

UN/SCETDG/33/INF.81

COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS AND ON THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS

Sub-Committee of Experts on the
Transport of Dangerous Goods

Thirty-third session
Geneva, 30 June-9 July (a.m) 2008
Item 12 of the provisional agenda

OTHER BUSINESS

Report by the UNECE secretariat to the Organisation for Security and Cooperation in Europe (OSCE)

The UNECE secretariat was invited to prepare a report on the transport of dangerous goods to the 16th OSCE Economic and Environmental Forum, held in Prague, Czech Republic.

The secretariat would like to express its appreciation to the expert of the United States, the European Commission and to representatives of NGOs who kindly provided some background figures and statistics for the preparation of this report.



**UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE**

**Review of the implementation of OSCE commitments
in the economic and environmental dimension**

**TRANSPORT OF
DANGEROUS GOODS**

Sixteenth OSCE Economic and Environmental Forum
19-21 May 2008
Prague, Czech Republic

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Acknowledgements

This report has been prepared by the staff of the Dangerous Goods and Special Cargoes Section of the Transport Division of the United Nations Economic Commission for Europe (Olivier Kervella, Rosa Garcia Couto, Sabrina Mansion, Valerie Blanchard, Christopher Smith, Mireille Chavet and Laurence Berthet) under the general direction of Eva Molnar, Director of the Transport Division. Robert Nowak wrote the foreword and Line Konstad edited the final version.

The following administrations and organizations kindly provided supporting information and statistical data:

- United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration (Biennial Report on Hazardous Materials Transportation, Calendar year 1996-1997; Department wide program evaluation of the hazardous materials transportation programs, March 2000; Hazardous Materials Shipments (prepared by the Office of Hazardous Materials Safety Research and Special Programs Administration, USDOT, October 1998); United States: 2002, Hazardous Materials, 2002 Economic Census, Transportation, 2002 Commodity Flow Survey);
- European Commission (Evaluation of EU Policy on the Transport of Dangerous Goods since 1994, TREN/E3/43-2003; Report from the Commission to the European Parliament and the Council on the application by the member States of Council Directive 95/50/EC on uniform procedures for checks on the transport of dangerous goods by road, COM (2007)795 final);
- European Association of Steel Drum Manufacturers (SEFA);
- European Industrial Gases Association (EIGA);
- European Liquefied Petroleum Gas Association (AEGPL);
- Federation of European Aerosol Associations (FEA);
- International Confederation of Plastics Packaging Manufacturers (ICPP);
- International Union of Private Wagons (UIP).

For more information on UNECE activities in the area of transport of dangerous goods
www.unece.org/trans/danger/danger.htm

Foreword

In December 2004, at the Organization for Security and Co-operation in Europe (OSCE) Ministerial Council meeting in Sofia, the Executive Secretary of the United Nations Economic Commission for Europe (UNECE) and the Secretary General of the OSCE signed a memorandum of understanding. The memorandum has consolidated and deepened co-operation between the two organizations, particularly in the context of responsibilities related to the annual OSCE Economic Forum where the UNECE is to periodically review various OSCE commitments.

What are OSCE commitments?

The Charter for European Security (Istanbul OSCE Summit 1999) stipulates that the Charter of the United Nations, the Helsinki Final Act, the Charter of Paris and all other OSCE documents to which participating States have agreed represent their common commitments

- These documents establish clear standards for participating States' treatment of each other and of all individuals within their territories
- The Charter for European Security notes that all OSCE commitments, without exception, apply equally to each participating State
- Their implementation in good faith is essential for relations between States, between governments and their peoples, as well as between the organizations of which they are members
- Participating States are accountable to their citizens and responsible to each other for the implementation of their OSCE commitments
- Commitments are regarded as common achievements and therefore are considered to be matters of immediate and legitimate concern to all participating States

The Government of Finland – the OSCE's Chair-in-Office for 2008 – after consultations with other OSCE participating States proposed the theme of the OSCE's Economic and Environmental Dimension in 2007/2008 be "maritime and inland waterways co-operation in the OSCE area: increasing security and protecting the environment". Consequently, the OSCE Permanent Council, in its Decision No. 798, has formally announced that:

"The Economic Forum will review the implementation of commitments in the economic and environmental dimension. The review, to be integrated in the Prague segment of the Economic and Environmental Forum, will address relevant OSCE commitments and in particular commitments related to governance and transport issues, with a special focus on environmental and transport security, including relevant international conventions and international co-operation initiatives".

The most recent and comprehensive OSCE commitment in the area of transport can be found in the OSCE Strategy Document for the Economic and Environmental Dimension of 2003. It declares that:

“We (participating States) encourage the development of transport networks in the OSCE region, which are efficient and integrated, free of avoidable safety and security risks and sensitive to the environment. In this regard, we will give a high priority to the uninterrupted operation of the existing transport corridors and to construction of new ones, where this can be economically justified”

Transportation touches upon various aspects of economic exchange and regional co-operation. Infrastructure, good governance, international trade, foreign investment, environment, energy, safety and security all relate to transportation (and vice versa). The development of transport networks that “are free of avoidable safety and security and sensitivity to the environment” is particularly relevant to transportation of dangerous goods.

The UNECE (and other) legal instruments concerned with transport of dangerous goods set standards for the international carriage to ensure a high level of safety. The instruments aim also at harmonizing transport conditions and at facilitating the international transport and trade of a wide range of products of economic importance such as petroleum products, gases, chemicals, agrochemicals and fertilizers.

The legal instruments stipulate specific conditions under which dangerous goods may be transported. The conditions cover both the packaging and labelling of dangerous goods, and the construction, equipment and operation of the means of transport carrying the goods. They also contain procedures for training of persons involved in the carriage of dangerous goods, safety obligations of the participants, security provisions, checks and other support measures to ensure compliance with safety requirements.

This paper is not a comprehensive review of transport of dangerous goods issues across all UNECE member States. It purposely focuses on some selected issues and regions/countries. The paper discusses regulatory measures to increase safety and protection of the environment, security, UN mechanisms for the development and harmonization of transport of dangerous goods regulations as well as providing a brief description of accidents involving dangerous goods. Annexes contain detailed descriptions of UNECE project proposals for consideration by OSCE participating States.

Conclusions

Dangerous goods, in particular energy products, industrial gases and chemicals, play a key role in economic development and are carried internationally in very large quantities.

A few spectacular and catastrophic accidents have occurred in the past, and despite much better records nowadays in countries which are enforcing suitable regulations based on the United Nations Recommendations on the Transport of Dangerous Goods, such transport still represents a risk for persons, property and the environment. This is particularly the case in countries which have no regulations at all, or obsolete regulations, and which do not have adequate administrative structures for ensuring implementation and enforcement of the legislation in place.

Most countries in the world, including UNECE countries concerned by maritime carriage, are parties to the International Convention for the Safety of Life at Sea (SOLAS 74), and are bound to apply the International Maritime Dangerous Goods (IMDG) Code to maritime transport. Similarly, parties to the Convention on International Civil Aviation apply the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by air (ICAO TI); 42 UNECE countries are parties to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR); out of 42 parties to the Convention concerning International Carriage by Rail (COTIF), 35 are UNECE countries and apply the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) to international transport; out of 25 parties to the Convention concerning international goods transport by railway (SMGS), 19 are UNECE countries (8 of which are also parties to the COTIF) and apply certain SMGS regulations concerning the international carriage of dangerous goods, which are partially, but not completely, harmonized with the UN Model Regulations, ADR and RID. So far, only 8 UNECE countries are parties to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (which has just entered into force) although several Rhine and Danubian countries already apply its annexed Regulations. For domestic transport of dangerous goods, 30 UNECE countries apply ADR and RID.

Additional efforts should be made to promote the application of ADR, RID and ADN in more UNECE countries.

Recommendations

In order to improve safety and to ensure full harmonization of rules and regulations applicable to all modes of transport in the UNECE countries which are linked by road, rail or inland waterways, the OSCE may wish to support the UNECE recommendation that:

- (1) Countries which are not yet parties to ADR and ADN accede to these agreements as appropriate as soon as possible;
- (2) The transport of dangerous goods regulations contained in SMGS be harmonized with those contained in RID, whenever appropriate;
- (3) All countries which are parties to the ADR, ADN and COTIF apply the requirements of ADR, RID and ADN to domestic traffic.

Special attention should be paid to accession to ADR, to its application to domestic traffic and to its effective implementation, since transport by road is the most used mode for transport of dangerous goods and is the essential link between all other modes.

Therefore the OSCE may wish to help the UNECE strengthen the implementation of ADR by supporting three related projects (see annexes 6 to 8).

I. INTRODUCTION

1. Dangerous goods are often seen as a very special and mysterious category of goods, to which the public is rarely exposed. The term itself inspires fear, and any accident or even minor incident involving such goods immediately entails reactions from the media and public opinion. In fact, dangerous goods are produced and transported in very large quantities and they cover an extensive range of products which present risks for the population in general, property and the environment. These risks are present at the stage of extraction, production, transport, and use at the workplace and when handled by consumers. Transport is a delicate part of the lifecycle of such goods, since it, or part of it, takes place in areas where people and the environment are particularly exposed.

2. A number of catastrophic accidents in the past have prompted Governments to develop regulations intended to eliminate, or to minimize to the extent possible, such risks. Nevertheless, due to the economic importance of dangerous goods and to the importance of international transport, it has been necessary to discuss these regulations internationally in order to ensure a high level of safety acceptable to all countries and authorities responsible for different modes of transport while making international and multimodal transport possible through the harmonization of transport conditions.

3. Realizing that the Governments of countries most interested in international transport of dangerous goods were separately developing regulations intended to ensure the safe transport of dangerous goods by various modes and recognizing that the incompatibilities between these regulations would sooner or later constitute important technical barriers to trade, the United Nations Economic and Social Council (ECOSOC) decided to create in 1953 a Committee of Experts on the Transport of Dangerous Goods. The mandate of the Committee was to elaborate recommendations addressed to all Governments and international organizations concerned with the safe transport of dangerous goods that would allow the uniform development of national and international regulations governing the various modes of transport.

4. These recommendations are now contained in the “UN Recommendations on the Transport of Dangerous Goods, Model Regulations”, also known as the “Orange Book”. They contain all necessary provisions concerning the classification and identification of dangerous goods; their packing conditions, including standards for packaging and tank construction; labelling, marking and placarding of packages and transport equipment; and transport documentation. Although they apply to all modes of transport, they nevertheless remain flexible enough to accommodate any special additional requirements that have to be met by specific modes of transport, or at national or regional level.

5. The main international organizations cooperating with the Committee for effective implementation of these recommendations through international legal instruments are: the International Maritime Organization (IMO); the International Civil Aviation Organization (ICAO); and, for inland transport at regional level, the United Nations Economic Commission for Europe (UNECE) and the Intergovernmental Organization for International Transport by Rail (OTIF).

