by any organization recognized by that authority shall be accepted during their period of validity by the competent authorities of other Contracting Parties.

8.2.1.9 The certificate shall be prepared in the language or one of the languages of the country of the competent authority which issued the certificate or recognized the issuing organization and, if this language is not English, French or German, also in English, French or German, except where otherwise provided by agreements concluded between the countries concerned with the transport operation.

(ADR 2007)

2.7 Chapter 2 Conclusion

Parallel to the prosperous economic and technological development of the Baltic Sea Region, there is a relentless increase in the national and international transport of dangerous goods. The legislators have done their utmost to support safe and efficient dangerous goods transport, but the implementation of regulations, harmonisation of working procedures, communication and exchange of information between the competent authorities in this area need to be improved.

In addition to the legal framework and its implications for business, the private sector has developed voluntary commitments for its stakeholders to improve safety and reliability of dangerous goods transport.

Consequently it should be in the interest of the transport industry as a whole that working standards relating to dangerous goods transport be harmonised across all countries.

In the following chapter, instruments are presented to enhance the harmonisation of working procedures and implementation of legislation, communication and information exchange in the sector of dangerous goods transport. These instruments have been developed during the DaGoB project.

3 Tools

3.1 Public sector

The toolkit implemented by the DaGoB project is a set of practical measures or instruments for building competence and encouraging exchange of knowledge and views by stakeholders in the problem domain.

Given that the main issues about the transport of dangerous goods relate to human factors rather than a need for greater regulation, the key tools required are the means to achieve good communication, mutual understanding and trust.

Since the project set out into uncharted waters, it has only been able to scratch the surface. The main outcome is that a clear picture can now be drawn of necessary further steps towards improved safety through cooperation.

During the DaGoB project, several groups of issues concerning dangerous goods transport and the cooperation between public authorities in participating countries have been addressed in workshops which together form a toolkit. Workshop participants were typically representatives of the dangerous goods authorities that are partners in DaGoB, such as police, customs, coastguard, port authorities, maritime authorities, ministries and railway administrations.

The general logic of the tools in this kit is shown in figure 2: “Interrelations between the tools” and can be described as follows. As shown in the previous chapters, the regulations exist and the authorities in the individual states are in place and know their duties, but they lack knowledge about their counterparts and structures in partner countries. The solution is to establish a dangerous goods community in the area.

The first tool needed is a contact database which will be continuously expanded as the community is built up through the interaction of participants in the other tool activities. The community gradually builds up the trust necessary for further communication and the exchange of information. Once information about incidents and accidents is exchanged, the community has already taken the first step towards risk assessment, since such information is a necessary

prerequisite of risk management. But such sensitive information will only be disclosed to other partners in an atmosphere of trust.

Identification of major common problems stimulates the discussion of risk management and the development of coordinated and harmonised strategies for risk reduction. This too depends on all partners having the same knowledge of the regulations and agreeing on their interpretation. Consequently, training should be as harmonised as possible, as shown in the bottom left box in figure 2. Regular staff exchange has proved to be an excellent tool to harmonise interpretation of the regulations.

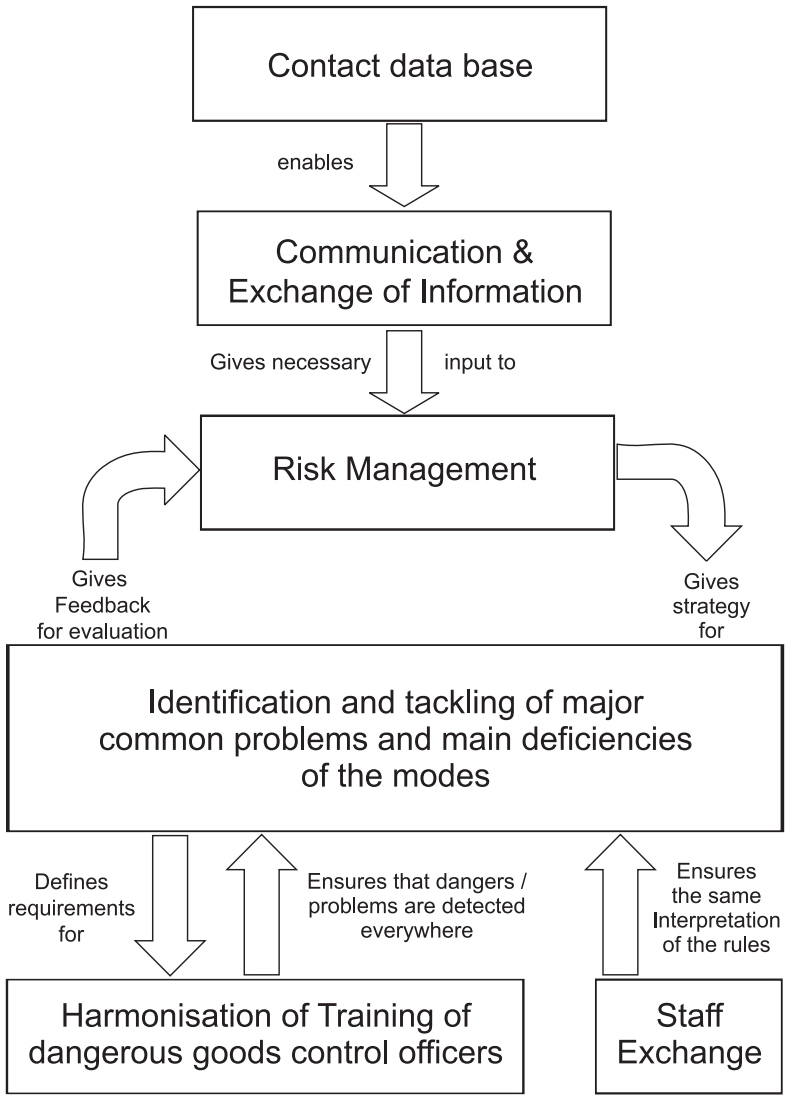


Figure 2: Interrelations between the tools (Prahm 2007)

The tools have been implemented in workshops whose methodology, topics and results are described in the following.

3.1.1 Contact database for community-building

A prerequisite for effective group work is that all members of the group get to know each other, a familiarity that is necessary if organisational boundaries are to be overcome (Müller-Rothmann et al., 2005). The aim is to create a network of informal contacts. In DaGoB this happened during the project meetings such as joint exercises in Sweden, Finland and Germany. Such an informal network helps individual members of the authorities concerned to gain knowledge of other countries' responsibilities and working methods in respect of dangerous goods transport. If they have a problem with an international dangerous goods shipment, they need to know whom to contact.

A good example of a result of the DaGoB community-building activities is the case of a container leakage on a container ship from Hamburg to St. Petersburg (DaGoB Newsletter No. 4, 2007). This case shows that the right contact at the right time can prevent damage to people, the environment and property.

Knowing the right contact is only the start. Community building means becoming familiar with the other organisations and also developing personal contacts to individuals. In the long run, the goal of community building is that separate organisations, although they have no formal relationship, act on selected issues as if they were one.

To achieve that goal it is necessary to build up trust between the individual members and in consequence between the organisations. The DaGoB tools constitute issues where joint actions of the DaGoB community are needed. An atmosphere of trust is essential for these joint actions, because it can be necessary to admit to shortcomings in one's own organisation or to criticise another. But if this can be done in a constructive atmosphere, it facilitates the coordination and harmonisation of work across such a large area as the Baltic Sea.

Online list of contacts

A recommendation for future development is to create a central online contact database of all DG transport-related organisations, public and private, around the Baltic Sea, listing responsibilities concerning

modes and countries. This would enable anyone with access permission for the system to find the right contact person.

The value of such a database to the dangerous goods community would be dependent on the accuracy of its entries. Since funds for data maintenance are unlikely to be available, users would be expected to keep their own entries up to date. This does not present a technical problem, as numerous examples of such contact databases on the Internet demonstrate. Provided that cooperation continues and deepens in the future, it should be possible to motivate users to keep their entries updated once they experience the benefits of efficient lines of communication.

Of course, such a system requires some maintenance. Since almost every organisation involved in dangerous goods transport has some sort of IT department, it is to be hoped that one of the participating organisations would be prepared to host and maintain the system. This will entail some costs, but simple design and the use of open source software should keep them to a minimum. If enough organisations support and benefit from the database, it should be possible to persuade them to share the necessary maintenance costs.

3.1.2 Communication and information exchange

Communication and exchange of information are tools that are prerequisites for cooperation.

What information is available?

Many different IT-systems are in use in the region for collecting information about DG transports. The main findings about these technical systems are set out in Annex IV.

Information that is typically collected can be categorised as follows:

Risk management information:

In the case of ships, for example, the risk has often been estimated before the ship reaches the next port – valuable information for that port in order to deal with the ship in the best way.

But information about segregation needs of the transported cargo is valuable, too, because it enables the port to find a suitable location for the substance in the port area before the ship arrives.

Some ports have special regulations for dangerous goods. The earlier the port receives the information about the arrival of dangerous

goods, the sooner the implications of the port regulations can be provided, potentially speeding up the handling of the DG cargo to the benefit of all concerned.

Advanced DG information:

Here the most important information is about when and in which vessel DG cargo will arrive, what volumes and classes of DG will come into the country at which point, not only by ship but also by rail and road, and which of the arriving cargo is due to be transhipped to another mode, e.g. from ship to rail.

This information enables the authorities and other stakeholders in the ports and at the borders to handle the cargo efficiently. It is also the information necessary for risk management

Contact information and product information, especially for emergencies:

Contact information refers to information about who is responsible for the cargo. This is quite clearly necessary and valuable information, mainly for the authorities, because they are not as closely involved in the information flow as the consignor, transport and warehousing companies and consignees of the DG transport. Even though a driver accompanies shipments by road, other parties may still need to be contacted, especially in the event of an accident or injury to the driver.

In the case of rail transport, the train driver cannot necessarily provide information about the cargo on the train. If more information about a consignment is needed than can be seen from the transport documents and the product labelling, other lines of communication will be essential.

Contact information of competent authority:

Especially in the case of trans-national DG transport, it is often helpful to know which is the competent authority in the country where a shipment originates or is bound, since one of the main obstacles to efficient communication among DG stakeholders, especially across national borders, is identifying the right person to talk to. It is usually clear what kind of responsibility the organisation must have, but it is often difficult to find out which organisation in the foreign country has this responsibility when it comes to DG transport. Customs can be responsible for maritime DG shipments in one country, while in another

it may be the coastguard (see also “Online list of contacts” in chapter 3.1.1 Contact database for community buildingOnline list of contacts).

Statistics:

Statistics again are important for DG risk assessment, especially in port areas, densely populated areas and heavily industrialised areas. On the basis of statistics, the flow of goods can be plotted and hot spots of DG transport or even certain dangerous substances can be identified.

Such statistical information is currently missing in many countries.

Surveillance information:

If one authority has checked a particular shipment, this information can be transferred to other authorities in the same and foreign countries. Information to be exchanged might be whether a deficiency was found, which countermeasures have been taken or which shipments have been checked (by transferring details of lorry licence plates or ships’ names or container numbers). Exchange of this information would avoid double checking. If double checks can be avoided, more checks can be conducted in total, which means more efficient use of the authorities’ available manpower.

Who has the information?

One source of information is the IT systems as described in Annex IV. Other information, e.g. surveillance information, will be available from the authority responsible for the surveillance.

Of course, information can only be exchanged if it is available to partners involved.

How can the information be exchanged?

There are different ways of exchanging information. Some of the aforementioned IT systems are accessible via the Internet, so it would be feasible to allow the partner authority limited online access to the database, for example to certain areas of the system or with “read only” permissions.

A further way method is telephone, fax and e-mail. This is the most likely method if surveillance information has to be exchanged or in specific cases.

Unfortunately there is currently no central IT system that would make this information accessible to all involved authorities. Although there are many IT systems in use in the BSR, they are mutually

incompatible and seldom support automatic exchange of information. Manual exchange is not considered suitable.

There is only one system that collects information about maritime DG transports centrally, SafeSeaNet (SSN) referred to in 2.4 above. It has as its legal basis EU Directive 2002/59 EG and is run by ZMGS, the Federal Republic of Germany's central reporting system for dangerous cargo at sea (Zentrales Meldsystem für Gefahrgut und Schiffsverkehre der Bundesrepublik Deutschland) based in Ilmenau, Thuringia.

SSN is a reference database where in future every ship carrying DG will have to be reported. On request by an authorised user, SSN retrieves more detailed information from the holder and transfers it to the requesting party.

There are several disadvantages to SSN:

Information may only be requested in the case of an incident and it is restricted to maritime transport. Since few countries currently provide data, geographical coverage is insufficient.

One solution would be bilateral agreements between countries' authorities, which would determine the type of information to be exchanged and the preferred means.

In both cases, SSN and bilateral agreements, one of the main obstacles to information exchange is data protection legislation. While in some countries, authorities' access to data is relatively easy, in others it is very restricted.

This report proposes that suitable methods of information exchange be investigated in future projects.

3.1.3 Identification and tackling of major common problems and main deficiencies of the modes

A survey carried out in WP 3 identified dangerous goods transport problems common to all involved authorities and a need to establish "best practices" to solve them.

In a workshop, participants presented deficiencies and problems they experienced and remedial measures they had taken. A synopsis of the presentations was merged with the results of a survey of available statistics on deficiencies in various European and non-European countries. The results are shown in the following table.

Despite the existence of DG regulations, the literature and the empirical data from the DaGoB workshop show that major deficiencies in their implementation remain.

Table 1: Major common problems and main deficiencies in DG transport (own calculations, IMO 2006)

Country / Problem	Belgium	Sweden	Lithuania	Latvia	Finland	Italy	Chile	USA	Canada	China	Republic of Korea
Labeling	X	X	X	X	X	X	X	X	X	X	X
Packaging				X		X	X	X	X		
Segregation of cargo	X					X	X		X		
Stowage/ Security	X	X			X	X	X		X	X	X
Wrong or missing documentation	X	X	X	X	X	X	X	X	X	X	X
Lack of security equipment					X						
Attitude		X			X						
Cooperation		X			X						

The most widespread deficiencies are as follows:

- Labelling (IMO 10 August 2006)
- Packaging (IMO 10 August 2006)
- Segregation of cargo (IMO 10 August 2006)
- Stowage/Security (IMO 10 August 2006)
- Wrong or missing information in the manifest (own calculations)
- Lack of security equipment (own calculations)
- Attitude (own calculations)
- Cooperation (own calculations)

Remedial action and strategies vary depending on the nature of the problem and the local situation. The following table gives an overview of empirical findings from the workshop.

Table 2: Strategies to reduce deficiencies in DG transport (own calculation)

Country	Lithuania	Latvia	Finland
Strategies	Information	Better Legislation	Training
	Sanctions	Improvement of IT system “Velkonis”	Increase of controls
	Training	More stringent sanctions	Collect information about routes and schedules of DG transport chains
		Training	Cooperation between competent authorities

3.1.4 Dangerous goods risk management

Risk management has been identified as a key issue in dangerous goods transport, but practitioners have only limited experience of structured risk analysis and management. In a seminar, several lectures on risk management methods were given, covering the following topics:

- Risk management in dangerous goods transport
- Risk and vulnerability analysis
- Global threats to maritime safety

The chief outcomes are that special training in risk management should become part of vocational education for involved personnel and that a dialogue about risk management should be established between DaGoB partners.

Analytical risk management is not widely practiced. Therefore the following overview of the main issues in dangerous goods risk management is given to illustrate the scope that should be covered by vocational training and dialogue.

As mentioned above, risk management systems are gradual processes with the interrelated but distinct phases of *risk assessment* (analysis and evaluation) and *risk management*. Each phase consists of a number of stages, steps and sub-steps that, in principle, are sequential. However, in many situations, this may not necessarily be so.

Figure 3 shows the generic constituent components of the risk management system as a wheel, representing a dynamic model. The overall risk management process has a hierarchical structure consisting of different levels, in which the highest levels are broken down further into stages, steps and sub-steps. The processes are interactive, with changes, re-evaluations and refinements often taking place. Although shown in a sequential and seamless order – i.e. risk analysis, risk evaluation and risk management – some stages and steps may be carried out and accomplished simultaneously. Skipping processes and returning to them later is also possible. A variety of factors may influence this, including the availability and accessibility of additional and/or new risk-related data and information, the breadth and depth of the analysis, results of the study, re-evaluations and redefinitions, and decision-making alternatives.

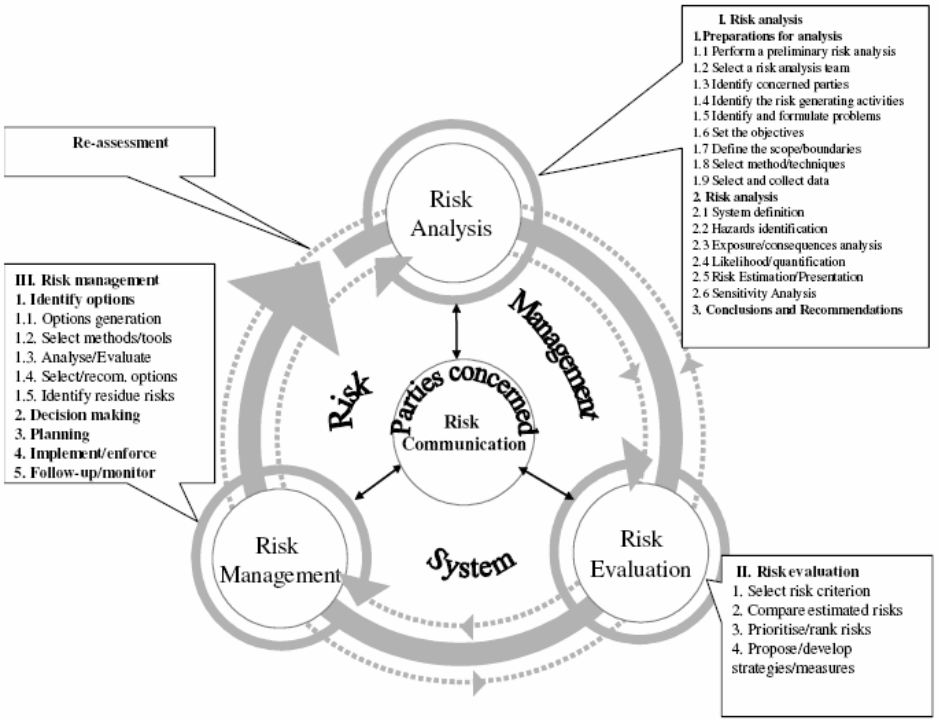


Figure 3: Main phases, stages and steps of risk management (Mullai 2006)

In many situations, it may be unnecessary to go through all the phases and stages shown in the model. The process may also be suspended at any point; for example, if risks are found to be at a low or

negligible level, more detailed risk analysis may be deemed unnecessary and cost inefficient.

For further in-depth information, the reader is referred to Annex III "Dangerous Goods Risk Management" by Mullai (2006) DaGoB publication series: Risk Management System – Risk Assessment Framework and Techniques.

The full report can be downloaded from the DaGoB Website: http://www.tukkk.fi/dagob/documents/DaGoB_2.pdf

3.1.5 Harmonisation of training

The aim of the tool "Harmonisation of training of dangerous goods control officers" was to develop a better and harmonised training system not only for dangerous goods control officers but also for all those who handle dangerous goods in transport chains.

A workshop was organised in Riga in February 2007, where experts from Finland, Germany, Sweden, Latvia, Estonia and Lithuania demonstrated and discussed their specific training systems. Systems differ somewhat from country to country and from transport mode to mode, but common requirements and components of such systems could be agreed. The following is a synopsis of the workshop results.

Authorisation of the training system

- The curriculum and requirements should be approved by a competent authority, e.g. the ministry of transport, ministry of the interior or the ministry of education. To ensure a well harmonised commonly high standard of education, the different authorities and schools from all countries should share their experience.

Skill of instructors

- Instructors should have relevant practical experience (either past or present) as a dangerous goods control officer or representative.
- Instructors should have appropriate and applicable pedagogical skills.

Learning targets

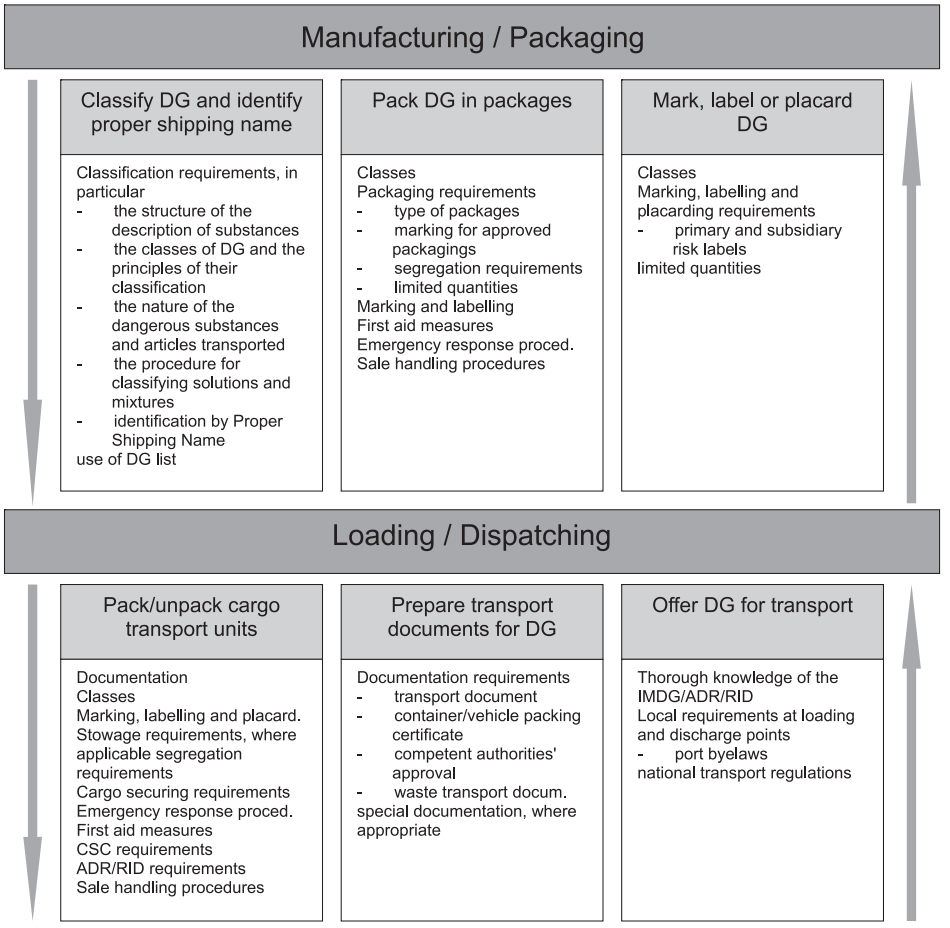
- Dangerous goods control officers and others handling dangerous goods need to be able and qualified to identify applicable and appropriate regulations and apply them correctly in practice.

- Those handling dangerous goods must know how to act safely and how to avoid unnecessary risks.

Contents of the training

The legal background to dangerous goods training is the IMDG code chapter 1.3 and ADR/RID chapters 1.3 and 8.2. They give a good overview of training contents for different functions in dangerous goods transportation chains.

In the following graphic, the horizontal bars indicate the stage in the transport chain in which the activities listed below it are performed. These activities serve also to define the training requirements of those performing them.



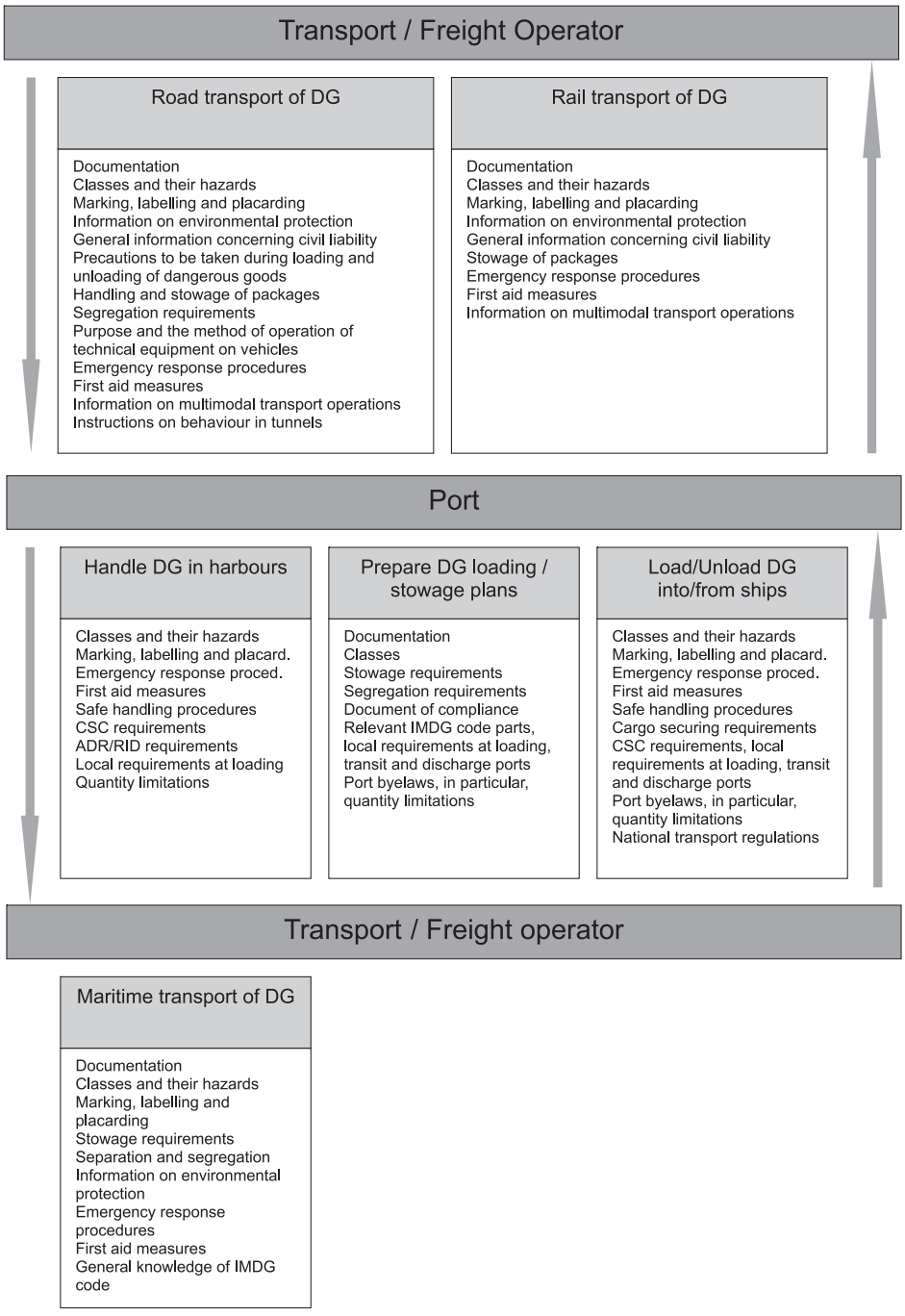


Figure 4: Content for training of DG handling and checking (Benecke 2007)

The training system of dangerous goods control officers is shown below:

Basic course in transport mode training

Prior practical experience of the transport mode is obligatory for dangerous goods control officers.

- It is of prime importance that officers pass basic courses and gain practical experience of their transport modes (e.g. lorries, trains and ships) before they participate in dangerous goods courses, because prior knowledge of the basics of the transport systems is essential.
- The intensity of this basic transport mode training depends on the work of the control officers (for example, traffic police officers usually need to know more about lorries than do customs officers).

Basic course for DG control officers

Dangerous goods control officers must be familiar with all relevant regulations, laws, orders, decrees and interpretations. The most important aspect is to maintain a broad educational profile and not to be biased towards any particular subject or discipline.