6. These main international instruments are:

- (a) The International Maritime Dangerous Goods Code (IMDG Code);
- (b) The ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TI);

- (c) The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR);
- (d) The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN);
- (e) Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (Appendix C of the Convention concerning international carriage by rail (COTIF)).

More detailed information is given in Part VI of this document (see also annex 1).

II. DANGEROUS GOODS

7. In the now well-recognized and implemented transport of dangerous goods regulatory system, dangerous goods are grouped in 9 main classes, some of which are broken down into divisions. Some dangerous goods possess hazardous properties belonging to several classes.

8. Table 1 shows the variety of commercial or industrial products which are concerned by transport of dangerous goods regulations.

Table 1: Hazard classes/divisions

Class	Danger	Examples
Class 1	Explosives	- All types of military ammunitions, bombs, etc. - Industrial explosives (dynamite etc.) - Fireworks
Class 2:	Gases compressed, liquefied, or refrigerated	
- Division 2.1	Flammable gases	- Propane, LPG - Cigarette lighters
- Division 2.2	Non-flammable, non-toxic gases	- Air, oxygen, nitrogen, helium
- Division 2.3	Toxic gases	- Ammonia, chlorine
Class 3:	Flammable liquids	- Petroleum products - Paints - Alcoholic beverages
Class 4:		
- Division 4.1	Flammable solids	- Sulphur - Matches
- Division 4.2	Substances liable to spontaneous combustion	- Phosphorus - Fish meal, seed cake
- Division 4.3	Substances, which in contact with water, emit flammable gases	- Metal powders - Sodium
Class 5:		
- Division 5.1	Oxidizing substances	- Ammonium nitrate fertilizers - Hydrogen peroxide - Bleaching agents
- Division 5.2	Organic peroxides	- Dibenzoyl peroxide - Catalysts for polyester resin
Class 6:		
- Division 6.1	Toxic substances	- Sodium cyanide - Pesticides
- Division 6.2	Infectious substances	- Cultures of bacteria viruses etc. - Medical diagnostic specimens - Medical wastes
Class 7:	Radioactive material	- Nuclear fuel - Uranium hexafluoride - Medical radioisotopes
Class 8:	Corrosive substances	- Sulphuric acid, caustic soda - Car batteries
Class 9:	Miscellaneous dangerous substances and articles	- Environmentally hazardous substances - Mobile phone/computer batteries

Source: UNECE secretariat.

9. It is rather difficult to provide figures representing the quantities transported at worldwide level since statistics are not collected on a systematic basis, class by class, in all countries, and methodologies differ. Nevertheless, some statistics have been published by the Government of the United States of America, and the European Commission has also started collecting statistics for inland transport, at least in the EU 15 countries.

United States of America¹

10. The Pipeline and Hazardous Materials Safety Administration (PHMSA) estimates the number of hazardous materials² shipments in the United States at more than 800,000 per day (in 1998). Approximately 500,000 daily shipments involve chemical and allied products (SIC 28); about 300,000 involve petroleum products; and at least 10,000 other shipments involve waste hazardous materials, medical wastes and various other hazardous materials.

¹ For the source of information, see acknowledgements on the first page of this document.

² The term "hazardous materials" is used in the United States to designate dangerous goods.

Shipments are defined as equivalent to deliveries, and in most instances may be distinguished from the number of movements, trip segments, or other measures. The estimated number of *movements* associated with these shipments exceeds 1.2 million per day (Table 2).

Table 2: Hazardous materials shipments movements and tons³ (United States) (1997)

Product group	Daily shipments	Daily movements ⁴	Annual tons shipped	Annual tons moved
Chemicals & Allied	500,000	900,000	0.53 billion	0.85 billion
Petroleum products	300,000	300,000	2.60 billion	3.03 billion
Other	10,000	10,000	0.01 billion	0.02 billion
TOTALS	> 800,000	> 1,200,000	>3.1 billion	> 3.9 billion

Source: United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Department wide evaluation of hazardous materials shipments, March 2000.

11. While only about 43% of all hazardous materials *tonnage* is transported by truck, approximately 94% of the individual *shipments* are carried by truck. The air mode, while almost negligible in terms of tonnage, also has a share of individual shipments that greatly exceeds its percentage of tonnage carried: less than 1% of all hazardous materials tonnage but about 5% of all hazardous materials shipments. In contrast, enormous amounts of hazardous materials tonnage are carried by rail, pipeline and water modes, and in some markets they are the only modes that transport hazardous materials products. Yet, the total number of shipments for all three of these bulk commodity modes is less than 1% (Table 3).

³ Based on 1993 Bureau of Census Commodity Flow Survey (CFS) shipment distribution data for standard transportation commodity classification (STCC) 28 ; 1995 CMA tonnage figures (SIC 28); 1995 EPA hazardous waste shipment and manifest data; 1996 DOE Energy Information Administration data; 1996 Waterborne Commerce Statistics; and 1997 BTS Air Carrier Traffic Statistics.

⁴ Movements correspond to the movement of vehicles, rail cars, etc. that carry shipments, and in some cases they are equivalent to shipments.

Table 3: Hazardous materials shipments, movements and tons (short tons) by mode (United States) (1997)

	Shipments	%	Movements	%	Tons Shipped	%	Tons Moved	%
CHEMICALS & ALLIED PRODUCTS								
Truck	445,218	90.3%	830,761	89.36%	808,662	55.52%	894,452	37.30%
Rail	3,723	0.8%	11,169	1.20%	335,070	23.00%	1,005,210	41.92%
Pipeline	34	0.0%	34	0.00%	127,500	8.75%	127,500	5.32%
Water	82	0.0%	164	0.02%	181,279	12.45%	362,558	15.12%
Air	43,750	8.9%	87,500	9.41%	4,049	0.28%	8,098	0.34%
SUBTOTAL -- a	492,807	100%	929,628	100%	1,456,560	100%	2,397,818	100%
PETROLEUM PRODUCTS								
Truck	313,689	99.5%	313,689	99.15%	2,857,470	40.04%	2,857,470	34.39%
Rail	448	0.1%	1,344	0.42%	40,320	0.57%	120,960	1.46%
Pipeline	839	0.3%	839	0.27%	3,146,250	44.09%	3,146,250	37.87%
Water	253	0.1%	506	0.16%	1,091,646	15.30%	2,183,292	26.28%
Air	-	0.0%	-	0.00%	-	0.00%	-	0.00%
SUBTOTAL -- b	315,229	100%	316,378	100%	7,135,686	100%	8,307,972	100%
OTHER HAZMAT								
Truck -- c	10,000	98.6%	10,000	95.9%	43,048	92.43%	43,048	80.27%
Rail	144	1.4%	432	4.1%	3,526	7.57%	10,578	19.73%
Pipeline	-	0.0%	-	0.0%	-	0.00%	-	0.00%
Water	-	0.0%	-	0.0%	-	0.00%	-	0.00%
Air	-	0.0%	-	0.0%	-	0.00%	-	0.00%
SUBTOTAL	10,144	100%	10,432	100%	46,574	100%	53,626	100%
TOTAL HAZMAT								
Truck	768,907	93.98%	1,154,450	91.88%	3,709,180	42.94%	3,794,970	35.27%
Rail	4,315	0.53%	12,945	1.03%	378,916	4.39%	1,136,748	10.57%
Pipeline	873	0.11%	873	0.07%	3,273,750	37.90%	3,273,750	30.43%
Water	335	0.04%	670	0.05%	1,272,925	14.73%	2,545,850	23.66%
Air	43,750	5.35%	87,500	6.96%	4,049	0.05%	8,098	0.08%
DAILY TOTALS -- d,e	818,180	100%	1,256,438	100%	8,638,820	100%	10,759,416	100%
ANNUAL TOTALS -- f	298,635,700		458,599,870		3,153,169,300		3,927,186,840	

Key:

- “ - ” is negligible and, in some instances, might actually be zero.
- a Daily shipment subtotal is rounded to 500,000 in Table 2 and in text.
- b Daily shipment subtotal is rounded to 300,000 in Table 2 and in text.
- c This figure is at least 10,000 and could be as high as 80,000 or more daily shipments. Waste hazardous materials, medical waste, various industrial products and other materials comprise this category. Virtually all shipments in the “Other” hazardous materials category are transported by truck.
- d Daily *shipment* TOTAL rounded to > 800,000 in Table 2 and text.
- e Daily *movement* TOTAL rounded to > 1,200,000 in Table 2 and text.
- f Annual tons *shipped* and *moved* are rounded to > 3.1 billion and > 3.9 billion in Table 2 and text.

Source: Hazardous Materials Shipments (prepared by the Office of Hazardous Materials Safety Research and Special Programs Administration, United States Department of Transportation, October 1998).

**Table 4:
Domestic bulk and packaged shipments and movements by mode of transportation**

Mode	Daily shipments	Percent of total	Daily movements	Percent of total	Daily tons moved	Percent of tons moved
Highway	768,907	94	1,154,450	92	3,794,970	50,69
Air	43,750	5	87,500	7	8,098	0,11
Rail	4,315	<1	12,945	1	1,136,748	15,19
Water	335	<1	670	<1	2,545,850	34,01
Total	817,307		1,245,565		7,485,666	

Source: RSPA Hazardous Materials Shipments, October 1998. The table does not include pipeline data, which account for less than 1 % of total daily shipments and movements (although a greater share of tons and ton-miles. Mode-to-mode comparisons of shipments and movements are not appropriate. For example, Table 4 reports highway shipments and water shipments equally, but a single vessel may contain upwards of 3000 forty-foot truckloads.

Forecasts of growth in hazardous materials movements in the United States

12. A forecast by the Chemical Manufacturers Association (CMA) projects that tons of chemicals produced will grow by 2 % annually. Applying the projected annual growth rate of 2 % to the baseline, the PHMSA estimate of 3.2 billion tons of all hazardous materials shipped in 1996, *including both chemicals and petroleum products*, the forecast is 5.1 billion tons of hazardous materials being shipped by the year 2020, i.e. about 59 % higher. A forecast prepared by Data Resources Inc./McGraw Hill estimated growth of roughly 2.5 % per year through 2003. The second forecast also estimated that air and intermodal growth would be 4 times and 3 times faster, respectively, than overall growth in hazardous materials shipments.

13. Statistics showing the evolution between 1997 and 2002 in this respect were published in the 2002 Commodity Flow Survey. They show the hazardous material shipment characteristics by mode of transport (Table 5), by hazard class (Table 6) and a comparison between shipments of hazardous material versus non-hazardous material (Table 7).