- The basic course in dangerous goods education should take 10 days.

In addition to theoretical education, practical exercises are very important. Theory is learned in the classroom and put to the test during practical exercises and field training.

- The time allocated for these exercises should be approx. 25% of the basic course.

Supervision

- After training, new inspectors should be under the supervision of experienced inspectors for approx. six months.

Refresher courses

- Every year, or at least every two years, officers should participate in five-day refresher courses in which new aspects of legislation and exercises are presented.

Timetable

Annex I contains a timetable of basic and refresher courses for road control officers of the Finnish Police, presented in Riga by Erkki Vikman from the National Traffic Police of Finland. The timings in this schedule can be used as a guideline for the organisation of dangerous goods courses for officers working in road control and other modes.

3.1.6 Staff exchange

Staff exchanges between authorities of different nationalities is a most efficient tool for giving authorities the opportunity to get to know each other across national borders. It enables the exchange of experience and best practice and is an element of international community building.

In DaGoB, it was shown that international staff exchange leads to a degree of cooperation which it is almost impossible to achieve by other means.

Detailed insight creates that trust between involved authorities across national borders which is necessary for broader international cooperation. The personal contact that is created by the staff exchange is the vehicle for effective trans-national cooperation.

Staff exchanges usually take place between authorities responsible for the same mode of transport, because this provides the greatest common ground for the discussion of procedures and problems.

In the light of intermodal transport, it can be helpful to learn how dangerous goods are transported by other modes, since regulations often differ. For example, if a substance that can be a marine pollutant is being shipped by sea, the container will be labelled accordingly. Once on land, the substance may not have to be declared as a pollutant, but the container will still be labelled as such. A road police officer will have to be familiar with the IMDG code to know about this difference.

The benefits of a staff exchange between authorities dealing with different modes need to be assessed by those responsible.

Why is staff exchange important and what motivates organisations to participate?

Trust and a good knowledge of the way other stakeholders work are necessary to identify the weak points in each authority. By comparing the ways of working, differences can be discussed and possibilities for

improvement can be sought or, ideally, adopted directly from the partner authority.

3.1.6.1 Guidelines for the organisation of staff exchanges

- One or two officers visit the partner organisation and participate in daily work:
    - accompany in field work, checking vehicles
    - desk work at the office
    - technical equipment in real-use environment
- Duration: One week
- Workshop on first day of the stay (duration: 4 hrs):
    - presentation of each organisation and principle routines regarding dangerous goods transport
    - definition of goals for the staff exchange:
        - host organisation presents detailed timetable for the forthcoming week – should include all issues thought to be necessary and not exclude special missions, e.g. controls at night or sea patrols (if appropriate)
        - special issues
        - guests' personal interests
        - specific needs, etc.
    - comparison of check lists and other instruments
- Workshop on last day of stay:
    - comparison of differences and similarities
    - discussion or/and summing up of possibilities identified or requirements for harmonising routines

Who should organise?

Ideally the staff exchange should be organised by those who are not divorced from the practical daily work of the organisation, but who have sufficient authority to implement changes identified during the staff exchange as having the potential to deliver improvements.

They also should have the power to allocate control officers to the project.

Who should participate?

Participants should be the organisers described above but also their subordinates, since they will benefit in their daily work from background knowledge of how their colleagues in the partner country work and be encouraged to communicate with them. Communication will be more likely if they have met each other personally. An obvious requirement is for participants to speak a common language sufficiently well. Often this will be English, but it could be the language of one of the organisations.

What issues should be covered?

There is no rule as to which issues have to be considered, but there are two ways of identifying the right ones. One way is simply to let the guests “look over the host’s shoulder” when working. After each action, a short feedback round should get an assessment from both sides. This already triggers lively discussions on how issues are handled in each country and what the similarities and differences are.

The general approach should be that standard routines are demonstrated from beginning to end. It is important to make staff exchange a routine, because only by repetition can the staff exchange become efficient.

Participants often have issues from their daily work that they would like to discuss with their colleagues from the other country. This should be taken as a guideline.

3.2 Private sector

The tools of the private sector to facilitate safe and reliable dangerous goods transport have not been the subject of practical activities in the DaGoB project, but an overview of the literature on this topic is given here. The chemical and petrochemical industry in particular, represented by their associations, have a vested interest in safe transport of dangerous goods. The tools described here are indicative, and in further activities, the tools of the private sector should be included.

3.2.1 Behaviour-based safety guidelines

Behaviour-based safety (BBS) is a programme that aims to increase safety during road freight transport by positively influencing the behaviour of drivers through observation, coaching and communication.

The present guidelines are a practical illustration of the general Guidelines for Safety Awareness and Behaviour in the Supply Chain, issued by Cefic/ ECTA / EPCA in April 2002.

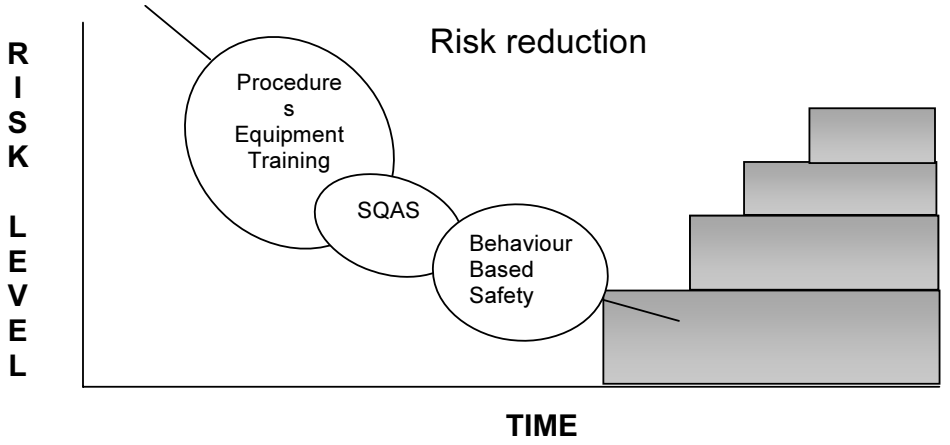


Figure 5: Importance of behaviour-based safety (ECTA, EPCA, Cefic, October 2003)

The BBS programme targets all European chemical transport companies. It is not intended to be a one-off exercise, but it should rather become a continuous effort by every individual transport company. It is expected that this programme will not only improve safety performance but will also have a positive effect on fuel consumption and other related costs such as maintenance costs and insurance premiums. Ultimately it will improve the total cost-effectiveness of the transport companies.

The results of a pilot project at a Dutch transport company showed a decrease in fuel consumption of 4 to 8 %, a decrease in accidents of more than 40% and a total net saving of 1000 Euro per driver per year.

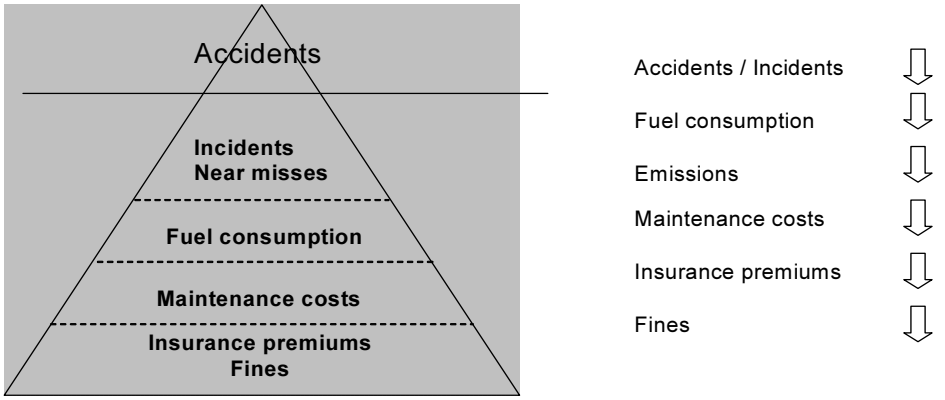


Figure 6: Benefits of BBS / iceberg principle process (ECTA, EPCA, Cefic, October 2003)

The process for implementing BBS should reside in the carrier's organisation as an important element of the continuous improvement programme. It should include the following steps:

1. The company management develops a BBS implementation plan and training programme based on the principles described in the present guidelines.
2. BBS trainers are recruited (internally or externally, e.g. from a training institute) and obtain training in accordance with the principles set out by the present guidelines.
3. BBS trainers provide individual training to drivers.
4. BBS trainers produce an assessment report for each trained driver, which is kept on file and/or may be incorporated into a database.
5. The drivers receive a copy of their assessment report and may consult the filing system for their individual records (as required by law in some countries).
6. The company keeps records of performance indicators such as incident/accident statistics, fuel consumption, maintenance costs, insurance premiums and fines.
7. Analysis of the results of the BBS programme by the management will provide a useful tool in deciding on further steps toward continuous improvement.
8. Checking of implementation of BBS during the tri-annual SQAS assessment of the carrier.

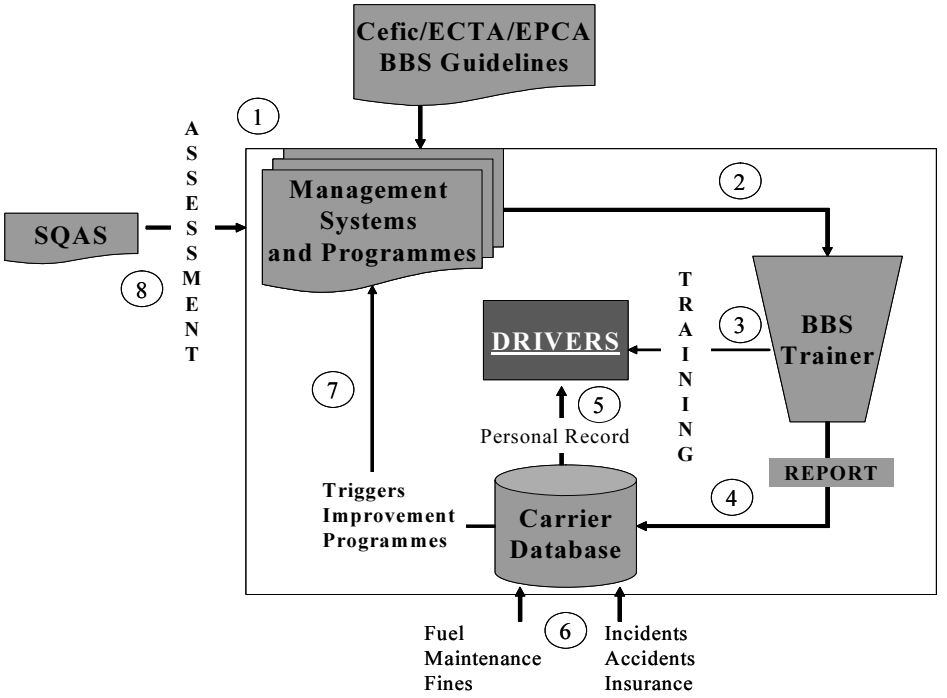


Figure 7: The implementation of BBS (ECTA, EPCA, Cefic, October 2003)

Successful implementation of behaviour-based safety requires a top-down management approach. The company's policy must not only reflect the importance of BBS but also the commitment of the management.

BBS must be fully integrated in the carrier's organisation and management systems. It needs to become an integral part of the company's culture and be one of the key drivers for continuous performance improvement through the implementation of following key performance indicators:

- Accident/incident statistics
- Fuel consumption
- Maintenance costs
- Emissions
- Insurance premiums
- Fines

3.2.1.1 Responsibilities

Management should:

- Prepare a document describing the company's planned approach towards BBS including all components.
- Communicate this plan to all personnel involved and review it at least annually.
- Develop a BBS training programme.
- Initiate, implement and provide ongoing support for the BBS programme.
- Define roles, deliver resources, resolve issues and remove barriers to successful implementation.
- Set targets, monitor status and results.
- Keep records of performance indicators.
- Manage the improvement process based on BBS data analysis.

Dispatchers/planners should:

- Understand and support the BBS programme.
- Avoid planning and instructions that conflict with the BBS principles (e.g. unrealistic delivery times).

Trainers should:

- Execute the BBS training.
- Observe and interactively communicate the findings with the driver.
- Collect data and report results to management.
- Identify and report any issues that need to be followed up by driver or management (confidentiality of private information to be guaranteed).

Drivers should:

- Understand the purpose of the BBS programme and be committed to participating.
- Discuss performance weaknesses with the trainer and help in finding solutions.
- Implement preventative changes as a result of the BBS analysis.

3.2.1.2 Record keeping

Driver records, along with the individual training observations and checklists, should be collated by the carrier into an efficient storage and retrieval system (database and/or filing system). Drivers should have the possibility of obtaining a copy of their personal record as a reminder/learning tool for continuous improvement.

Other key performance indicators such as incident/accident statistics, fuel consumption, maintenance costs, insurance premiums and fines should be identified, monitored and recorded to demonstrate and follow up the results of the programme.

The management should use the collected data to identify structural trends and issues. Results of analyses should trigger corrective actions to processes, safety programmes and employees. The effect of implemented corrective actions should be monitored through the key performance indicators.

3.3 Issues for further research

By no means all issues were covered during the DaGoB project. Many still need addressing and can form further tools or instruments for improving the safety of dangerous goods transport. Some suggestions for research and anticipated benefits are given below.

3.3.1 Development of multilateral and bilateral agreements

Chapter 1.5 of ADR and RID allows contracting parties to agree temporary derogations from ADR/RID. Because this places a heavy responsibility on the competent authorities involved, future research could established ways of helping them negotiate such derogations.

3.3.2 Harmonisation of supervision and enforcement practices

A next step in the ongoing process of harmonising supervision and enforcement practices could be the comparison and subsequent harmonisation of the catalogues of violations.