Table 5: Hazardous material shipment characteristics by mode of transport in the United States: 2002 and 1997

[Estimates are based on data from the 2002 and 1997 Commodity Flow Surveys. Because of rounding, estimates may not add up]

Mode of transport	Value			Tons			Ton-miles			Average miles per shipment		
	2002 (million \$)	1997 (million \$)	Percent change	2002 (thousands)	1997 (thousands)	Percent change	2002 (millions)	1997 (millions)	Percent change	2002	1997	Percent change
All modes	660'181	526'679	25.3	2'191'519	1'783'620	22.9	326'727	294'823	10.8	136	110	23.7
Single modes	644'489	510'417	26.3	2'158'533	1'752'056	23.2	311'897	273'865	13.9	105	89	17.1
Truck (1)	419'630	325'166	29.1	1'159'514	959'199	20.9	110'163	82'211	34.0	86	70	23.7
For-hire truck	189'803	144'469	31.4	449'503	369'991	21.5	65'112	49'238	32.2	285	251	13.4
Private truck	226'660	177'144	28.0	702'186	577'003	21.7	44'087	31'948	38.0	38	35	8.0
Rail	31'339	34'937	-10.3	109'369	102'508	6.7	72'087	78'619	-8.3	695	837	-17.0
Water	46'856	33'071	41.7	228'197	167'716	36.1	70'649	63'089	12.0	S	S	S
Air (includes truck and air)	1'643	8'591	-80.9	64	74	-12.5	85	100	-15.4	2'080	1'455	42.9
Pipeline (2)	145'021	108'653	33.5	661'390	522'560	26.6	S	S	S	S	S	S
Multiple modes	9'631	7'203	33.7	18'745	12'266	52.8	12'488	S	S	849	652	30.2
Parcel, U.S.P.S. or courier	4'268	3'184	34.0	245	202	21.2	119	93	27.3	837	697	20.1
Other multiple modes	5'363	4'019	33.4	18'500	12'064	53.4	12'369	S	S	1'371	168	718.4
Other and unknown modes	6'061	9'058	-33.1	14'241	19'298	-26.2	2'342	1'885	24.2	57	33	73.2

Key:

“-“ : Represents an estimate equal to zero or less than 1 unit of measure.

“S” : Estimate does not meet publication standards because of high sampling variability or poor response quality.

(1) "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of private and for-hire truck.

(2) Estimates for pipeline exclude shipments of crude petroleum.

Source: Bureau of Transportation Statistics (USDOT) and U.S. Census Bureau, 2002 Commodity Flow Survey, Hazmat Data, December 2004.

Table 6 :
Hazardous material shipment characteristics by hazard class: 2002 and 1997

[Estimates are based on data from the 2002 and 1997 Commodity Flow Surveys. Because of rounding, estimates may not add up]

Hazard class and description	Value			Tons			Ton-miles			Average miles per shipment		
	2002 (million \$)	1997 (million \$)	Percent change	2002 (thousands)	1997 (thousands)	Percent change	2002 (millions)	1997 (millions)	Percent change	2002	1997	Percent change
Total	660'181	526'679	25.3	2'191'519	1'783'620	22.9	326'727	294'823	10.8	136	110	23.7
Class 1, Explosives	7'901	5'584	41.5	5'000	1'718	191.0	1'568	S	S	651	771	-15.6
Class 2, Gases	73'932	47'288	56.3	213'358	137'138	55.6	37'262	26'002	43.3	95	60	58.7
Class 3, Flammable liquids	490'238	386'994	26.7	1'788'986	1'450'591	23.3	218'574	184'824	18.3	106	69	54.3
Class 4, Flammable solids	6'566	4'238	54.9	11'300	14'832	-23.8	4'391	9'735	-54.9	158	660	-76.0
Class 5, Oxidizers and organic peroxides	5'471	4'485	22.0	12'670	9'239	37.1	4'221	4'471	-5.6	407	193	111.2
Class 6, Toxic (poison)	8'275	10'085	-18.0	8'459	6'366	32.9	4'254	2'824	50.6	626	403	55.2
Class 7, Radioactive materials	5'850	2'722	114.9	57	87	-35.1	44	48	-8.8	S	445	S
Class 8, Corrosive materials	38'324	41'336	-7.3	90'671	98'331	-7.8	36'260	42'918	-15.5	301	205	46.7
Class 9, Miscellaneous dangerous goods	23'625	23'946	-1.3	61'018	65'317	-6.6	20'153	22'727	-11.3	368	323	13.9

Key:

“-“: Represents an estimate equal to zero or less than 1 unit of measure.

“S” : Estimate does not meet publication standards because of high sampling variability or poor response quality.

Source: Bureau of Transportation Statistics (USDOT) and U.S. Census Bureau, *2002 Commodity Flow Survey*, Hazmat Data, December 2004.

**Table 7:
Hazardous versus non-hazardous material shipment characteristics by mode of transport in the
United States (2002)**

[Estimates are based on data from the 2002 Commodity Flow Survey. Because of rounding, estimates may not add up]

Mode of transport	Tons					Ton-miles				
	Total (thousands)	Hazardous		Non-hazardous		Total (millions)	Hazardous		Non-hazardous	
		2002 (thousands)	Percent	2002 (thousands)	Percent		2002 (millions)	Percent	2002 (millions)	Percent
All modes	11'667'919	2'191'519	18.8	9'476'400	81.2	3'137'898	326'727	10.4	2'811'171	89.6
Single modes	11'086'660	2'158'533	19.5	8'928'127	80.5	2'867'938	311'897	10.9	2'556'041	89.1
Truck (1)	7'842'836	1'159'514	14.8	6'683'322	85.2	1'255'908	110'163	8.8	1'145'745	91.2
For-hire truck	3'657'333	449'503	12.3	3'207'830	87.7	959'610	65'112	6.8	894'498	93.2
Private truck	4'149'658	702'186	16.9	3'447'472	83.1	291'114	44'087	15.1	247'027	84.9
Rail	1'873'884	109'369	5.8	1'764'516	94.2	1'261'612	72'087	5.7	1'189'525	94.3
Water	681'227	228'197	33.5	453'030	66.5	282'659	70'649	25.0	212'011	75.0
Air (includes truck and air)	3'760	64	1.7	3'696	98.3	5'835	85	1.5	5'751	98.5
Pipeline (2)	684'953	661'390	96.6	23'563	3.4	S	S	S	S	S
Multiple modes	216'686	18'745	8.7	197'941	91.3	225'715	12'488	5.5	213'228	94.5
Parcel, U.S.P.S. or courier	25'513	245	1.0	25'268	99.0	19'004	119	0.6	18'885	99.4
Other multiple modes	191'173	18'500	9.7	172'673	90.3	206'712	12'369	6.0	194'343	94.0
Other and unknown modes	364'573	14'241	3.9	350'332	96.1	44'245	2'342	5.3	41'903	94.7

Key:

“—“ : Represents an estimate equal to zero or less than 1 unit of measure.

“S” : Estimate does not meet publication standards because of high sampling variability or poor response quality.

- (1) "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of private and for-hire truck.
- (2) Estimates for pipeline exclude shipments of crude petroleum.

Source: Bureau of Transportation Statistics (USDOT) and U.S. Census Bureau, *2002 Commodity Flow Survey*, Hazmat Data, December 2004.

European Union 1990 – 2002

14. In the European Union, the data currently available concern mainly EU 15 countries so far. The following conclusions were reported in the final report on the “Evaluation of EU Policy on the Transport of Dangerous Goods since 1994” published by the European Commission (TREN/E3/43 – 2003).

Dangerous goods transport by mode

15. From 1990 to 2002 the transport of dangerous goods in the EU 15 has increased from 98.3 billion tonne-kms in the year 1990 to 111.1 billion tonne-km in the year 2002 (+ 13.0 %). The highest increase was by road (+ 27.4 %), followed by inland waterways (+ 11.1 %) and rail (-9.4 %). The market share of road transport in all transport of dangerous goods has increased from 51 % in 1990 to 58 % in 2002.

Share of dangerous goods transport by mode

16. From 1990 to 2002 the share of dangerous goods has decreased from 9.1 % to 7.8 % meaning that transport of dangerous goods is increasing more slowly than the whole transport market. The growth rate from 1990 to 2002 for the total market is 31 % whilst dangerous goods increased by 13 % only.

Dangerous goods transport by dangerous goods class and mode

17. According to Table 8 ‘Petroleum Products’ are by far the most important dangerous goods class accounting for 54 % of all dangerous goods moved in 2002. The next most important classes are ‘Gases’ (12 %), ‘Flammable liquids’ (10 %, belonging to class 3, but no petroleum products) and ‘Corrosive substances’ (8 %). Nearly 85 % of all dangerous goods are included in these four most important dangerous goods classes. Transport of classes 5.2 ‘Organic peroxides’, 6.2 ‘Infectious substances’ and 7 ‘Radioactive material’ are not reported.

18. For dangerous goods of class 1 (explosives) transport volumes are higher than production in the EU, which amounts to about 0.3 to 0.4 million tonnes per year. This is due to a remarkable level of imports, probably from East Asia, and their consequential effect on distribution.

Table 8: Development of dangerous goods transport in the EU-15 by dangerous goods class and mode (in billion tonne-km)

Dangerous Goods Classes	Total				Road			
	1990	1994	1998	2002	1990	1994	1998	2002
10 Explosives substances and articles	0.5	0.5	0.7	0.8	0.4	0.4	0.5	0.7
20 Gases	10.0	10.8	15.4	13.8	5.3	5.5	8.2	7.7
30 Flammable liquids	16.8	9.9	10.3	10.7	4.5	5.8	5.9	5.9
31 Petroleum Products	50.3	57.6	57.7	60.3	27.2	31.8	31.7	34.3
41 Flammable solids	2.8	2.9	4.2	3.4	1.1	1.4	2.0	1.5
42 Substances liable to spont. combustion	0.9	2.1	2.1	2.9	0.7	1.8	1.6	2.6
43 Substances emitting flammable gases	0.3	0.3	0.5	0.4	0.2	0.2	0.4	0.3
51 Oxidising substances	1.1	1.6	2.0	1.8	0.8	1.1	1.6	1.4
61 Toxic substances	1.0	3.8	4.5	4.0	0.4	1.6	1.9	1.8
80 Corrosive substances	9.2	8.5	9.5	8.9	6.5	5.8	6.2	5.7
90 Miscellaneous dangerous substances	5.3	6.5	5.7	4.1	3.3	2.9	2.7	2.3
00 Total	98.3	104.5	112.6	111.1	50.4	58.2	62.7	64.2

Dangerous Goods Classes	Rail				Inland Waterways			
	1990	1994	1998	2002	1990	1994	1998	2002
10 Explosives substances and articles	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0
20 Gases	3.8	4.1	5.7	4.5	1.0	1.3	1.5	1.5
30 Flammable liquids	11.4	3.3	3.2	3.5	1.0	0.8	1.2	1.4
31 Petroleum Products	9.9	11.2	11.8	12.8	13.2	14.6	14.2	13.2
41 Flammable solids	1.6	1.1	1.7	1.5	0.2	0.4	0.6	0.4
42 Substances liable to spont. combustion	0.1	0.1	0.2	0.1	0.1	0.2	0.3	0.2
43 Substances emitting flammable gases	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
51 Oxidising substances	0.3	0.4	0.3	0.3	0.0	0.1	0.1	0.1
61 Toxic substances	0.5	2.0	2.2	1.9	0.1	0.2	0.3	0.3
80 Corrosive substances	1.8	1.9	2.2	2.0	0.9	0.8	1.1	1.2
90 Miscellaneous dangerous substances	1.4	3.0	2.3	1.1	0.7	0.6	0.7	0.7
00 Total	30.8	27.4	29.7	27.9	17.1	18.9	20.1	19.0

Source: "Evaluation of EU Policy on the Transport of Dangerous Goods since 1994" published by the European Commission (TREN/E3/43 – 2003).