3.3.3 Incident reporting

Chapter 1.8.5 of ADR/RID sets out precise regulations on when and how incidents are to reported. Although much is regulated in this chapter, there is still a lot of room for individual interpretation and practice by the authorities concerned. This clearly qualifies as an issue for workshops whose aim could be to harmonise the interpretation of the regulation and thus establish a common practice for handling incident reporting.

3.3.4 Harmonisation of additional regulations

In accordance with Article 4, paragraph 1 of ADR, the entry of dangerous goods into the territory of the contracting parties may be subject to regulations or prohibitions imposed for reasons other than safety during carriage. Furthermore, a contracting party may apply to vehicles engaged in the international carriage of dangerous goods by road on its territory certain additional provisions not included in the ADR, provided that these do not conflict with Article 2, paragraph 2 of the agreement, and are contained in its domestic legislation applying equally to vehicles engaged in the domestic carriage of dangerous goods by road on the territory of that contracting party.

Additional provisions are as follows:

- (a) Additional safety requirements or restrictions concerning vehicles using certain structures such as bridges, vehicles using combined transport modes such as ferries or trains, or vehicles entering or leaving ports or other transport terminals;
- (b) Requirements for vehicles to follow prescribed routes to avoid commercial or residential areas, environmentally sensitive areas, industrial zones containing hazardous installations or roads presenting severe physical hazards;
- (c) Emergency requirements regarding routing or parking of vehicles carrying dangerous goods resulting from extreme weather conditions, earthquake, accident, industrial action, civil disorder or military hostilities;
- (d) Restrictions on movement of dangerous goods traffic on certain days of the week or year.

Future research should be conducted on the implications of this regulation for international dangerous goods transport. During the DaGoB project it was repeatedly recognised that there were additional regulations in the different countries dealing with the same issue, such as load securing, but stating different things. For example, the number of required security straps for the load on a lorry can differ from one country to another. These differences increase the complexity of DG shipments and to a certain degree jeopardise the harmonised environment created by ADR/RID. The goal should be to harmonise additional regulations as far as possible. This would make it easier for the involved parties, especially drivers, to obey the rules. Transport would become safer and fewer violations would need to be reported.

3.4 Chapter 3 Conclusion

The main result of the workshops and activities is improved international cooperation between the project partners which can now be rated as very good. Discussions of different aspects of dangerous goods transport and an intensive sharing of experience have increased the knowledge of responsibilities and working standards among all participants.

In a number of regulations, legislation allows scope for discretion. The relevant authorities should coordinate how they exercise this discretion. A key to harmonisation of the implementation of legislation proved to be the harmonisation of training. There are currently considerable differences within the Baltic Sea Region.

Furthermore, it was recognised that risk management was a very important issue in dangerous goods transport but that knowledge of it could be significantly improved.

Staff exchange, and the resultant improved cooperation between control officers in daily practical work, has developed into a most efficient instrument. In combination with the other instruments developed, this has resulted in a good knowledge of respective organisational structures.

The private sector has developed good instruments for its own sphere of responsibility by which it continues to improve the safety of dangerous goods transport.

In the following chapter, recommendations are made as to how the instruments illustrated above can be developed further.

4 Recommendations for practical activities and policies

4.1 Continuation and expansion of cooperation

Based on the benefits from the DaGoB project, it is strongly recommended that the structured cooperation between the authorities currently participating be continued and that the group be extended both in its breadth, to include the remaining Baltic countries of Poland, Denmark and Norway, and its depth, by involving the railway authorities from each country.

The main goal should be to institutionalise cooperation in regular workshops so that the authorities integrate this work in their normal working routines and, very importantly, reserve the necessary financial resources and manpower.

4.2 Further development of IT systems

Greater harmonisation and integration of BSR countries' IT systems will be necessary in future, since they are currently very fragmented

But not only discussions between the ports across the borders need to be improved, system users and system developers need to be integrated as well

In future, joint workshops between users and developers in the different ports 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 (Raitio, 2007).

4.3 Regular round tables to solve major common problems

Practitioners from the participating authorities should institutionalise the debate about major common problems and ways to reduce them. Such a step is likely to result in three benefits:

- A regular working group can become an effective tool for knowledge transfer between countries and institutions.
- Not only would knowledge be transferred. By regular discussion, new knowledge in the form of new strategies or new instruments would be created.
- Harmonisation of the interpretation of regulations at practitioner level should result from the exchange of experience between international colleagues.

4.4 Future research on risk management

Joint approach to risk assessment

For the future work of the dangerous goods community in the field of risk management it is suggested that a joint approach to risk assessment be made the basis for

- classification of new substances
- proposing new regulations (cf. the FSA requirements of the IMO)
- proposing multilateral agreements about derogations from the regulations
- routing of dangerous goods

Joint activities in this field would help to ease the process, because consensus is achieved much quickly in a cooperative working atmosphere. Faster implementation of new regulations is to the advantage of all stakeholders: companies, authorities and the general public.

Harmonised laboratory procedures

Future workshops could develop joint laboratory procedures and best practice for the

- classification of dangerous goods and
- testing of packaging and other equipment

thereby integrating the expertise in these fields that already exists in the Baltic Sea Region.

Information and awareness work

As an important element of risk management, work could be intensified between partner countries to increase awareness of the issues within the transport community. Workshops could begin with an exchange of strategies demonstrating “state of the art” in the countries concerned, progressing to the development of a joint strategy.

4.5 Harmonisation of the training system

If a high standard of education for all those handling dangerous goods is to be achieved in all countries, experience must be shared between the different parties. Strong cooperation between the relevant authorities is essential to this goal. It is recommended that the momentum of the exchange of experience created by DaGoB be maintained by putting the harmonisation of training on a regular footing, for example by agreeing on a regular annual meeting. It is important to harmonise the different systems to reach a common high standard of control activities. Experience, information and suggestions from the different parties should be pooled to establish one training system for implementation throughout the region.

4.6 Staff exchange

It is recommended that the exchange of staff be made a policy in every institution. Staff exchange should take place on a regular basis, e.g. two officers each year. Earlier chapters have made clear that staff exchanges bring benefits, making them not an additional burden on the organisation but a good investment which pays a return in higher effectiveness and efficiency of. On this evidence, providing the necessary resources for staff exchange should not present a problem.

5 DaGoB toolkit conclusion

The aim of the DaGoB project is to increase the safety level of dangerous goods transports in the Baltic Sea Region by enhancing the cooperation between competent authorities. In this context, Work Package 3 has the task of finding ways of overcoming the problems in this sector, based on a synthesis of recommendations from Work Packages 1 and 2.

It can be noted that the legislation in this area is well developed and covers all relevant issues adequately. Regulations are drawn up largely at international level and harmonisation of the legislation can therefore be considered successful. However, differences exist in implementation and enforcement by the authorities 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 was thought to be attainable during the project.

This report contains a set of instruments to overcome several problems identified within the project and which support the harmonised application of legislation and a similar standard of working in all participating countries.

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

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7 ANNEXES

7.1 Annex I: Basic ADR course of Finnish police

The basic course of the ADR-rules for the traffic enforcers / POLICE ACADEMY / Week I

Period	MON	TUE	WED	THU	FRI
8.15 9.00		ADR-LAW AND ADR-ORDINANCE	THE FREELIMIT / HOW TO COUNT IT AND USE IN THE	EXEMPTIONS / COLUMN 6	CASE-EXERCISES
9.15 10.00		ADR-LAW AND ADR-ORDINANCE	ENFORCEMENT + EXERCICES	SPECIAL ORDERS FOR THE TRANSPORT COLUMNS 16 – 19	CASE-EXERCISES
10.15 11.00	OPENING WORDS AND ARRANGEMENTS FOR THE COURSE	ADR-LICENCE + ORDINANCE	OTHER DOCUMENTS	SPECIAL ORDERS FOR THE TRANSPORT COLUMNS 16 – 19	ADR – ACCIDENTS (EXAMPLES)
11.15 12.00	THE SCOPE OF ADR APPLICATION	APPENDIXES A; B AND C	LOADING / TRANSPORTING / SECURING OF CARGO	SPECIAL ORDERS FOR THE TRANSPORT COLUMNS 16 – 19	ADR-ACCIDENTS (EXAMPLES)
12.00 12.45	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
12.45 13.30	ADR-LAW AND ADR-ORDINANCE	THE BOOK IN THE ENFORCEMENT / EXERCICES	LOADING / TRANSPORTING / SECURING OF CARGO	THE TANK-TRANSPORTS	POLICE IN THE SCENE OF THE ACCIDENT
13.45 14.30	ADR-LAW AND ADR-ORDINANCE	THE BOOK IN THE ENFORCEMENT / EXERCICES	ESSENTIAL REQUIREMENTS	THE TANK-TRANSPORTS	THE DOCUMENTS / ADR ACCIDENTS
14.45 15.30	ADR-LAW AND ADR-ORDINANCE	TRANSPORT DOCUMENTS / WAYBILL	ESSENTIAL REQUIREMENTS	THE MARKINGS OF A TRANSPORT UNIT	
15.45 16.30	ADR-LAW AND ADR-ORDINANCE	SECURITY INSTRUCTIONS	EXEMPTIONS	THE MARKINGS OF A TRANSPORT UNIT	

Vikman, 2007

The basic course of the ADR-rules for the traffic enforcers / POLICE ACADEMY / WEEK II

Period	MON	TUE	WED	THU	FRI
8.15 9.00		ADR-CONTROL CASE-EXERCISES	VEHICLE CHECK: MIXED CARGO	EXAMINATION	RESPONSIBILTY CASE EXERCISES
9.15 10.00		ADR-CONTROL CASE-EXERCISES	TANKS; CASE-EXERCISES	EXAMINATION	RESPONSIBILTY CASE EXERCISES
10.15 11.00	THE PENALTY REGULATION	ADR-CONTROL CASE-EXERCISES	VEHICLE CHECK: MIXED CARGO	CLASSIFICATION AND THE CHARACTER OF THE SUBSTANCES	RESPONSIBILTY CASE EXERCISES
11.15 12.00	THE PENALTY REGULATION	ADR-CONTROL CASE-EXERCISES	TANKS; CASE-EXERCISES	PACKING ORDERS	RESPONSIBILTY CASE EXERCISES
12.00 12.45	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
12.45 13.30	CHECKLIST / -FORM (FULLFILLING)	ADR-CONTROL CASE-EXERCISES	VEHICLE CHECK: MIXED CARGO	WASTE TRANSPORTS	FEEDBACK
13.45 14.30	CHECKLIST / -FORM (FULLFILLING)	ADR-CONTROL CASE-EXERCISES	TANKS; CASE-EXERCISES	WASTE TRANSPORTS	CLOSING THE COURSE
14.45 15.30	SECURITY TECHNIC CENTRAL (TUKES)	ADR-CONTROL CASE-EXERCISES	CASE EXERCISES CONTINUES	EXERCISES OF THE DISTINGUISHER	
15.45 16.30	SECURITY TECHNIC CENTRAL (TUKES)	THE FEEDBACK FROM THE EXERCISES	FEEDBACK OF THE EXERCICES	CHEMICAL FIRST AID	

Vikman, 2007

Updating days of the ADR-rules for the traffic enforcers

Period	MON	TUE	WED	THU	FRI
8.15 9.00		ADR-LAW AND ORDINANCE	INSPECTION FORM	LOADING COMMON ORDERS	CASE-EXERCISES
9.15 10.00		RESPONSIBILITY CASE-EXERCISES	SUBSTANCE CLASSIFICATION	LOADING + CARGO SECURING	CASE-EXERCISES
10.15 11.00	OPENING WORDS AND ARRANGEMENTS FOR THE DAY	RESPONSIBILITY CASE-EXERCISES	HOW TO USE THE BOOK IN THE ENFORCEMENT	SPECIAL ORDERS COLUMN 16 – 19	CASE-EXERCISES
11.15 12.00	THE SCOPE OF ADR APPLICATION	SPECIFICATIONS	HOW TO USE THE BOOK IN THE ENFORCEMENT	EQUIPMENT CLAIMS	CASE-EXERCISES
12.00 12.45	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
12.45 13.30	ADR-LAW AND ORDINANCE	DOCUMENTS: WAYBILL	THE EXEMPTIONS AND THE FREE LIMIT	MARKINGS	FEEDBACK + CLOSING THE DAYS
13.45 14.30	ADR-LAW AND ORDINANCE	SAFETY CARD ADR-LICENCE	THE EXEMPTIONS AND THE FREE LIMIT	TO PERFORM THE ENFORCEMENT	
14.45 15.30	ADR-LAW AND ORDINANCE	APPROVAL CERTIFICATE OTHER DOCUMENTS	THE EXEMPTIONS AND THE FREE LIMIT	TACTICS FOR THE ENFORCEMENT	
15.45 16.30	ADR-LAW AND ORDINANCE	ACTIONS AGAINST THE TERRORISM	EXERCISES FOR THE FREE LIMIT CALCULATION	ADR-ACCIDENTS	

Vikman, 2007

7.2 Annex II: Draft agreement on information exchange on dangerous goods transport

Draft Agreement on Information Exchange on Dangerous Goods Transport

The following agreement shall be made between

Partner A and Partner B

for the exchange of information regarding the transport of dangerous goods by sea / rail / road.

§1 Subject of the agreement

The subject of the agreement is the exchange of information regarding the transport of dangerous goods by (sea / rail /road, select the applicable mode)

§2 Duration of the agreement

The agreement shall enter force after signature of both parties. The agreement shall be in power until it is cancelled by one partner with four weeks notice.