General observations

19. From the statistics available in the United States and in Europe, it appears that:
- (a) Transport of dangerous goods is increasing regularly;
 - (b) The highest volumes transported are energy products (petroleum products, flammable gases), followed by flammable liquids and gases other than energy products, and by corrosive substances;
 - (c) Road transport is by far the most used inland transport mode, not only in terms of quantities carried but especially in terms of number of shipments.

Other remarks

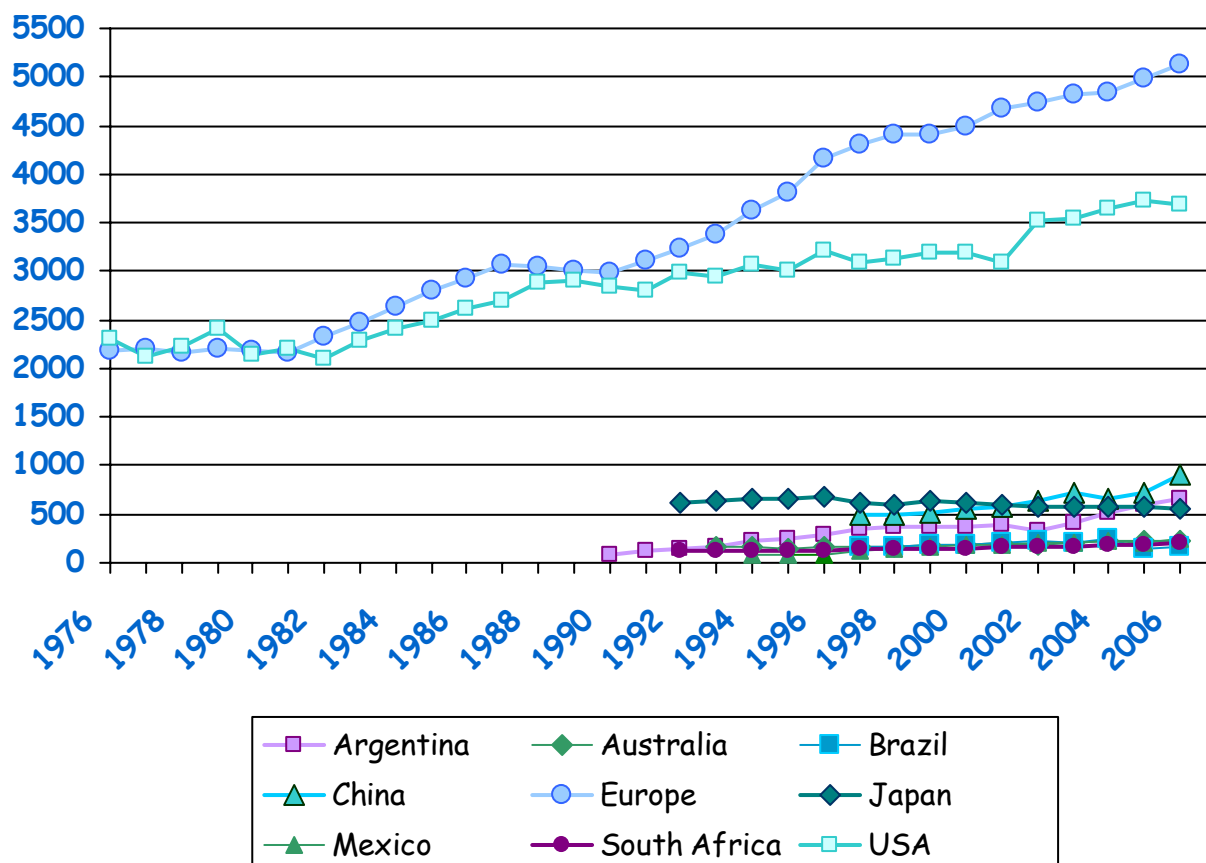
20. The data available for the European Union do not concern air or maritime transport. For the United States, they do not concern imports or exports, which means that they are not representative of maritime traffic which is mostly international. The International Maritime Organization (IMO)⁵ estimated in 1989 that more than 50 % of the cargoes transported by sea

⁵ Focus on IMO, *the Safe Transport of Dangerous, Hazardous and Harmful Cargoes by Sea*, August 1989.

could be regarded as dangerous, hazardous and/or harmful under the IMO classification criteria, but this estimation probably included not only carriage in packaged form, but also bulk carriage by oil tankers, chemical tankers and gas tankers, and solid bulk cargoes in bulk carriers.

21. For transport in Europe, it is also unclear whether or not the statistics take account of dangerous goods packed in limited quantities. In Europe, no specific mention of these goods is required in the transport document. When the quantity per packaging falls below a certain limit the transport of dangerous goods packed in limited quantities may benefit from certain exemptions from some regulations. Examples are dangerous goods such as perfumes, paints, aerosol dispensers, etc. which are delivered to retail shops or supermarkets for sale to the public. Nevertheless, the quantities carried are also important. Most aerosol dispensers are carried in accordance with these exemptions. Figure 1 shows the quantities of aerosol dispensers produced in the world and therefore carried.

Figure 1:
World production of aerosol dispensers (in millions of items)



Source: Federation of European Aerosols (FEA).

III. DANGEROUS GOODS ACCIDENTS

22. Although in recent years there have been relatively few major accidents involving dangerous goods, dangerous goods have been involved in some of the worst disasters in transport history.

Halifax, 1917

23. By the end of 1917, with the World War I at its height, the 3000 ton freighter *Mont Blanc*, heavily overloaded with more than 2600 tons of explosives, entered Halifax harbour in Canada on her way from the United States to Europe. She collided with another ship, the *Imo*, and caught fire.

24. There were two explosions, as a result of which 1250 people were killed and 15 ships destroyed or damaged.

Texas City, 1947

25. With the end of World War II, demand fell off for ammonium nitrate, a raw material for the production of various explosives. However, the substance is also widely used as an agricultural fertilizer and in the immediate post-war period vast quantities were shipped from the United States to Europe, where it was urgently needed.

26. The freighter *Grandcamp* was one of many ships used for this purpose and in April 1947 was being loaded with ammonium nitrate in the port of Texas City. A fire started in one of the holds and spread. By the time the fire department had been called it was too late: less than an hour later the ship exploded with such force that two light planes flying overhead were destroyed by the blast. The explosion also blew the hatch covers off another ship, the *High Flyer*, which was moored 200 yards away and was also carrying ammonium nitrate. She caught fire and subsequently blew up.

27. A total of 468 people were killed, mostly as a result of the first explosion.

Los Alfaques, 1978

28. In July 1978, a road tanker transporting liquefied propylene sprang a leak as it passed a camp site at Los Alfaques in Spain. It was the peak of the summer tourist season and the camp site was crowded.

29. The leak resulted in some of the liquefied gas escaping and pouring rapidly across the camp site in a huge cloud, which immediately ignited – possibly as a result of coming into contact with flames from one of the many camp stoves in use at the time.

30. The explosion resulted in a fireball some 200 yards in diameter which was so intense that more than 200 people were burnt to death. The devastation spread for 400 yards in all directions.

31. Yet the lorry was carrying only 43 cubic metres of liquefied gas. Some ships carry 125,000 cubic metres or even more.

Mississauga

32. On 10 November 1979, a train of 106 wagons derailed at night in the city of Mississauga (Canada). The first derailed wagon was a tank-wagon loaded with toluene (flammable liquid). It took with it 23 other wagons into the derailment, 19 of which were tank-wagons loaded with dangerous goods. Fire spread through most of the derailed cars; three of which were loaded with propane (flammable gas) and exploded in a fireball causing considerable damage to neighbouring property. One tank-wagon loaded with chlorine (toxic gas) suffered a hole in its shell 2.5 feet in diameter, and because of the fear of the consequence of the escape of this gas, almost 250 000 people from the city were evacuated from their homes and businesses for up to 5 days.

More recent accidents

33. Fortunately, such catastrophic accidents do not happen very often, and the development of regulations based on the UN Recommendations on the Transport of Dangerous Goods has effectively reduced the number of occurrences and minimized their effects. Nevertheless, zero risk does not exist, as shown for example by the **Tauern tunnel fire** in May 1999 in **Austria**, where the crash of a lorry carrying paint into cars in the tunnel entailed the death of 12 persons, injuries to 50 persons, the closure of the tunnel for 3 months and an economic cost of 17 million German marks for the reconstruction and renovation of the tunnel.

34. Other accidents have recently occurred in developing countries where the regulatory system was almost inexistent, e.g. in **Bangkok, Thailand** (25 September 1990, crash of a tank-vehicle carrying LPG, 63 deaths, 90 persons injured) or **Yaounde, Cameroun** (14 February 1998, railway accident involving petroleum products, 220 deaths, 130 persons injured).

35. Accidents also have negative effects on the environment. Catastrophic pollution of the sea caused by oil spillages from the **Torrey-Canyon, Amoco Cadiz, Exxon Valdez, and Erika** are very well-known examples, but small spillages of highly toxic substances may also have disastrous effects.

36. In 1998, a truck carrying sodium cyanide to a gold mine plunged off a bridge in **Kyrgyzstan**, and around 1800 kg of highly toxic sodium cyanide were spilled into a river upstream of a number of villages. Several hundred people later had to seek medical treatment due to contamination of the water, and the effect on the fauna is likely to have been disastrous.

Accident data in the United States

37. In the United States, PHSMA estimates there are roughly 300 million hazardous materials shipments each year totalling approximately 3.2 billion tons and the vast majority of these shipments arrive at their destinations safely.⁶ In 1998, there were 15,322 incidents, including 429 serious incidents, 13 deaths and 198 injuries. Although this is a relatively good safety record, given the number of shipments and movements, there remains the potential for catastrophic incidents in the transport of hazardous materials with multiple fatalities, serious injuries, large-scale evacuations, and other costs to society as possible results. For example:

⁶ All data used that provide a measure of the volume of hazardous materials in transportation such as shipments, movements, and tons, represent domestic quantities only.