§ 3 Obligations

Both Partners provide each other with the following information on a regular basis (i.e. daily or on request): (Select the agreed information)

1. Risk management information

- Ship: Risk estimation
- Segregation information to find and prepare a good location for the substance for storage in the port area
- Special port regulations for DG

2. Advanced DG information:

- Timetables / Schedules
  - when and in which vessel is the dg cargo coming
- Before hand information of dg – Sea transports arriving in ports – that can concern the railway (wagons, containers, tank containers)
- Which volumes and classes of DG will come into the country at which point?
- Information on DG -> Railway system?
- Railway: Detailed DG information
- Railway: Early information before arriving
- Lorries: Detailed DG information
- Rail / Road:
  - Detailed DG information for authorities
  - Authorised request for others
- Cargo information:
  - Substance
  - Class
  - UN-number
- Quantity of DG per class

5. Contact information:

a. for emergency on 24 h basis

- Name of responsible person
- Telephone number
- Ship: Captain
- Who is it for lorries?
- Who is it for railways?

b. For normal procedures on 24 h basis

- DG information 24 h before arrival to / departure from a port

6. Product information:

- Guidance for accident situations for all parties working around the accident

- Behaviour for spilled chemical

7. Contact information of competent authority:

- Who is the responsible person in the other country?
- Detailed information of DG in emergency and contact address or authorise request

8. Emergency information:

- ISPS – Class
- Quantity of DG
- Position of DG
- Stowage plan reference (three dimensional)
- Number of crew on board
- Number of passengers on board

9. Statistics:

- Flow of volumes of DG: Routes and tonnes
- Amount of DG
- Statistical information of DG – flows to and from ports and terminals for planning of inspections

10. Surveillance information:

- Deficiencies found?
- Checks performed?
    - What measures were taken?
- Which containers / ships / lorries/ wagons have been controlled in the other country?

11. Vessel / Train / Lorry information:

- Ship’s name
- ETA (Estimated Time of Arrival)
- Ship identification number
- Routing info:
    - Last port
    - Next port
- Container identification number

- DG cargo information

12. (Facilitating) information:

- Waste on board
- Number of crew on board / late changes of crew
- Number of passengers on board
- Sender / Consignor

Both partners are allowed to use the information only for their organisations internal use. No partner is allowed to disclose the information to persons outside its organisation.

§ 4 Liability

The information is given according to best knowledge but no liability arises from incorrect information or incorrectly transferred information.

§ 5 Costs

Both partners bear their own costs.

§ 6 Working languages

The working language shall be

Partner A	Partner B
_____	_____
Date and Signature Name in print letters	Date and Signature Name in print letters

Prahm, 2007

7.3 Annex III: Dangerous goods risk management

7.3.1 Phase 1: Risk analysis

Risk analysis is the process in which risks are examined in various degrees of detail – qualifying and quantifying – to determine the extent of risks, how risk components are related to each other, and which ones are the most important to deal with. This may not necessarily involve any consideration of the significance of risks (DNV 1996). The main stages of risk analysis are: 1) *preparations for analysis*, 2) *risk analysis process* and 3) *conclusions and recommendations*.

Stage 1: Preparations for the risk analysis

Preparations for risk analysis consist of the following key steps:

- Background:
- Perform a preliminary or screening risk analysis:
- Determine who should conduct risk analysis:
- Identify interested parties:
- Identify risk generating activities:
- Identify and formulate problems:
- Set the objective(s) of risk analysis:
- Define boundaries:
- Select appropriate methods and techniques:
- Collect relevant risk-related data and information:

Stage 2: Risk analysis

Risks analysis varies from simple to very complex and detailed. A preliminary analysis may be conducted prior to detailed risk analysis. The stage of risk analysis consists of the following key steps and sub-steps:

Step 1: System definition

- Maritime transport system: define and describe the system and related activities whose risks are to be analysed and managed – the maritime transport system and related activities of PDG.
- *Regulatory system*: review and evaluate the current state-of-the-art regulatory system governing the maritime transport system of PDG.

Based on risk-related data and information and risk analysis techniques, analyse risk attributes including:

Step 2: Hazards identification

- *Define top events*, including the wide rage of breaches and failures of packages.
- *Explore transport/distribution hazards*, including their cause and contributing factors and sequences of events that have or can lead to loss of containment and/or involvement of dangerous goods.

Step 3: Exposure and consequences analysis

- *Dangerous goods and their hazards*: Explore the list/inventory of PDG and their hazards that have or are likely to cause consequences to the risks receptors.
- *Dangerous goods release-dispersion-concentration*: Explore sequences of events following the release, dispersion, concentration and/or involvement of dangerous goods that can lead to consequences for the risk receptors.
- *Risk receptors exposure*: Explore categories of risk receptors and estimate the size of the risk receptors exposed to dangerous goods hazards.
- *Consequences analysis*: Explore the nature of actual consequences of dangerous goods hazards for the risk receptors.

Step 4: Likelihood estimation – quantification

Quantify the risk and system elements, including:

- *Quantify risk elements:* including top events, hazards, and causes and contributing factors.
- *Exposure estimation*: Estimate the size/extent of risk receptors exposed to dangerous goods hazards, along with the magnitude, duration, and spatial extent of the exposure.

- *Consequence estimation*: Estimate the magnitude of the actual consequences of dangerous goods hazards to the risk receptors, including the influencing factors and conditions.

Step 5: Risk estimation and presentation

- *Risk estimation*: Estimate risks by combining: a) the likelihood and consequences; b) the consequences and exposures to dangerous goods hazards.
- *Risk presentation*: Present estimated risks based on risk presentation formats, including these formats: a single number index (e.g.1/100,000), tables (e.g. sizes or bands of fatalities are 1-10, 11-100 and 101-1000), graphs or diagrams (e.g. Frequency-Number (F-N) curve), and maps (e.g. risk contour plot).

Stage 3: Conclusions and recommendations

This stage consists of the following key steps:

Step 1: Conclusions:

Step 2: Recommendations:

7.3.2 Phase 2: Risk evaluation

Risk evaluation may include the following steps:

Step 1: Select risk evaluation criteria:

Step 2: Compare estimated risks against the risk criteria:

Step 3: Prioritize/rank risks:

- In cases involving various types of risks, the results of risk evaluation may show that risks (e.g. human, environmental and property risks) may have various degrees of significance or lie on various risk regions or levels. Further, an important task in quantitative risk analysis is to relate risks to various system elements (e.g. types of ships, types of dangerous goods related activities such as loading and discharging, classes of dangerous goods, location of accidents etc) and risk receptors (e.g. crew, passengers, stevedores etc). In order to prioritize risk management

strategies and measures and subsequently resources and efforts, risks are ranked according to their significances.

Step 4: **Propose risk management strategies and measures:**

7.3.3 Risk Evaluation criteria

Human risk criteria

Risk criteria means the probability of a certain incident happening. It can also be called risk level.

When talking about human risk criteria the safety and health of humans is meant.

Different organisations have developed criteria to assess the human safety and health risks, such as the UK's Health and Safety Commission (HSC) or the IMO.

Generally it can be made a distinction between individual risks and societal risks.

The probability of injuries or even fatalities is measured in e.g. "1 fatality per 1 million inhabitants per year". For the various groups like workers of a hazardous facility or residents close to a hazardous facility or far away from a hazardous facility different levels of risks are defined which can be sorted into the categories "acceptable" and "not acceptable" risk level.

The categorisation differs between the groups. For workers in a hazardous facility for example a higher risk level is regarded as "acceptable" than for inhabitants living far away from such a facility.

Which level is acceptable depends on what level of risk is accepted in a society. It can differ from one country to another.

Societal risk and risk criteria: Societal risk is the risk of the occurrence of multiple fatalities in a single event (HSE 2001) (Vrijling et al. 2004). According to the IMO (2004), societal risk (SR) is defined as average risk, in terms of fatalities, experienced by a whole group of people, such as for example crew, port employees or society at large, exposed to hazards. Societal risk is determined for everyone exposed, even if only once a year, and it is usually presented as FN diagrams or Potential Loss of Life (PLL) (IMO 2004). Societal risk criteria are generally based on individual risk criteria. They usually express a balance between costs and benefits. Standards for costs and benefits, risk estimation and evaluation vary among countries, industries, sectors

or activities. Therefore, risk criteria for other systems or activities may not be directly employed to the transport of dangerous goods. The IMO's societal risk criteria are provided in Table 6.

Table 3: Individual risk criteria in use

Authority	Description	Criterion (fatality per year)
U.K. HSE (1999)	Maximum tolerable risk to workers	1.10^{-3}
	Maximum tolerable risk to the public	1.10^{-4}
	Negligible risk	1.10^{-6}
Netherlands Bottelberghs (1995)	Maximum tolerable for existing situations	1.10^{-5}
	Maximum tolerable risk for new situations	1.10^{-6}
New South Wales, Australia DUAP (1997)	Sensitive developments (hospitals, schools, etc.)	5.10^{-7}
	Residential, hotels, motels, tourist resorts, etc.	1.10^{-6}
	Commercial, retail, offices, etc	1.10^{-5}
	Sporting complexes, active open space	1.10^{-5}
	Industrial	5.10^{-5}
Western Australia EPA (1998)	Sensitive developments (hospitals, schools, etc.)	5.10^{-7}
	Residential zones	1.10^{-6}
	Non-industrial (commercial, sporting, etc.)	1.10^{-5}
	Industrial	5.10^{-5}

(Annual Fatality Risk) (IMO 2006 from HSE 1999; Bottelberghs 1995; DUAP 1997; EPA 1998)

Table 4 shows human risk criteria applied for evaluation of fatality risk to the members of the public living close to hazardous facilities. These hazardous facilities also may include ports and terminals, channels and rivers where large amounts of many different classes of dangerous goods are handled, stored, transferred or carried through. Table 5 shows that the boundaries of acceptable risk vary among countries. Risks about 10^{-5} per year are broadly "unacceptable" for the members of the general public living close to hazardous facilities in the countries shown in Table 5.

Table 4: Risk criteria for residents close to hazardous facilities (OECD 2002)

Countries	Limit of unacceptability	Limit of acceptability	Criteria applied between the upper and lower boundaries
Honk Kong	1 in 100,000	1 in 100,000	N/A[1]
Netherlands	1 in 1 million	1 in 100 million	ALARA
UK	1 in 100,000	0.3 in a million	ALARP
Australia[2]	Not given	1 in 1 million	N/A

The concept of "scrutiny level"

So for assessing the societal risk of e.g. dangerous goods transports the balancing of costs and benefits is fundamental to the decision making process. Judgments about risks change as dangerous goods related activities and their benefits, tolerance and perceptions also change. One concept to assess the societal risk is the concept of the "scrutiny level." The "scrutiny level" scaled according to the national total tonnage of dangerous cargoes produces a "national scrutiny line." Risks above this line are considered "possibly unjustified." The concept of the "scrutiny level" has been adopted by the U.K. Health and Safety Commission/Executive (HSC 1991) for vessel traffic and handling of bulk dangerous cargoes only. The concept has been applied for both local or port and national risks, where risk levels are scaled in accordance to the annual tonnage of dangerous cargoes shipped through the U.K. ports and national territorial waters.

IMO's risk criteria

The IMO (2004) has proposed individual and societal risk acceptance criteria for the shipping industry (see Table 6) based on risk criteria of the U.K. HSE (1999) and others (see Table 4). The risk criteria, which determine threshold values for tolerability and non-tolerability of risks, concern fatality risks to individuals (e.g. crew, passengers, and the third party such as port employees), groups of people or society. The total risk consists of the sum of all risks. According to the U.K. HSE data (for the period 1987–1991), which are also supported by other studies, the level of the individual risk for the crew in the sea transport was 2.9×10^{-4} per year (Vrijling et al. 2004). The IMO's risk criteria are proposed for use in evaluating the total fatality risk of being onboard the ship, but not for specific risks from specific hazards (e.g. fire) (IMO 2004). Despite extensive search and

literature review, no specific risk criteria for the maritime transport of PDG have been found.

Table 5: Quantitative risk acceptance criteria – upper and lower bounds (IMO 2004 from HSE 1999)

Decision parameter		Risk Acceptance Criteria	
		Lower bound for ALARP region	Upper bound for ALARP region
		Negligible (broadly acceptable) fatality risk per year	Maximum tolerable fatality risk per year
Individual Risk	to crew member	10^{-6}	10^{-3}
	to passenger	10^{-6}	10^{-4}
	To third parties ashore	10^{-6}	10^{-4}
	Target value for new ships[1]	10^{-6}	The above values to be reduced to one order of magnitude
Societal Risk	To groups of above people	To be derived by using economic parameters[2]	

Environmental quality criteria

The evaluation and assessment of environmental risks of dangerous goods transport is much more difficult because there are not so obvious risks compared to human health and safety risks like injuries or fatalities.

A few years ago the environmental risk criteria were still in their infancy but several attempts have been undertaken to evaluate the damage to the environment by pollutants.

One concept are the costs of cleaning-up and repair, which of course can only be applied to reversible damages but not to irreversible damages.

Other concepts go by the perceived “value” and “vulnerability”, or concepts that set standards for water, land and air quality.

For the marine environment they include quality criteria for the physical, chemical and biological quality of water, sediment and biota. The criteria set benchmarking standards for 157 pollutants.

The drawback of benchmarks for certain pollutants is, that all other pollutants are not looked at and therefore not assessed.

Risk criteria for aggregated risks

Evaluation of compound or aggregated risks (which combine two or more of the following: human safety and health risks, environmental risks, property risks and other risks) requires compound risk criteria (see Figure 8). Combining one set of criteria with another is a very complex and difficult task. In recent years, attempts have been made to deal with this problem.

ISO risk criteria

The ISO (1999) 17776 risk matrix (see Figure 8) is a detailed matrix that has been designed for ranking and evaluation of aggregated risks in petroleum and natural gas industries including offshore production installations. It reflects the practices in the industries and organisations in integrating human safety and environmental risks in the total risk decision-making process. The ISO risk matrix is a 5x5 matrix combining various categories of consequences and likelihood. The consequences are divided into four categories: people, assets, environment and reputation. The inclusion of asset and reputation risks is intended for use by any category of corporate businesses including the shipping industry. The matrix can be used as a combined risk criterion for ranking and evaluation of aggregated risks (see Figure 8).