- (a) Chemical oxygen generators on a commercial airliner ignited causing the crash of ValuJet Flight 592 into the Florida Everglades in 1996 killing 110 passengers and crew;
- (b) Unleaded gasoline spilled during unloading of a cargo tank in Biloxi, Mississippi, in 1998 resulting in 5 hazardous materials fatalities, the evacuation of over 80 people, and the closure of an interstate highway;
- (c) Phosphoric acid being transported in intermodal freight containers on a barge were lost over the side or crushed in heavy seas in April 1998. Cleanup costs in the Morgan City, Louisiana, area totalled almost \$1 million;
- (d) A flatbed tractor-trailer hauling black powder in an intermodal freight container overturned on Interstate-95 in Springfield, Virginia, in June 1999, inconveniencing 250,000 highway users and costing society \$25 million due to traffic delays even though there was no release of hazardous materials;
- (e) Over 16,250 gallons of chlorine were released when a freight train derailed in Alberton, Montana, in April 1996 resulting in 1 fatality, 787 hospitalizations, 1,000 evacuations, and over \$4.5 million in cleanup costs.

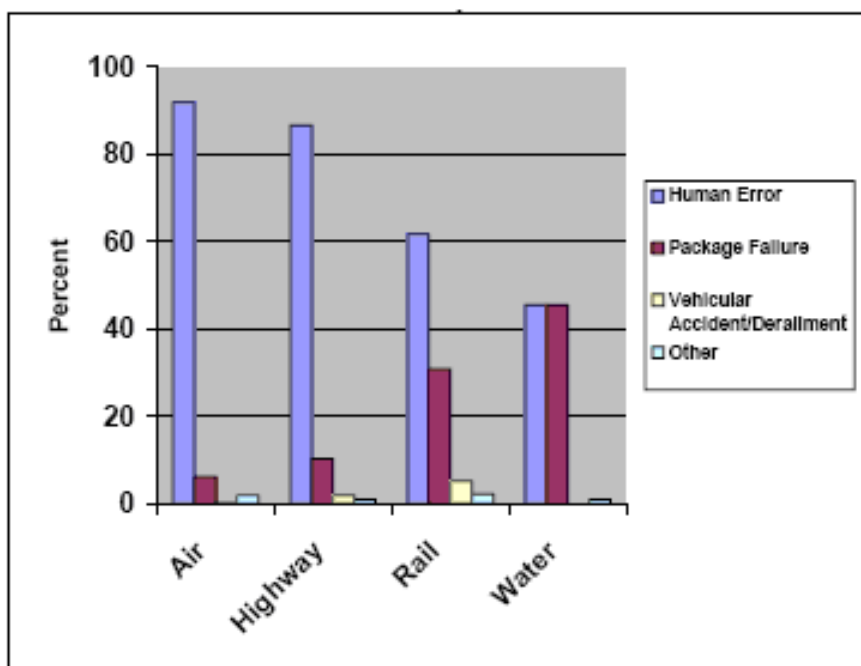
Table 9: Serious hazardous material incident history from 1990 through 1998 in the United States

Year	Total reported incidents	Number of serious incidents	Number of fatalities	Number of injuries	Number of persons evacuated	Amount of property damage
1990	8,879	402	8	423	12,123	\$32,353,276
1991	9,110	403	10	439	10,502	\$38,350,611
1992	9,310	375	15	600	29,186	\$35,164,057
1993	12,830	357	15	627	18,237	\$22,801,551
1994	16,087	429	11	577	18,398	\$44,185,413
1995	14,743	409	7	400	11,444	\$30,903,281
1996	13,950	464	120 ¹	1,175 ²	19,556	\$46,849,243
1997	13,994	417	12	225	24,587	\$33,393,504
1998	15,322	429	13	198	9,181	\$45,497,550
Total	114,225	3,685	211	4,664³	153,214	\$329,498,486

Source: RSPA, Biennial Reports on Hazardous Materials Transportation, and RSPA Hazardous Materials Information System incident database as of October 21, 1999.

1. 110 deaths were the result of the ValuJet crash in 1996.
2. A single rail incident in Montana involving chlorine resulted in injuries to 787 people.
3. In summarizing serious incident injuries for the biennial report, RSPA combines hospitalization (serious) injuries with minor injuries.

Figure 2
Incident Cause by Mode - 1998



Source: Source: RSPA HMIS incident database as of October 21, 1999.

IV. REGULATORY MEASURES TO INCREASE SAFETY AND PROTECTION OF THE ENVIRONMENT

A. General

38. Safety – and protection of the environment – during the transport of dangerous goods may be ensured through:

- (a) The use of containment systems of good quality, adapted to the danger presented by the goods to be transported and compatible with them, meeting the construction requirements and the performance tests or other tests contained in the UN Model Regulations on the Transport of Dangerous Goods, as appropriate, in order to withstand stresses, impacts and other wear and tear to which packages may be submitted during normal conditions of transport. Failure of containment systems can lead to leakage or spillages or even explosion of the containment system itself in case of pressure build-up.

The means of transport themselves may also have to meet certain safety requirements depending on the goods carried (e.g. tank-vehicles, holds of ships, maritime or inland navigation tankers);

- (b) Good operational practices;
- (c) An adequate hazard communication system (labelling, marking, placarding, documentation) which provides appropriate information to:
 - (i) Transport workers involved in dangerous goods handling;

- (ii) Emergency responders who have to take immediate action in case of incidents or accidents;
- (d) Training of transport workers and all participants involved in a chain of transport of dangerous goods;
- (e) Effective control and enforcement by competent authorities.

B. Containment systems

39. Distinction can be made between:

- (a) Packagings for dangerous goods packed in limited quantities;
- (b) “Classic” packagings (up to 400 kg/450 litres) such as drums, boxes, etc.
- (c) Intermediate bulk packagings (IBCs) and large packagings (up to 3000 kg/3000 l);
- (d) Tanks (including tank-containers, tanks of tank wagons and tank-vehicles);
- (e) Cargo tanks or bulk holds of sea-going or inland navigation tankers or bulk carriers (not addressed by the UN Model Regulations; covered by specific IMO or UNECE instruments (SOLAS, MARPOL, IBC Code, IGC Code and BC Codes; ADN));
- (f) Pipelines (not covered by the UN Model Regulations nor related international legal instruments).

40. Packagings for dangerous goods packed in limited quantities have to meet certain construction standards, but they are not required to be certified.

41. All other packagings, including IBCs, large packagings used for the transport of dangerous goods internationally, have to be manufactured to a design type which has been tested according to the UN Model Regulations and certified (“UN” mark) by the competent authority of the countries of design type approval.

42. The performance tests include e.g. drop tests, stacking tests, leakproofness tests, hydraulic pressure tests, depending on the type of dangerous goods to be carried and the degree of danger (three degrees of danger, Packing Groups I, II and III).

43. The packaging requirements have of course important economic implications as dangerous goods packagings are much more expensive than ordinary packagings. In Europe, the figures in Table 10 give an idea of the yearly market for some types of packagings designed for the carriage of dangerous goods.

Table 10: European market for some specific types of “UN” certified dangerous goods packagings

Plastics drums	Steel drums	Flexible IBCs (“Big bags”)	Other IBCs
11 million	45 million	5 million	3.8 million

Source: Estimates provided by representatives of the International Confederation of Plastics Packaging Manufacturers (ICPP) and by the European Association of Steel Drum Manufacturers (SEFA).

44. Gas receptacles and portable tanks used for the international carriage of liquids, gases or granular or powdery solids and bulk packagings for solids also have to meet requirements contained in the UN Model Regulations and be approved accordingly, although in Europe there exist alternative requirements which may be applied for international inland transport only (e.g. ADR/RID gas receptacles and tank-containers).

45. The European Industrial Gases Association (EIGA) reports that its companies fill, store, transport and maintain an inventory of about 40 million cylinders to serve the market, and these cylinders are moved several times a year for refilling. To supply in bulk or in cylinders its 4 million customers at its 4.5 million delivery points, they operate a fleet of 14 000 vehicles covering 500 million km per year.

46. Similarly the European Association of Liquid Petroleum Gases (AEGPL) reports that its companies fill, store, transport and maintain 200 million gas cylinders per year (involving a fleet of 20 000 to 30 000 vehicles for delivery) and operate a fleet of 9700 road tank vehicles for bulk carriage.

47. For carriage of all kind of dangerous goods in tanks, 150 000 railway tank-wagons are operating in the EU, and 3000 new tank-wagons are built in Europe every year, according to a representative of the International Union of Private Wagons (UIP).

C. Operational requirements

48. Since the UN Model Regulations are intended to apply to all modes of transport, the operational requirements contained therein are only those relevant for all modes, mainly concerning the use of packagings, bulk packagings and tanks.

49. The regulations which are based on the UN Model Regulations usually contain additional requirements specific to the mode of transport, e.g.:

- (a) For maritime transport: stowage and segregation; restrictions on passenger ships; some restrictions on quantities allowed for certain packagings; provisions in the event of incidents and for fire precautions;
- (b) For air transport: stowage and segregation; restrictions on quantities allowed per packaging; passenger aircraft restrictions;
- (c) For road and rail transport in Europe: possibilities of using alternative construction tanks (RID/ADR tanks); use of fibre reinforced plastic tanks; use of vacuum operated waste tanks; provisions concerning loading, unloading and handling; requirements for vehicle crew and equipment; restrictions for the passage of vehicles through road tunnels; supervision of vehicles;

- (d) For inland navigation (ADN): requirements for loading, carriage, unloading and handling of cargo on board dry cargo vessels or tank vessels; provisions concerning vessel crew and equipment.

D. Hazard communication

50. Hazard communication in the transport of dangerous goods consists in:

- (a) Affixing appropriate hazard label(s) on the packages (see annex 2);
- (b) Marking the UN (identification) number of the goods on the package, and (except for inland transport in Europe) the “Proper Shipping Name”;
- (c) Affixing placards identical to hazard labels but of a bigger format on the cargo transport units (vehicles, wagons, containers, tanks) and displaying, either on these placards or on separate orange plates, the UN identification number;
- (d) Providing details of the dangerous goods offered for shipment in the transport document (i.e. UN No., name, hazard class, etc).

51. The labels, marks and placards provide information to transport workers as to the dangerous nature of the consignments, and help them in deciding how to stow such goods in the means of transport and checking compliance with relevant stowage and segregation requirements. They also provide essential information to emergency responders since the UN number itself provides sufficient information for immediate emergency action. Databases and guide books have been published in order to provide emergency responders with appropriate emergency action guidelines, on the basis of the UN number (e.g. North American Emergency Response Guidebook, IMO Emergency Procedures for Ships carrying Dangerous Goods (EmS) and Medical First Aid Guide for Use in Accidents involving Dangerous Goods (MFAG), ICAO Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods).

52. For road transport in Europe (ADR), drivers also have to be provided with instructions in writing informing them of the nature of the danger presented by the cargoes, proper use of personal protection equipment, action to be taken to protect themselves and to inform road users and emergency response services, first aid and how to deal with minor leakages or minor fires if this can be done without personal risk.

53. The information which has to be entered in the transport document by the consignor allows the carrier to take appropriate steps to comply with the transport requirements applicable to the dangerous goods carried. It is also an important tool for advance planning in particular for multimodal transport, for emergency response, and for control by authorities.

E. Training

54. As shown by accident statistics, one of the main causes of accidents in the transport of dangerous goods is human error. The UN Model Regulations and the related legal instruments require that all persons engaged in the transport of dangerous goods receive training in the contents of dangerous goods requirements commensurate with their responsibilities and they lay down specific provisions regarding general awareness/familiarization training, function specific training, safety training, records of training, etc. This training can be provided by the employer and concerns all persons

involved in classification, packing, filling, labelling, documentation etc. as well as drivers and transport workers in general.

55. In Europe, additional mandatory and certified training is required for drivers of road vehicles (ADR driver training certificate). This involves mandatory initial training for about three days and examination for all drivers of vehicles carrying certain quantities of dangerous goods; two-day refresher courses and a new examination every five years; additional training is required for drivers of tank vehicles, vehicles carrying explosives and vehicles carrying radioactive material.

56. For inland navigation, experts are required to be on board chemical and gas tankers (under ADN), and these experts also have to undergo training every 5 years and to pass examinations.

57. Finally, in Europe, in all countries applying ADR, RID or ADN, each undertaking, the activities of which include the carriage, or the related packing, loading, filling or unloading of dangerous goods, has to appoint one or more dangerous goods safety advisers (DGSA) for the carriage of dangerous goods, responsible for helping to prevent the risks inherent in such activities with regard to persons, property and the environment. These DGSAs also have to hold a vocational training certificate issued after examination which has to be renewed every five years.

58. Apart from the safety benefits that result from these various training requirements, it is important to note that they also have important economic and social implications. They have of course a cost for the various employers concerned, but they also raise significantly the professional qualifications of the workers trained.

F. Controls

1. General

59. The UN Model Regulations do not contain recommendations as regards the control of the compliance by the various participants in a transport chain with the various requirements, since the legal requirements to be applied are contained in international conventions or national legislation.

60. Controls or other enforcement actions are normally carried out under the direct responsibility of national authorities designated for these purposes. The number of controls and the level of penalties in case of infringement may vary considerably from one country to the other, but controls are deemed necessary to ensure compliance. They are also an effective tool in revealing problems connected with the safety of the transport of dangerous goods or with the practicability of regulations, and in improving them.

61. Some guidance may be found in Chapter 1.8 of ADR, RID and ADN on how to carry out control operations without causing major disruption of transport services. ADR, RID and ADN also require their Contracting Parties to agree on mutual administrative support for the implementation of these legal instruments.

62. Problems of compliance occur very often in countries where the requirements applicable to international transport by one mode of transport differ from those applicable nationally to domestic transport by the same mode. This problem no longer exists in EU countries since all domestic regulations have been replaced by ADR and RID for road and

rail transport (and soon by ADN for inland waterway transport). This is nevertheless still a problem in many European countries outside the EU, and in particular for the controls in international transport by road since road transport controllers themselves may be confused when checking vehicles involved in international transport if the regulations are not the same as those they are used to when checking vehicles involved in domestic traffic. Harmonization of national and international rules, in particular in the road sector is therefore an important factor not only for better compliance with safety requirements but also for transport facilitation.

2. Controls in the United States

63. According to PHMSA, there are approximately 47,000 firms shipping significant quantities of hazardous materials. This figure, however, does not include small or occasional shippers. The figure of 75,000 represents the total of hazardous materials shippers in the United States. However, this figure may be understated because many “firms” or shippers have multiple business locations.

64. PHMSA also estimates that there are approximately 500,000 potential carriers of hazardous materials in the United States. About 43,000 carriers are dedicated hazardous materials transporters that primarily move petroleum products and corrosives in cargo tank trucks. Yet, every carrier can knowingly, or even unknowingly, carry hazardous materials. Table 11 shows the number of hazardous materials carriers which could potentially carry hazardous materials.

Table 11: Number of potential hazardous materials carriers (United States)

Mode	Number of carriers
Air*	3,500
Highway	497,908
Rail	559
Marine	1,300
Total	503,267

* Includes both domestic and foreign carriers with the potential to carry hazardous materials.

Sources: FAA Air Carrier data; FMCSA National Carrier Census Summary Report; FRA Inspection Database; and U.S. Army Corps of Engineers Waterborne Transportation Lines of the United States, Calendar Year 1997, Volume 1, National Summary.

65. Approximately 444,000 vehicles and vessels are dedicated to hazardous materials transport in the United States, primarily highway tank trucks and railroad tank cars. Potentially, another 7.6 million vehicles, vessels, and aircraft could carry hazardous materials on a periodic basis. When one considers the potential for hazardous materials to be undeclared, either due to economics or lack of knowledge, any vehicle, vessel, or aircraft could carry hazardous materials. The fleet breakdown for hazardous materials by mode in the United States is shown in Table 12.

Table 12: Hazardous materials fleet/vehicles (United States)

Mode	Dedicated HM Fleet/Vehicles	Additional potential HM fleet	Total potential fleet
Truck	195,000	6,436,000	6,631,000
Rail	238,000	1,078,000	1,316,000
Waterborne ¹	11,000	68,000	79,000
Air (commercial aircraft) ^{2,3}	0	12,000	12,000
Total	444,000	7,594,000	8,038,000

¹ Represents both United States and foreign flag vessels including barges.

² The figures are based on the air fleet of carriers who "will carry" hazardous materials.

³ Aircraft are not typically dedicated to hazardous materials transport.

Source: United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Department wide evaluation of hazardous materials shipments, March 2000.

66. The US administration carried out about 250 000 inspections in 1998 (all modes of transport) (see Table 13), which showed 95 361 violations. 40% of the violations were attributed to shipper functions, 37% to either the shipper or the carrier, and almost 23% to the carrier (see Table 14).

**Table 13: Number of inspections by point of intervention
(United States, all modes) – 1998**

Point of Intervention				
Packaging/Manufacturing	Shipper	Carrier/Forwarder	Vehicles/ Railcars	Total
614	5,228	19,299	223,307	248,448

Source: United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Department wide evaluation of hazardous materials shipments, March 2000.

Table 14: Violations detected in 1998 (United States, all modes)

Section	Description	Total
<i>Shipper violations</i>		
	Special provisions	10
	Shipping papers	17,036
	Marking	5,774
	Labelling	2,077
	Emergency response	6,647
	General requirements – shipping and packing	6,418
	Specifications for tank bars	269
Percentage of total violations		40.1%
<i>Shipper or carrier violations</i>		
	Program procedures	3,141
	General	2,986
	Placarding	19,972
	Training	3,865
	Specifications for packagings	2,515
	Maintenance of packages	2,851
Percentage of total violations		37.0%
<i>Carrier violations</i>		
		21,800
Percentage of total violations		22.9%
Total		
		95,361

Source: United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Department wide evaluation of hazardous materials shipments, March 2000.

3. Road checks in Europe

67. EU Council Directive 95/50/EC on uniform procedures for checks on the transport of dangerous goods by road requires EU Member States to report on its application. The last report to the European Parliament and the Council published by the European Commission (COM (2007) 795, of 13 December 2007) shows that the number of infringements per check may vary depending on the country from 0.02 to nearly 2. The data provided include only road checks and not checks on the premises (see Table 15). They do not provide information on the gravity of the violation.

Table 15: Time series (1997 – 2005) of the number of checks on infringements and penalties registered in each EU Member State

COUNTRY		1997	1998	1999	2000	2001	2002	2003	2004	2005	'97-'99	'00-'02	'03-'05
AT	Checks	5698	6062	6720	7666	5940	6671	5831	5420	5273	18480	20277	16524
	Infring.	3834	6043	11913	10542	6923	8271	13973	14653	n.a	21790	25736	28626
	Penalties	2317	3094	5630	7514	3825	2647	2647	5362	3041	11041	13986	11050
BE	Checks	1163	1624	2544	2414	2762	2594	2919	3417	3835	5331	7770	10171
	Infring.	1331	1548	2243	2450	2582	2338	1167	1445	1536	5122	7370	4148
	Penalties	0	0	0	0	0	0	0	1342	1306	0	0	2648
CY	Checks	0	0	0	0	0	0	0	0	0	0	0	0
	Infring.	0	0	0	0	0	0	0	0	0	0	0	0
	Penalties	0	0	0	0	0	0	0	0	0	0	0	0
CZ	Checks	0	0	0	0	0	0	0	11334	17796	0	0	29130
	Infring.	0	0	0	0	0	0	0	1271	1615	0	0	2886
	Penalties	0	0	0	0	0	0	0	1187	855	0	0	2042
DE	Checks	126533	129758	131161	115786	98005	93247	106653	103975	88915	387452	307038	299543
	Infring.	21849	24020	24351	21467	18279	19929	21556	20617	16418	70220	59675	58591
	Penalties	19408	17701	19014	14144	14773	14903	19660	20594	16418	56123	43820	56672
DK	Checks	275	251	274	242	94	203	311	621	708	800	539	1640
	Infring.	80	70	67	28	47	25	80	197	410	217	100	687
	Penalties	66	73	67	28	40	25	32	104	232	206	93	368
EE	Checks	0	0	0	0	0	0	0	74	67	0	0	141
	Infring.	0	0	0	0	0	0	0	74	67	0	0	141
	Penalties	0	0	0	0	0	0	0	74	67	0	0	141
EL	Checks	0	0	0	0	0	0	96	211	1106	0	0	1413
	Infring.	0	0	0	0	0	0	25	21	81	0	0	127
	Penalties	0	0	0	0	0	0	29	44	136	0	0	209
ES	Checks	23900	28037	32849	38759	40013	34423	36782	30453	32591	84786	113195	99826
	Infring.	3205	2975	4342	5569	6319	5087	5620	4706	3759	10522	16975	14085
	Penalties	0	0	0	0	0	0	0	0	3759	0	0	3759
FI	Checks	1602	1723	1437	1849	1690	1739	2394	2536	2401	4762	5278	7331
	Infring.	573	1109	745	763	637	666	706	1057	924	2427	2066	2687
	Penalties	776	1338	623	761	615	496	1202	1259	1002	2737	1872	3463
FR	Checks	19561	0	0	0	0	0	22951	28122	23341	19561	0	74414
	Infring.	1919	0	0	0	0	0	2325	2770	2303	1919	0	7398
	Penalties	0	0	0	0	0	0	485	783	n.a.	0	0	1268
HU	Checks	0	0	0	0	0	0	0	74546	41609	0	0	116155
	Infring.	0	0	0	0	0	0	0	819	935	0	0	1754
	Penalties	0	0	0	0	0	0	0	864	717	0	0	1581
IE	Checks	0	0	0	0	0	435	356	375	815	0	435	1546
	Infring.	0	0	0	0	0	269	399	429	684	0	269	1512
	Penalties	0	0	0	0	0	203	370	395	718	0	203	1483
IT	Checks	0	1797	2389	2459	2514	2528	2797	3135	3963	4186	7501	9895
	Infring.	0	440	333	347	296	247	760	1036	1353	773	890	3149
	Penalties	0	440	333	347	296	247	0	0	0	773	890	0
LT	Checks	0	0	0	0	0	0	0	189	258	0	0	447
	Infring.	0	0	0	0	0	0	0	74	93	0	0	167
	Penalties	0	0	0	0	0	0	0	74	96	0	0	170
LU	Checks	203	286	203	451	454	228	313	100	190	692	1133	603
	Infring.	52	52	4	44	37	18	122	60	114	108	99	296
	Penalties	12	4	0	0	0	0	192	91	183	16	0	466