CONSEQUENCE					PROBABILITY/FREQUENCY				
					A	B	C	D	E
Severity Rating	People	Assets	Environment	Reputation	Rarely occurred in industry	Happened several times per year in industry	Has occurred in operating company	Happened several times per year in operating company	Happened several times per year in location
0	Zero injury	Zero damage	Zero effect	Zero impact	Manage for continue improvement				
1	Slight injury	Slight damage	Slight effect	Slight impact					
2	Minor injury	Minor damage	Minor effect	Limited impact					
3	Major injury	Local damage	Local effect	Considerable impact					
4	Single fatality	Major damage	Major effect	Major national impact	Incorporate risk reducing measures				
5	Multiple fatalities	Extensive damage	Massive effect	Major international impact				Intolerable	

Figure 8: ISO Risk Matrix (ISO 1999)

Some issues related to risk criteria

Based on the understanding gained through the review of several risks criteria, the following provides some issues related to risk criteria.

- Although reflecting the latest scientific knowledge, environmental risk criteria are only for a limited set of pollutants. For example, USEPA's water quality criteria have been developed for a limited number of pollutants – 157 pollutants only. A large number of chemicals have not been included in the criteria. New chemicals may be produced faster than their environmental risks can be assessed and criteria can be developed. Some chemicals, which may result in long-term effects on marine organisms such as those disrupting animal hormone systems, may yet be poorly understood.
- Risk criteria are generally applicable to local conditions. Because of differences among coastal and marine environments, it is difficult, if not impossible, to develop, adopt or apply universal criteria. For example, seawater, sediments and organisms contain natural levels of metals, which may vary according to local factors such as bedrock and sediment type, oxygen supply, currents, salinity and temperature. In many areas, there are substantial differences even among different parts of a country.
- In many countries and industries, risk criteria only provide guidance to the parties concerned. They may not necessarily be regulations imposing legal binding requirements.
- Risk criteria, including both human and environmental risk criteria, are generally facts or risk-based criteria. In many instances, however, communities affected by risks of chemicals are not satisfied with only fact-based risk analysis and evaluation based on fact-based criteria. In addition to fact-based criteria, risks may also be evaluated against value based criteria. However, this is not a common practice. Value-based criteria are employed to characterise multiple dimensions of risks involved, which take into account other factors, such as persistency, reversibility (i.e. possibility to restore the situation), and delayed effects (Kilnke and Renn 1999).
- Human risk criteria are designed to measure the level of immediate and apparent consequences. Long term and "minor" disabilities, injuries or ill health, and other human consequences are often not considered.

7.3.3.1 Risk perception

Risk perception is an important element that considerably affects the entire risk management process, including risk analysis and risk evaluation, and attitudes towards risks. Risk analysis, which is, in principal, a "pure" scientific and technical process, may not necessarily take into consideration socio-political and other related factors. Risk evaluation, on the other hand, in particular evaluation at high levels of decision-making, takes into consideration the wide range of interrelated factors, including public risk tolerance, costs/benefits trade-offs, socio-political and ethical factors.

The level of risks is generally determined by the basis of scientific estimations and judgments, and by observations of what society at the present tolerates. Whether risks are considered tolerable or not may often be judged by the decision-makers at higher levels. Their judgments will depend on whether they believe that there is extra public sensitivity about risks (HSC 1991). In many cases, risk evaluation may be a socio-political rather than a scientific matter (Kunreuther and Slovic 1996).

It is often difficult to judge precisely what may be acceptable and unacceptable in a particular country, industry, or sector of society. This is because of the wide range of various interrelated factors. Judgments about the tolerability or acceptability of risks vary across countries, regions, industries, sectors, individuals, and societies, as do types of risks and experiences. Judgments also alter with time – what was acceptable yesterday may not be acceptable today and tomorrow. People's views on risks and their value judgements are not static, but change according to circumstances (HSE 2001). Studies on risk perception have led to a theory which considers that it may be simplistic to believe that it will be possible to derive a quantifiable physical reality that most people will agree represents the 'true' risk from a hazard (HSE 2001). This theory maintains that the concept of risk is strongly shaped by human minds and cultures (HSE 2001).

The public risk tolerance is a function of different factors including risk perception, judgments, aversion, willingness and benefits. For example, a survey (ACS 1998) has shown that a sizable gap exists between risk experts and non-technical citizens or the general public over how to define measure and evaluate risks. Risk experts and technical officials tend to focus on the standard concept of risk as the

possibility of damage (ACS 1998). By contrast, the general public tends to expand the concept of risk to include other “non-damage” attributes (ACS 1998). They reflect societal values and the role of aversions and fears that hazards can cause. In the Netherlands, for example, attempts have been made to express risk aversion mathematically in the form of a risk aversion index, and to integrate it in the overall risk evaluation (Vrijling et al. 2004).

For more detailed reading about risk perception, evaluation and attitudes towards risks, including risks of dangerous goods it is recommended to read Sprent P, (1988) Taking Risks, The Science of uncertainty. Penguin Book, Canada, 1988 and Foundation for American Communications and National Sea Grant College Program (FACN) (1995), Reporting on Risk: A handbook for Journalists and Citizens. Annapolis Center, pp 84 – 86.

In summary, risk perception is an important multidimensional and dynamic factor that should be taken into account in understanding and dealing with risk issues, risk evaluation and risk management.

7.3.4 Phase 3: Risk management

Risk management attempts to provide answers to the questions on how best to deal with risks, such as (USCG 2001): What can be done? What options are available and what are their associated tradeoffs? What are the effects of current decisions on future options? This process, which is distinct from risk assessment, involves the key stages and steps shown below (Weigkricht and Fedra 1993) (Vincent1 et al. 1993) (USCG 2001). Although a large part of this process concerns the decision of policy makers, risk assessors provide useful information and propositions for dealing with risks in a most effective and efficient manner.

The key stages and steps of risk management are:

Stage 1: Identify, analyse and select decision making alternatives:

including:

- Identify key interests
- Risk management strategies
- Risk management measures – options generation

- Select appropriate methods and tools
- Option analysis and
- Option selection
- Residual risks and recommendations

Stage 2: Decision-making:

This concerns decisions on implementation of selected risk management strategies and measures. In consultations with all interested parties, weighed alternatives are selected and decisions are made for their implementation. The decision may involve implementation of measures to reduce or eliminate unacceptable risks. When appropriate, risks are eliminated, reduced or transferred in the most cost effective manner. When they are justified, risks are retained or accepted.

Stage 3: Planning:

Prepare and communicate action plans to deal with risks, including:

- Documentation of strategies, actions, goals, and schedule dates;
- Emergency response and contingency planning;
- Transport planning;
- Providing supporting information needed to implement risk management strategies and measures.

Stage 4: Implementation and enforcement:

The implementation or execution of risk management strategies and measures, including:

- Implementation of risk management measures for different risks and systems components;
- Emergency response procedures and means;
- Education and training of all persons involved;
- Supervision, inspection and monitoring to verify compliance with regulations;
- Measures to compel compliance;
- Safety management audit.

Stage 5: Follow-up and monitoring actions:

Follow-up and monitor the effectiveness of planned actions and the continuous update of all assessments as they change due to the implementation of actions and changes in the transport system and surrounding environment with the passage of time. The decision-making process is a central element of risk management. It is a discipline in its own right and involves identification and assessment of alternative actions for risk management, taking into account costs of actions, the likelihood of future uncertain actions that may occur if the action is taken, and the rewards or costs estimated to result (RMSI Group 2001).

In the shipping industry, decision-makers at all levels are continually faced with difficult decisions. A wide range of complex factors and conditions contribute to difficulties in the decision-making process. For managing risks of dangerous goods, the process involves not only consideration of technical factors, but also political, social, economic, and many other factors. Further, the process may be complicated by the variety and complexity of the choices and the environment in which they are made, multiple and often conflicting objectives, different perspectives of those who are involved and affected by risks, sensitivity of decisions and uncertainty of various variables in the decision-making process. It is, therefore, important to provide decision makers with valid, reliable and sufficient information to ensure that they have taken a decision to their best knowledge.

The risk management process should be accompanied at all times by an appropriate risk communication.

Risk communication does not constitute a phase on its own, but it is rather an essential integrated element of the system. In each phase and stage of the process, communications among the concerned parties are essential important. Risk-related information generated at each stage is communicated to the concerned parties. The stage of re-assessment indicates that this is a continuous and cyclic process. Although presented at the “end” of the cycle, the re-assessment or re-analysis can take place at any given phase or stage and at any moment. For further literature see e.g. Mullai 2006.

Mullai, Arben, 2006, DaGoB publication series: Risk Management System – Risk Assessment Frameworks and Techniques

7.4 Annex IV: Dangerous goods IT systems in focus ports of the Baltic Sea Region

The last paragraph is about the depth of system integration and capabilities for inter-organisational data exchange such as SafeSeaNet. This part also discusses of user-level and access matters.

7.4.1 Tallinn

The rather large number of separate software increases manual labour when transferring data from system to system since the current softwares are not able to do it automatically.

The software is built on top of an Oracle database which is hosted inside the port organisation. Dangerous Goods do not have a web interface, but works simply as a client – server –system and the user is recognized by username/password authentication. The given inputs are stored directly to the database and no double-checks are made. Approximately 40 workers of the Port of Tallinn have access to the system, which cover vastly different actors such as Harbour Master, Commercial department, analysts, IT-department, financial department etc.

The used architecture in the Port of Tallinn represents pure stand-alone system. It is a combination of several independent software, performing the various duties of a certain department in the organisation. The port officials, though, doesn't recognize a vast need for ERP-system and are quite pleased for the current situation. The IT-department has the capabilities to develop the system, but it requires the request from the user-side.

Dangerous Goods is an individual system and doesn't have any kind of connection to other systems inside or outside the port area. Middleware-translator hasn't been in a consideration and totally new combined system is more possible solution in the future if the integration requirements increase.

7.4.2 Hamburg

Name of the system: GEGIS (Gefahrgut-Informationssystem), translated to Dangerous Goods Information System. Created by Dakosy AG.

The DG-officials in the Port of Hamburg use The GEGIS dangerous goods information system which has been especially developed for dangerous goods transport safety. In Hamburg GEGIS has been implemented with a registration requirement for all movements of dangerous goods in the harbour. Main benefits of the GEGIS-system are the seamless monitoring and documentation of all movements of hazardous cargo to the port area, inside the port area and from the port area. Other advantages are internationally usable Internet applications which relieve the users from their offices and comprehensive databases containing all the legislation data, segregation and handling requirements as well a log of all the movements since the system implementation. The software is built by pure java and it requires a functional internet connection to operate properly, there is no www-interface. Wireless or mobile use is possible via WLAN stations from accepted laptops but Dakosy AG has a future plan to make a pure wireless application which is enabled by UTMS-technology (Gefahrgut-Informationssystem (GEGIS) / Transport Emergency Card (Tremcard) Service, 2007).

The liner agent or ship owner must enter the DG-notifications 12 hours prior arrival or departure through his GEGIS-interface. The stored data is simultaneously available via Dakosy integrated network for the authorities such as the Water Police, Fire Department and as well as the other stakeholders such as the quay operator, forwarder etc. The database contains versatile data from the movements of the DG-cargo and can be exploited in many various ways such as reporting and statistics. Other useful modules are effective stowage and segregation application for assisting the container loading.

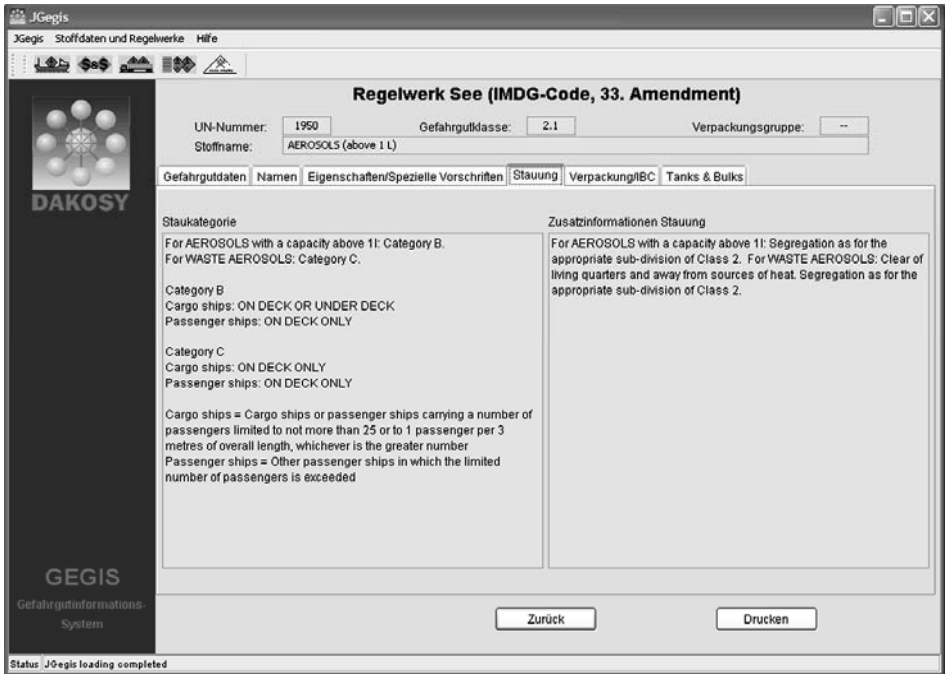

Figure 9: Stowage and segregation instructions on GEGIS interface (Ratio 2007)

With the graphic support the user can check which dangerous substances may be placed together, or determine if segregation requirements even apply. The stowage and segregation regulations can also be viewed and used separately. The database contains comprehensive up-to-date regulatory requirements for all transport modes such as sea, road, rail and barge with all essential information like classification, labelling, substance characteristics and packaging policies. A realistic risk analysis, estimated of hazards and accidental, is combined with data on first aid measures as well as thorough information and help for damage control.