COUNTRY		1997	1998	1999	2000	2001	2002	2003	2004	2005	'97-'99	'00-'02	'03-'05
LV	Checks	0	0	0	0	0	0	0	403	417	0	0	820
	Infring.	0	0	0	0	0	0	0	231	79	0	0	310
	Penalties	0	0	0	0	0	0	0	149	79	0	0	228
MT	Checks	0	0	0	0	0	0	0	0	36	0	0	36
	Infring.	0	0	0	0	0	0	0	0	34	0	0	34
	Penalties	0	0	0	0	0	0	0	0	34	0	0	34
NL	Checks	3521	2266	2416	3145	1429	4510	2362	2138	1949	8203	9084	6449
	Infring.	1586	656	1275	4889	2149	3287	946	1047	898	3517	10325	2891
	Penalties	1419	481	931	1158	711	1209	946	842	898	2831	3078	2686
PL	Checks	0	0	0	0	0	0	0	0	13505	0	0	13505
	Infring.	0	0	0	0	0	0	0	0	2323	0	0	2323
	Penalties	0	0	0	0	0	0	0	0	2210	0	0	2210
PT	Checks	0	0	0	135	150	78	67	192	171	0	363	430
	Infring.	0	0	0	43	116	60	34	118	116	0	219	268
	Penalties	0	0	0	0	0	0	0	0	0	0	0	0
SE	Checks	8125	7839	6669	7263	6283	5995	6333	5109	6375	22633	19541	17817
	Infring.	4509	4041	3096	2929	3447	3087	2275	2138	2138	11646	9463	6551
	Penalties	2140	2152	1758	1833	1435	1186	1462	1195	1917	6050	4454	4574
SI	Checks	0	0	0	0	0	0	4178	3228	2179	0	0	9585
	Infring.	0	0	0	0	0	0	736	586	359	0	0	1681
	Penalties	0	0	0	0	0	0	295	268	277	0	0	840
SK	Checks	0	0	0	0	0	0	0	0	83	0	0	83
	Infring.	0	0	0	0	0	0	0	0	5	0	0	5
	Penalties	0	0	0	0	0	0	0	0	0	0	0	0
UK	Checks	6011	9016	7928	7087	6616	4985	6124	4863	5762	22955	18688	16749
	Infring.	1817	1308	1041	660	972	806	810	745	916	4166	2438	2471
	Penalties	237	131	93	11	261	234	488	277	496	461	506	1261

█: Not EU Member State yet / No Data Provision Required

Source: European Commission.

V. SECURITY

68. Some requirements traditionally contained in transport of dangerous goods regulations may be deemed as representing themselves a security factor, e.g. high safety level construction requirements for packagings and transport equipment, training of transport workers etc. Some legal instruments contain provisions which serve the purposes of both safety and security. ADR addresses the supervision of vehicles, in particular those carrying explosives but also those carrying highly dangerous substances above certain quantities, including supervision during loading and unloading and on parking sites.

69. After 11 September 2001, many Governments realized that it had become necessary to consider much more closely how to prevent potential terrorist attacks. Transport of dangerous goods was rapidly identified as one of the areas where appropriate international action should be taken urgently. As a result, the UN ECOSOC Sub-Committee of Experts on the Transport of Dangerous Goods issued, already in December 2002, recommendations as regards the security measures or precautions that should be provided through transport of dangerous goods regulations in order to minimize the risk of theft or misuse of dangerous goods that may endanger persons or property.

70. These new security provisions are contained in Chapter 1.4 of the UN Model Regulations. They have been included in the IMDG Code (for maritime transport) and the ICAO TI (for air transport) with the reservations nevertheless that:

- (a) For maritime transport, they remain recommendations to Governments, that national competent authorities may apply additional security provisions, and that the relevant security provisions of Chapter XI-2 of the SOLAS 74 Convention and of the International Ship and Port Facility Security (ISPS) Code apply;
- (b) For air transport, they supplement (and do not supersede) the provisions of Annex 17 (Security) of the Convention on International Civil Aviation and of the ICAO Security Manual for Safeguarding Civil Aviation against Acts of Unlawful Interference.

71. The provisions of Chapter 1.4 of the UN Model Regulations were also introduced in Chapter 1.10 of ADR and RID for mandatory application to international (and domestic in EU countries) transport by road and rail as from 1 July 2005, with some minor adaptations. They were also included in ADN, but their effective date of mandatory application for international carriage by inland waterways will be 28 February 2009 (following entry into force of ADN on 29 February 2008), although some Governments have already taken steps to implement them at national level (notably on the Rhine through ADNR).

72. These security provisions consist of:

- (1) General provisions applicable to all dangerous goods: the security of areas used for the temporary storage during carriage of dangerous goods; identification of carriers and their staff; training; registration of valid training certificates;
- (2) Provisions applicable to the so-called “high consequence dangerous goods” i.e. those which have the potential for misuse in a terrorist incident and which, as a result, could produce serious consequences such as mass casualties or mass destruction. They require special measures to be applied to prevent theft of the vehicles and cargoes. Arrangements between consignors, carriers and any other participants in the transport operation have to be made for adopting, implementing and complying with a security plan (see Tables 16 and 17).

73. The European Commission is currently carrying out a study on the effective implementation of these measures in the EU member States, their practicability and problems encountered.

Table 16: Table of high consequence dangerous goods (ADR)

Class	Division	Substance or article	Quantity		
			Tank (l)	Bulk (kg)	Packages (kg)
1	1.1	Explosives	a	a	0
	1.2	Explosives	a	a	0
	1.3	Compatibility group C explosives	a	a	0
	1.5	Explosives	0	a	0
2		Flammable gases (classification codes including only the letter F)	3000	a	b
		Toxic gases (classification codes including letters T, TF, TC, TO, TFC or TOC) excluding aerosols	0	a	0
3		Flammable liquids of packing groups I and II	3000	a	b
		Desensitized explosives	a	a	0
4.1		Desensitized explosives	a	a	0
4.2		Packing group I substances	3000	a	b
4.3		Packing group I substances	3000	a	b
5.1		Oxidizing liquids of packing group I	3000	a	b
		Perchlorates, ammonium nitrate and ammonium nitrate fertilizers	3000	3000	b
6.1		Toxic substances of packing group I	0	a	0
6.2		Infectious substances of Category A (UN Nos. 2814 and 2900)	a	0	0
7		Radioactive material	3000 A ₁ (special form) or 3000 A ₂ , as applicable, in Type B(U), B(M) or C packages		
8		Corrosive substances of packing group I	3000	a	b

^a Not relevant.

^b The provisions of 1.10.3 of the ADR do not apply, whatever the quantity is.

Source: ADR, Annex A, Table 1.10.5.

Table 17: Security plan according to ADR

The security plan shall comprise at least the following elements:

- (a) specific allocation of responsibilities for security to competent and qualified persons with appropriate authority to carry out their responsibilities;
- (b) records of dangerous goods or types of dangerous goods concerned;
- (c) review of current operations and assessment of security risks, including any stops necessary to the transport operation, the keeping of dangerous goods in the vehicle, tank or container before, during and after the journey and the intermediate temporary storage of dangerous goods during the course of intermodal transfer or transshipment between units as appropriate;
- (d) clear statement of measures that are to be taken to reduce security risks, commensurate with the responsibilities and duties of the participant, including:
 - training;
 - security policies (e.g. response to higher threat conditions, new employee/employment verification, etc.);
 - operating practices (e.g. choice/use of routes where known, access to dangerous goods in intermediate temporary storage (as defined in (c)), proximity to vulnerable infrastructure etc.);
 - equipment and resources that are to be used to reduce security risks;
- (e) effective and up to date procedures for reporting and dealing with security threats, breaches of security or security incidents;
- (f) procedures for the evaluation and testing of security plans and procedures for periodic review and update of the plans;
- (g) measures to ensure the physical security of transport information contained in the security plan; and
- (h) measures to ensure that the distribution of information relating to the transport operation contained in the security plan is limited to those who need to have it. Such measures shall not preclude the provision of information required elsewhere in ADR.

Note: Carriers, consignors and consignees should co-operate with each other and with competent authorities to exchange threat information, apply appropriate security measures and respond to security incidents.

Source: ADR, Annex A, para.1.10.3.2.2.

VI. UN MECHANISMS FOR THE DEVELOPMENT AND HARMONIZATION OF TRANSPORT OF DANGEROUS GOODS REGULATIONS

A. Recommendations of global scope: Model Regulations on the Transport of Dangerous Goods (“Orange Book”) and Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

1. The United Nations Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

74. The United Nations created in 1953 the UN Committee of Experts on the Transport of Dangerous Goods, as a subsidiary body of the Economic and Social Council belonging to the category of "Expert bodies composed of governmental experts".

75. In 1999, the Economic and Social Council decided to extend the mandate of the Committee in order to provide a mechanism for ensuring a global harmonization of systems of classification and labelling of chemicals and to meet the objectives set out in Chapter 19 of Agenda 21 by the United Nations Conference on Environment and Development (UNCED) (Rio de Janeiro, 3-12 June 1992). Thus, the Committee became the Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals.

76. The Committee now has two subsidiary bodies: the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee) and the Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals. The Committee and the Sub-Committees work on a biennial basis. The two Sub-Committees hold their sessions back-to-back twice a year (July and December). The Committee meets once only at the end of the biennium in every even year. All sessions take place in Geneva.

77. The TDG Sub-Committee is now composed of 27 expert countries from all parts of the world. The criteria for full membership are the availability of expertise in the applicant country, the willingness of the country to make available qualified experts at its own expenses, the interest of the country in international transport of dangerous goods and the adequate participation of developing countries. Furthermore, States which are not members of the Sub-Committee may be invited to participate in its deliberations on any matter of particular concern to that State. States thus invited participate as “Observers”. They do not have the right to vote but they may submit proposals which may be put to the vote on request of any member of the Sub-Committee.

78. Specialized agencies of the United Nations are entitled to be represented at meetings of the Sub-Committee and to participate through their representatives without the right to vote, and to submit proposals which may be put to the vote at the request of any member of the Sub-Committee.