The GEGIS has many integration solutions for interacting with the systems used by the private shipping companies operating in the port. Usually Dakosy AG gives permission for few users in each of the organisations. For example shipping company Maersk Line uses GEGIS for reporting incoming and outgoing cargo. The Hamburg office have four people working in the office with the DG-cargo and the required data is installed from their own system to GEGIS with a EDI-transfer and therefore they avoid manual labour for transferring data from one system to another. The usage of Maersk Line is restricted only

to inputting and viewing of the DG-notification slot and they don't have rights to use for example the reporting and statistics modules. The Waterways Police of Hamburg on another hand have fever limitations with the software as they work as the main supervising officials in the port area. The road officials have access on GEGIS as well to have preliminary information of the arriving cargo from the harbour. The Hamburg Port Railway uses HABIS information system for a central management tool for smooth operation, maintaining and expansion of the infrastructure of rail services. HABIS features interfaces with railway companies, freight forwarders, terminals, shippers, customers and other parties in the transport sector. The networking model allows information to be exchanged without delay. HABIS connects the EDP systems of the Deutsche Bahn AG (German Railways) with those of the shipping and transport industry and facilitates an IT-supported operation of the Port Railway System (HABIS 2007, Biggest transshipment location for rail container traffic, 2007). HABIS and GEGIS are linked together allowing efficient, accurate and up-to-date DG data exchange in multimodal transportations.

7.4.3 Riga

Name of the system: Velkonis. Created by a Latvian based software company HMS.

Freeport of Riga is located on the outfall of River Daugava covering 15 kilometers in length and total land territory of 1 962 ha. The numerous berths served in the year 2006 total 3648 vessels whose main types of cargo were containers, various metals, timber, coal, mineral fertilizers, chemical cargoes, oil and food products. Up to 80% of the 25.4 million tones of cargo turnover is transit forwarded to or received from the CIS-countries.

Velkonis has a web based interface and therefore can be used in anywhere with an internet connection or mobile via GPRS-connection.

The upcoming feature for Velkonis is a GPS mapping system which shows the current location of each vessel in the port area and assists the planning of the loading and unloading process.

Incoming vessels are reported by the agents via web based form 48 hours prior to arrival if it is transporting Dangerous Cargo. Enquiries

during storage time can be made by printing out tables of the cargo divided based on the class.

The integration works well between different actors in the Freeport of Riga. The Latvian Maritime administration has access to Velkonis and they use it daily to calculate all different kinds of shipping and navigational fees. Other users of the system are naturally shipping companies, special DG-division of the Police Department, bunkering companies and several state-level organisations. The system is developed for open multi-user software and is not trying to be exclusive for the port staff only. Velkonis doesn't have any connection to other transportation mode systems such as trucking or railway operators.

7.4.4 Klaipeda

Name of the system: Laivo (Ship in Lithuanian)

The IT-field of Klaipeda Seaport is in a transition. They are currently using a system called Laivo for managing the DG-cargo flows in the port area, but plans for whole port coverage ERP-system is in development. In this chapter we discuss both solutions side by side, because there is no point of reviewing only the withdrawing system. The upcoming CACIS-system (Cargoes and Commodities Information System) is in use already for some modules, but the final implementation is scheduled for the end of year 2007.

The upcoming CACIS system aims to fasten Customs declaration of sea-going cargo and therefore relieving performance of risk analysis and unifying electronic communication for stevedoring companies. The increasing data exchange between logistic partners and Customs such as import/export/transit, temporary storage and other customs formalities is considered do diminish the manual labour and providing essential information to all stakeholders simultaneously. One of the basic functions is an interface for data communication with ports of cargo dispatch and destination. Main general objective of the system is to speed-up of the cargo operations at the seaport area, aiming to increase the overall competitive ability of the Klaipeda State Seaport. In more specific level the objective is to design, develop and implement an Information System for data exchange and workflow processes between the logistic partners involved in all port activities. The new system is in

the pipeline and should be operational in summer 2007 and includes the following characteristics:

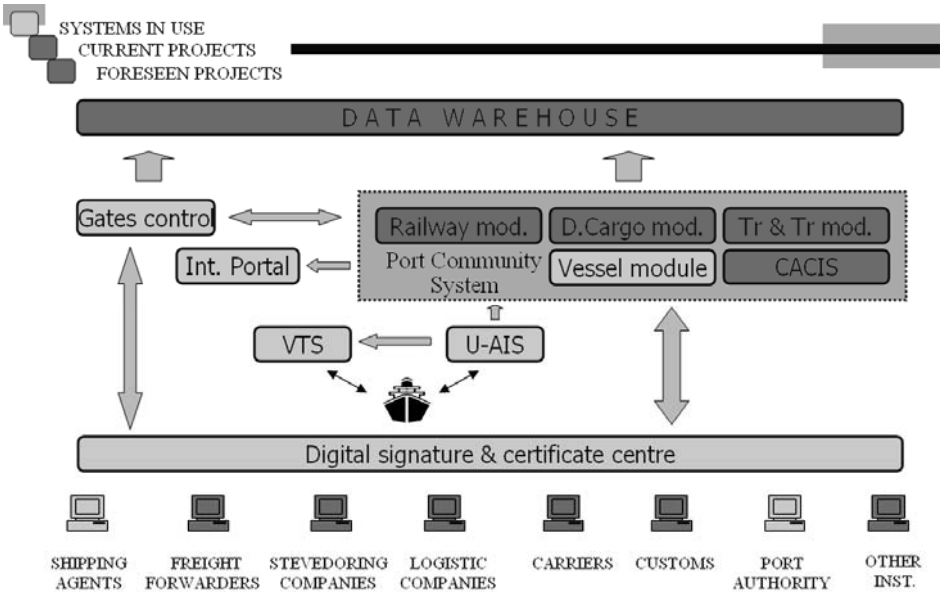

Figure 10: CACIS and the port IS (Ratio 2007)

Gates control, Int. portal, VTS, U-AIS and the Vessel module in the port community centre are already in use. At the moment there isn't any operational system specified to monitor dangerous cargo, but the CACIS will have an individual module for it. Other new innovation in the system is a GIS-based positioning to track the vessels movements it the port area (Žygus 2006).

As soon as the CACIS is online the Port officials are planning to implement a report/statistics program to it. There hasn't emerged any needs for mobile use of Laivo and special handheld devices have been considered too small and difficult to use. For CACIS the Port have taken into consideration some specially designed www-pages for mobile phone use, which make demands for smaller screen resolution and petite file-sizes.

What differs from the other Baltic Sea ports is that the Port Of Klaipeda has already implemented SafeSeaNet –notifications where xml-form data is transferred to both directions. The operational part includes vessel and port-of-call information provided by the agent. CACIS is due to have outside linkages for example Customs IS, Port IS

(Vessel module, Gates Control IS), Lithuanian Railways (CARGO) and other ports of cargo dispatch and destination.

After completion CACIS is a very powerful and deeply integrated port ERP-system.

7.4.5 Stockholm

Name of the system: PortIT, created by InPort Intelligent Port Systems A/S & AB

The main tool for the port information handling at Stockholm Port is the PortIT system. PortIT is a system developed jointly by a majority of Swedish harbours and it provides means for electronic interchange of information between all operations in the port. The data interchange covers as well the linkage between the port and its clients and service providers

The graphical interface of PortIT displays when the ship or the transportation unit contains Dangerous Goods. The software searches automatically essential information of the current substance such as storage regulations, stickers and accident procedures. The main container shipping company in Port of Stockholm is Teamlines, which provide the cargo information data by EDI-messages to PortIT.

With the help of the PortIT –system, the port officials can view and control the stored cargo in port area. The charts show normal cargo and DG-cargo separated, but it doesn't provide tools for land segregation. One of the modules named Kartago map-system enables to view the current location of each container and it allows the user to examine the contents as well the handling instructions for it. The software can't review the cargo's ownership details but the information can be easily checked from the gate by the transportation unit's ID-number.

The system has modules for reporting and statistics which can date back at least two years. The statistics software is actually a different application but it is able to make queries to PortIT databases. Containers which are not shipped by Teamlines and other general cargo notifications are still made to traffic control by hand via fax or e-mail 24 hours in advance. The Swedish Maritime Administration is responsible for compiling DG-cargo information from ports and shipping companies and has developed an information-processing system for the task called Fartygs Rapporterings Systemet – FRS (Vessel Reporting

System). The information regarding each vessel has to be reported to FRS and it works as middleware for translating data to Safe Sea Net. At the moment PortIT is incapable of receiving incoming Hazardous Cargo data from FRS but it will be possible in the near future.

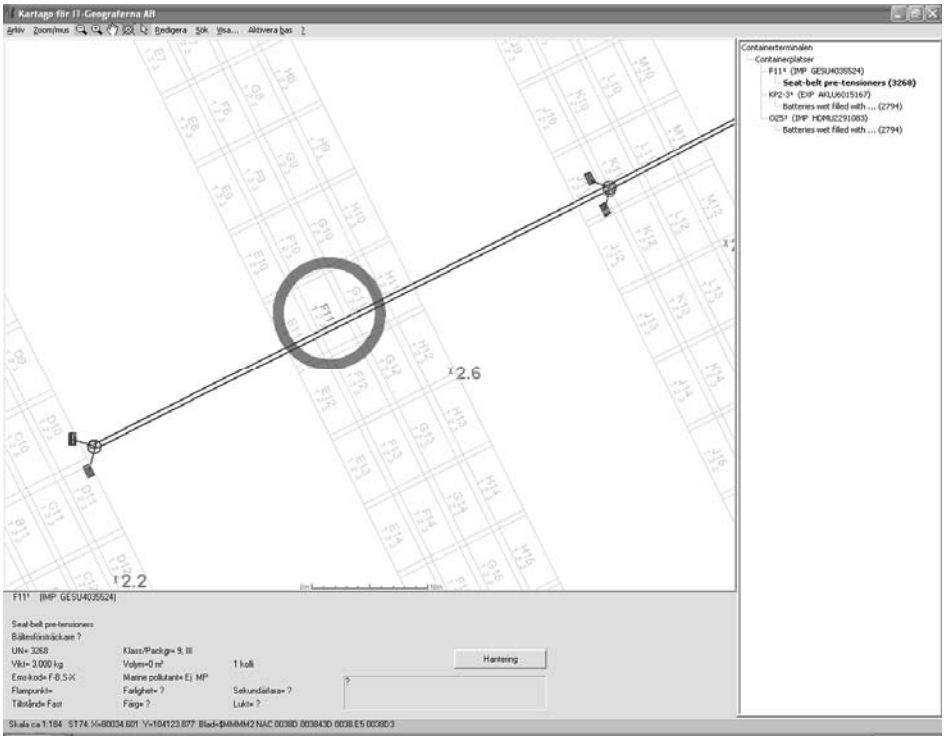

Figure 11: PortIT displays the location of DG container (Ratio 2007)

Each of the three ports in the organisation is using the PortIT system, but they are not currently linked directly together another than via FRS, which provides information to various players such as the Swedish Coast Guard, the Swedish Customs and many ports. The main goal for FRS is that all information regarding a port call, eventually, be transferred to a single centre. By looking at other authorities the PortIT is linked closely to The Swedish Rescue Service's Information Bank (RIB) which contains various risk-analysis tools as well as general information of all Dangerous Substances. In this solution the PORT-it system doesn't need to have up-to-date information about different substances as they can be downloaded from the RIB.

7.4.6 Helsinki

Name of the system: MasterIMO

IT-infrastructure in the Port of Helsinki distincts a bit from other ports studied as one stevedoring company is responsible for the majority of cargo handling port operations. This company is a subsidiary of Finnlines Plc. called Finnsteve Ltd. Finnsteve has developed and used a port IT-system of their own for many years and the Port of Helsinki has bought the same software for their use. The system uses same database and selected modules for both parties when there is no need to data exchange between. This collaboration dates back as far as 1989 and the software is more or less the same as it was then. The software is actually an IMO-application called Masterimo and its text base interface is very straight-forward and easy to use.

Finnlines is the major transporter in the Port of Helsinki and since the ship and cargo database is shared with the port organisation there is no extra work needed for the notifications. The inputted data is received by EDI-transfers from the Finnlines agencies from the departure port or from the home port booking department. For non-Finnlines cargo the port has an internet form whose inputs are stored directly to the database. In January 2007 the form was operational only in Finnish and other languages must still send the data by fax. The notifications must be provided 24 hours in advance in case the shipment contains Dangerous Substances. This poses a slight problem as Helsinki has frequent regular liner traffic to Tallinn and the sea voyages are clearly shorter than the 24 hour margin.

The software operates purely as a port operations tool and doesn't have linkages to SafeSeaNet. The cargo information, including DG-notifications, can be transferred by EDI to Finnish Maritime Administration's PortNet system. This protocol diminishes manual labour required for inputting data from one system to another and enables SSN transfer through PortNet.

7.5 Discussion: Comparing the different systems

In the previous chapter I introduced all target IT-systems and in this part of the paper we compare them to each other in the framework.. It is essential also to follow the guidelines given in chapter 5.2 since they are reflected via the theoretical framework to the following comparison

matrixes. In the first sub-paragraph we discuss and present the qualities or features which appeared in the studied IT-systems. I'll give a short review of each of them to help to understand what their function actually is. In second sub-paragraph I present three matrixes derived from paragraph 5.2 guidelines in which fashion each feature in each port is executed and in third section I present the fictional "best practice" IT-system, again followed by the 5.2 guidelines.

7.6 Directory of the qualities and introduction

Port IT-systems execute various different tasks in normal daily port routines and some of them are still taken care by hand and some can be electronically aided. The following timeline represent the most common tasks which the shipping of Dangerous Goods poses in a port organisation.

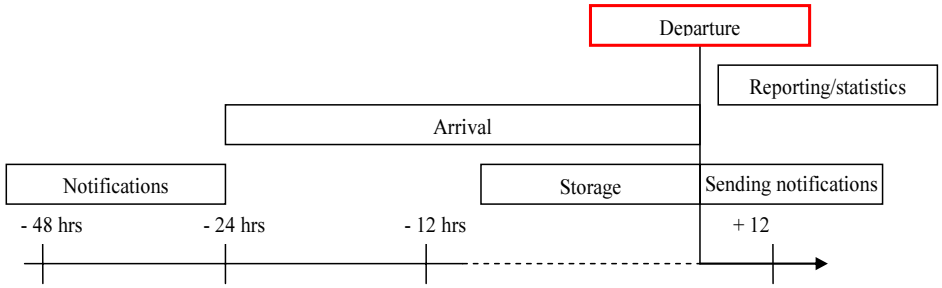

Figure 12: Timeline of actions required on shipping DG cargo (Ratio 2007)

This figure represents carrying Dangerous Cargo in mixed cargo ports. Oil and chemical bulk harbours are different case as the substances are usually also stored near the berths. The following actions cover only Hazardous Substances or otherwise noted.

Notifications

Notifications are announcement usually provided by the ships agent to port organisation or other officials about the in- or outgoing cargo. They contain information about the vessel, its timetable, crew and passengers and most importantly the cargo. In most cases when the ship is transporting DG-material the notification about is must be made 48 or 24 hours in advance. The most common way to give inter-organisational notifications is via fax or e-mail, but some ports provide an opportunity to make the notification in a web-based form which saves the data directly to the system. In Helsinki the situation is

optimized as the Port and the major stevedoring company are using the same software.

Arrival

Usually the outgoing cargo has some preliminary booking already made in the port IT-system and on arrival the booking becomes concrete. The arrival time is essential in case of DG-cargo since the storage time is aimed to keep as short as possible. Some IT-systems automatically aides the cargo positioning and then an early information of incoming cargo assists the project.

Storage

It's a custom that Dangerous Goods aren't usually stored very long times in the port area as they can pose a serious danger in case of an accident. The maximum storage time depends of the substance, but in mixed cargo ports it isn't usually more than 24 hours. If the port has special warehouses or other storage areas designed to fulfil the cargo area requirements then the storage is possible for longer times. Good IT-systems visually shows the actual position of each cargo unit in the port and displays instructions of the containing substance and protocol for accident situations.

Departure

When the vessel is leaving the port it is essential to transfer cargo information to the next port or the consignee. Inter-organisational IT-systems are capable by EDI-transfer to send essential information directly without the need of sending papers by fax or e-mail. Naturally some documents travel onboard or are sent to consignee in case they are papers, which have to be presented as originals i.e. some custom notifications.

Reporting/statistics

It is always time-consuming if the reporting and statistics tools aren't integrated to the main system. It helps to query and edit data directly from the original database and therefore the information is correct and on-time. The relational model database although makes it easy to make summations in a spreadsheet software such as excel, but the data might be out-of-date and rarely automatically updated when the master data changes. In most cases the searchable data is connected to the age of the current system. The documents prior to the software creation

are not re-inputted in the system, at least in the target ports of this study. Then in case you want to make statistics that are older than the software you must collect the data from paper archives. Various actors search information for various purposes and optimal search-function provides many different search criteria. Naturally a well designed database helps and fastens the searches. Most common query attributes are based on:

- The name of the substance (UN-number, packing group, shipping name etc.)
- Arrival or departure date and time
- Name of the vessel
- Port of loading or discharge
- Owner of the cargo
- Transportation unit

7.7 Comparison of the systems in use and matrix

The following paragraph represents the findings on this survey on a three feature/port matrix. The matrixes are selected on the same classification as was used in the port review chapter:

- Technical issues
- The ERP-qualities and provided modules
- Depth of system integration

The horizontal axel represents each function and each cell displays how the function is executed in the port, shown on the vertical axel.

The ERP-qualities and provided modules –matrix

This matrix goes through the various applications each system contains and the model that it is implemented and accomplished.

Depth of system integration

The depth of system integration is illustrated on bars which represent the level of electronically data exchange based on the evaluation model in chapter 3.3.3. For each port the possible data is divided to three sections for three important information slots: timetable, cargo-data and accident situations.

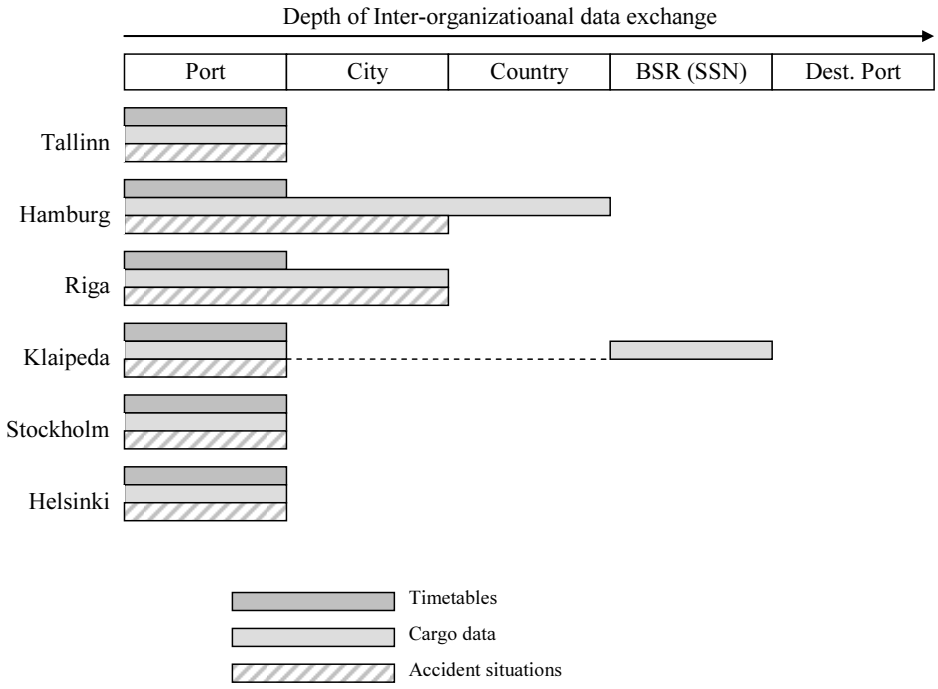

Figure 13: Depth of inter-organisational data exchange (Ratio 2007)

The chart reviews that the studied ports do not have very deeply integrated system. The electronic data is stored on a specific form inside the Port but very rarely it's transferable to other organisations. Hamburg and Riga make an exception to others as they give access to other city-level actors to their system, which is a great help in accident situations. In Riga's situation the granted access for Maritime Administration and Customs also fastens the calculation process of shipping related fees and making of risk analysis. Klaipeda is currently the only BSR port with operational SafeSeaNet linkage.

7.8 Toolkit How to find new innovations on current systems

An inter-organisational or otherwise open system brings in along run cost and time savings in a Port environment. The current situation when we have huge amount of actors working in Shipping Logistics and growing cargo flows it becomes essential to efficiently share the required information. The information flow is an important part of the field of logistics and slow and inaccurate information can pose unnecessary delays on the transport chain.

The following fictional port IT system is a combination of all the good elements found in the studied ports. It is introduced on the same structure as the case ports in chapter 4.

Software with web-based interface is clearly the most convenient way to operate as it enables usage in every location with an internet connection and doesn't require any installations. When the user is not bound to his or her office the data is accessible outside office hours in the evenings or even weekends. Internet access enables at the same time all GPRS cell phones mobile devices for using the system on the field such as in the port area or inside the vessels. The database type is not an essential issue, but in www-environment SQL is shown to be most effective and MySQL provides an open source alternative for the purpose. The commonly used model with two separate servers in different locations is a secure solution and with real time back-upping scripts the data-loss is efficiently ruled out.

The web-application is capable of providing useful modules for the notification aspect as internet form is easily connected to the relational model database. In this solution there are no in-house delays as the client makes the inputs straight to the server (of course it can be proofread before publishing it) and the fewer players in the middle the fewer chances to make mistypes. For viewing the stored information the web interface is easy customable for displaying chosen data for each user or user groups. In more detail this means tailored user-rights for each party depending on their status in the Port community i.e. shipping companies have access to cargo and timetable data for their vessels and so on.

If one wants to have a unified efficient port ERP-system it's quite obvious that the representatives from closely related organisations have to be given access for at least inputting required data directly to the system. The following illustration describes the current status in many ports about the information flow from the departure harbor to the next port-of-call. The lower timeline represents the optimum system when the first port can input data straight to the database and the next port has access to view it. Please notice also the missing delay slots as the inputs are simultaneously usable for all without the need for someone manually store the data for next system.

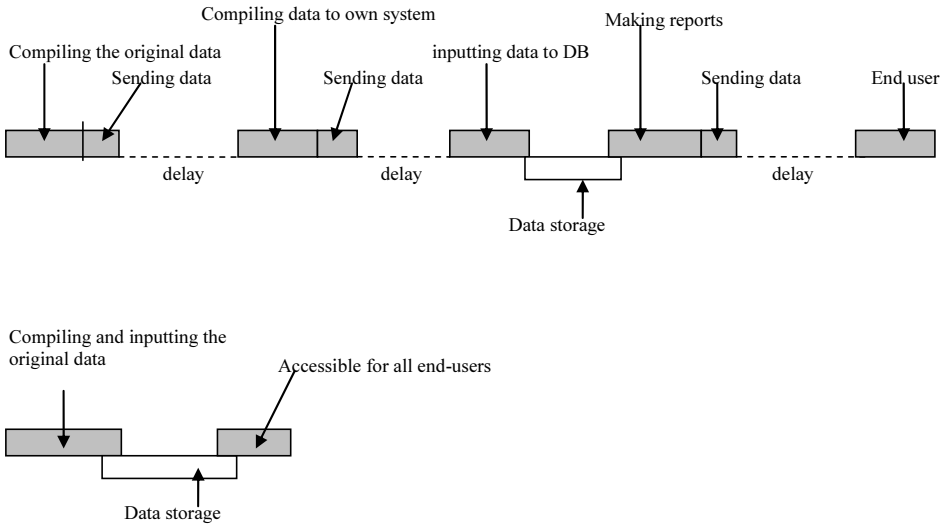

Figure 14: Information flow timeline for three ports of call (Ratio 2007)

As said here “all users” doesn’t naturally mean that the information is accessible for whomever but with well-defined user-groups with varying user-right the administration can control who can input and who can view which is not too difficult to plan and execute. The requirements for each group depend on the structure of the port community, but basic guidelines can be considered that official parties such as the Police, Customs and Border Control have the most rights and commercial actors only for the modules they will be needing. The integration to other related systems with fluent real-time data exchange is an important part of data-exchange development. Problems arise from incompatible system structure such as different programming languages and database models. When the current software is widespread inside the organisation and there is no desire to create totally new IT-system, then a translator middleware is worth of consideration. The SafeSeaNet integration is not too difficult to execute as it operates purely on translator server for different ports and collect only basic information about vessels and their timetables.

7.9 Conclusions

The field of Port IT-systems in major Baltic Sea Area ports is very fractured and dissimilar with each other. Most of the used software has been developed to fulfil the need of each port and some particular function and the development has occurred in a long period of time. This

leads to a situation that many different functions or departments in the port have develop their own system without cooperation with each other. The basic structure of a port is that in a relatively small area work various operators, both officials and commercial firms. On other hand this kind of an environment can be seen as a potential breeding ground for deep integration but in reality everyone works on their own circle and use their own IT-systems. For corporate point of view this is more understandable as they don't like to allow competitors to access their systems, but the supervisory Port organisation could easily ease their own workload by allowing other stakeholders to store data directly to their own databases.

The cooperation between official Port organisations isn't too deep even in liner traffic in the IT-matters. In this study I have noticed several reasons for the problem and one is that the used systems have been developed over time and are therefore very different compared to each other. As the systems might be seen totally incompatible, the Ports can be afraid of the amount of work what the consolidation process might take which restrains the eagerness to develop systems. In the logistics theory the information flow has been seen equally important as the material flow and therefore it's unfortunate that shipping related organisations do not pay enough attention to it.

Especially when transporting Dangerous Goods the correct and sufficient information is crucial to ensure proper handling and to avoid accidents and other misuses.

The cost savings, enabled by the new IT-system, in the long run always depend on the situation and come little by little in a long period of time. Naturally the high costs in the planning and implementation phase of new IT-system might block the view for long time cost savings; it's cheaper to do nothing than buy new software and earn back the costs for example in ten years. One visible major factor of delaying the development progress is that the system developers aren't usually involved in the handling of the logistics process and the heavy-users – on the other hand – aren't professionals of system development. This leads to a situation when the users-side isn't aware of the capabilities to alter the current software or to develop new ones and the administrators don't know what kind of improvements to make. This issue can be easily solved by increasing the discussion between each party but in a very fractured organisation the users and developers doesn't in some cases even know each other. It's quite common that the all-day users do not have a chance to propose changes to the system as the executive level

is the decision making actor and they don't necessarily even ever use the system. In a situation like this the organisation can be officially quite happy of their systems but the reality can be totally different if someone has bothered to ask the every day users opinion. The problem arises from the nature of city or state owned ports which can be seen as a very hierarchical and inflexible organisation. The users` opinions from operational level to decision making level can take very long time when passing thorough the steps on the organisation chart.

The most obvious benefits for inter-organisational data exchange in this industry are the avoidance of delay and mistyped information. It is quite clear that when cargo related data including lots of numerical information is inputted many times in different systems the possibility of error increases substantially. If and when the Port is using only one shared IT-system the cargo flow information become more open and the data more transparent which improves the overall competitiveness of the whole Port when each stakeholder doesn't have to do manual labour to alter and input data again to their own systems (see figure 27). The efficiently shared information can improve also the efficiency of the whole port which can make it more eligible for shippers, when deciding which harbour to use to use to transport their cargo. The model of one single shared database enables accurate and correct cargo flow statistics as well because the possibility of the data to change along the way is diminished.

All the studied ports are at least some level developing their current system at the moment. The prevailing atmosphere is that many are waiting the SafeSeaNet to become obligatory and therefore the process of combining systems between ports has not developed as fast as it could have. The EU directive which requires the use of SSN isn't in use yet, but at current forecast given by Mr. Arkima (2006) it will be operational at the beginning of 2008 and full implementation of the SSN software in 2011. The newest current innovations take the SSN into account already which is a good road to travel as the organisation doesn't need to make big changes when the actual implementation day arrives.

- Raitio, Johannes (2007), Comparison of the ICT-systems of monitoring and surveillance of the movements of dangerous goods in the ports of Baltic Sea area countries, Master Thesis at the Turku School of Economics, Turku