79. Representatives of intergovernmental organizations accorded permanent observer status by the General Assembly and of other intergovernmental organizations designated on an *ad hoc* or a continuing basis by the Committee may participate, without the right to vote, in the deliberations on questions within the scope of their activities.

2. UN Recommendations on the Transport of Dangerous Goods

80. The TDG Sub-Committee prepares and up-dates on a biennial basis the Recommendations on the Transport of Dangerous Goods, also known as the "Orange Book", which are addressed not only to Members States of the UN for the development of their national requirements for domestic traffic of dangerous goods, but also to international organizations such as the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO) and regional commissions such as UNECE for regulations and international/regional agreements or conventions governing the international transport of dangerous goods by sea, air, road, rail and inland waterways.

81. The UN Recommendations on the Transport of Dangerous Goods, which were first published in 1956, address the following main areas:

- List of dangerous goods most commonly carried and their identification and classification;
- Consignment procedures: labelling, marking, and transport documents;
- Standards for packagings and Intermediate Bulk Containers, test procedures, and certification;
- Standards for multimodal tank-containers (portable tanks) and bulk containers, test procedures certification and service requirements.

82. These recommendations contain all basic provisions for the safe carriage of dangerous goods, but they have to be completed by additional requirements which may have to be applied at national level or for international transport depending on the mode of transport envisaged.

83. In December 1994, the UN Committee of Experts recognized that reformatting the recommendations contained in the "Orange Book" into the form of "Model Regulations" annexed to a set of basic recommendations would provide certain benefits:

- more direct integration into all modal, national and international regulations and easier updating;
- enhanced harmonization;
- overall resource savings for the Governments of Member States, the United Nations and other international organizations;
- improvement in the "user-friendliness" of the regulations;
- better identification of responsibilities in transport operations; and,
- improvement of compliance with the regulations, in particular in the case of multimodal operations.

84. The Model Regulations on the Transport of Dangerous Goods annexed to the Recommendations are divided into seven parts as follows:

- Part 1: General provisions, including definitions and training provisions
- Part 2: Classification

- Part 3: Dangerous Goods List, special provisions and limited quantity provisions
- Part 4: Use of packagings (including gas receptacles), intermediate bulk containers (IBCs) and portable tanks (including tanks for gases and multiple-element gas containers (MEGCs))
- Part 5: Consignment procedures
- Part 6: Construction, testing and approval of packagings (including gas receptacles), IBCs and portable tanks (including tanks for gases and multiple-element gas containers (MEGCs))
- Part 7: Transport operations

85. The latest version (15th revised edition) was issued in 2007 (see also annex 3).

86. For the specific case of radioactive material, the International Atomic Energy Agency (IAEA) issues very detailed requirements concerning all aspects of the safe transport of radioactive material, published as the "IAEA Regulations for the Safe Transport of Radioactive Material". These requirements are also incorporated in the UN Model Regulations.

87. It is recommended that all Governments (when developing national regulations), and international organizations (when developing regional or internationally legally binding instruments) follow the same structure and implement the provisions contained in these seven parts, although it is recognized that the Model Regulations may have to be supplemented by specific provisions related to legal aspects or by requirements specific to one mode of transport because such requirements are not addressed in the Model Regulations.

88. The Model Regulations are supplemented by a publication entitled "Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria". This Manual is intended to present the United Nations schemes for the classification of certain types of dangerous goods (in particular dangerous goods presenting a physical hazard, such as explosivity, flammability, self-reactivity, oxidizing properties, etc.) and to give a description of the test methods and procedures considered to be the most useful for providing competent authorities with the necessary information to arrive at a proper classification of substances and articles for transport.

3. Globally Harmonized System of Classification and Labelling of Chemicals

89. Transport of dangerous goods is regulated in order to prevent, as far as possible, accidents to persons or property and damage to the environment, the means of transport employed or to other goods. With different regulations in every country and for different modes of transport, international trade of chemicals and dangerous products would have been seriously impeded, if not made impossible and unsafe.

90. With the UN Recommendations harmonized system of classification, listing, packing, marking, labelling, placarding and documentation, carriers, consignors, inspection authorities and emergency services benefit from simplified transport, handling and control, from a reduction in time-consuming formalities to a coherent approach for emergency response.

91. However, this system is implemented only through transport regulations. In practice, dangerous goods are also subject to other kinds of regulations, e.g. work safety regulations, consumer protection regulations, storage regulations. These regulatory systems

also contain provisions concerning classification and labelling, and for the time being they are not internationally harmonized.

92. In June 1992, the United Nations Conference on Environment and Development (UNCED) adopted the so-called "Agenda 21" which was a programme of action for the future. It contained a Chapter 19 on the environmentally sound management of toxic chemicals including prevention of illegal international traffic in toxic and dangerous products.

93. This Chapter 19 proposed six programme areas for environmentally sound management of chemicals. Programme Area B concerned harmonization of classification and labelling of chemicals and its objective was that a globally harmonized hazard classification and compatible labelling system, including material safety data sheets and easily understandable symbols should be available, if possible, by the year 2000.

94. In accordance with the recommendations contained in Programme Area B, the UN Sub-Committee of Experts on the Transport of Dangerous Goods, the International Labour Office (ILO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO), the Food and Agriculture Organization (FAO), the Organization for Economic Co-operation and Development (OECD) and regional and national authorities having existing classification and labelling systems formed a coordinating group in order to elaborate a globally harmonized system of classification and labelling of chemicals, and to draft proposals for standardization of hazard communication terminology and symbols in order to enhance risk management of chemicals and facilitate both international trade and translation of information into the end-user's language. The coordinating group allocated tasks to three focal points:

UN/CETDG-ILO	for classification criteria for physical hazards
OECD	for classification criteria for health hazards and hazards to the environment
ILO	for hazard communication

95. The Co-ordinating Group finished its work in 2001 and transmitted the outcome to the newly created GHS Sub-Committee at its December 2001 session. The GHS Sub-Committee continued the work in 2002, and the Committee adopted, in December 2002, the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The second revised edition was published in 2007.

96. The GHS contains recommendations concerning hazard classification and hazard communication (including labelling and safety data sheets) for all kinds of hazards, including hazards from compressed gases, flammable gases, toxic gases, corrosive gases and oxidizing gases.

97. The World Summit on Sustainable Development (Johannesburg) recommended in 2002 that this new system, covering all kinds of regulations in multiple sectors, be implemented at international level by 2008. This has been achieved in the transport sector.

B. Implementation of the UN Model Regulations on the Transport of Dangerous Goods through legal modal transport instruments of global scope

1. Maritime transport

98. Transport of dangerous goods by sea is regulated by Chapter VII of the International Convention for the Safety of Life at Sea (SOLAS 74) and Annex III of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). For the purposes of effective implementation of the requirements of these conventions, the International Maritime Organization has published the "International Maritime Dangerous Goods Code" (IMDG Code).

99. The application of the IMDG Code to maritime transport became mandatory through the SOLAS Convention on 1 January 2004 (156 Contracting Parties).

100. The format of the IMDG Code is in line with that of the UN Model Regulations. The seven parts of the UN Model Regulations described above are supplemented with chapters specific to the maritime mode of transport, dealing in particular with stowage and segregation of dangerous goods and cargo transport units on board ships, marine pollution aspects, carriage of road tank vehicles on board ships, special provisions in the event of an incident and fire precautions, transport of dangerous goods in shipborne barges on barge-carrying ships, transport of wastes, etc.

2. Air transport

101. Transport of dangerous goods by air is regulated by Annex 18 to the Convention on International Civil Aviation (Chicago Convention). Annex 18 is amplified by the International Civil Aviation Organization (ICAO)'s "Technical Instructions for the Safe Transport of Dangerous Goods by Air" and the 189 Contracting Parties to the Chicago Convention are required to implement these Technical Instructions or to notify ICAO of those cases where they have adopted provisions different from those contained in the Technical Instructions. The ICAO Technical Instructions have always been developed and kept up to date on the basis of the UN Recommendations on the Transport of Dangerous Goods (and IAEA Regulations in the case of radioactive material).

102. The International Air Transport Association also publishes a manual called "Dangerous Goods Regulations" on the basis of the ICAO Technical Instructions. This manual incorporates additional operational requirements and is intended to provide a harmonized system of procedures for air transport operators to accept and transport dangerous goods safely and efficiently.

C. Implementation through international legal instruments of regional application

1. ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road

103. ADR was developed under the auspices of the UNECE Inland Transport Committee and was concluded in 1957. It entered into force in 1968.

104. The Agreement contains 17 articles, the most important of which is the second, which says in effect that, apart from some excessively dangerous goods, other dangerous goods may be moved internationally in road vehicles provided that the packaging, labelling, vehicle

construction, equipment and operation are all in accordance with Annexes A and B to the Agreement, which contain all the detailed provisions (see annex 4). ADR is an Agreement between States, and there is no overall enforcing authority. In practice, highway checks are carried out by Contracting States, and non-compliance may then result in action by national authorities against the driver in accordance with their domestic legislation. ADR itself does not prescribe any penalties.

105. ADR is intended primarily to increase the safety of international transport by road, but it is also an important trade facilitation instrument. Except for dangerous goods which are totally prohibited for carriage, and except when carriage is regulated or prohibited for reasons other than safety, the international carriage of dangerous goods by road is authorized by ADR on the territories of Contracting Parties, provided that the conditions laid down in Annexes A and B, that is, the detailed provisions of the Agreement, are complied with.

106. There are at present 43 Contracting Parties to ADR. It should be noted that the requirements of Annexes A and B of ADR have been annexed to European Union Council Directive 94/55/EC (as amended) on the approximation of the laws of Member States with regard to the transport of dangerous goods, and therefore these requirements have become applicable not only to international transport of dangerous goods but also to domestic traffic in the 27 countries of the European Union since 1 January 1997, as well as in Iceland, Norway, Liechtenstein and Switzerland.

ADR Contracting Parties			
ALBANIA	ESTONIA	LITHUANIA	RUSSIAN FEDERATION
AUSTRIA	FINLAND	LUXEMBOURG	SERBIA
AZERBAIJAN	FRANCE	MALTA	SLOVAKIA
BELARUS	GERMANY	MOLDOVA	SLOVENIA
BELGIUM	GREECE	MONTENEGRO	SPAIN
BOSNIA AND HERZEGOVINA	HUNGARY	MOROCCO	SWEDEN
BULGARIA	IRELAND	NETHERLANDS	SWITZERLAND
CROATIA	ITALY	NORWAY	THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
CYPRUS	KAZAKHSTAN	POLAND	UKRAINE
CZECH REPUBLIC	LATVIA	PORTUGAL	UNITED KINGDOM
DENMARK	LIECHTENSTEIN	ROMANIA	

2. RID - Regulations concerning the International Transport of Dangerous Goods by Rail

107. RID is annexed to the Convention for international transport by rail (COTIF), and therefore it is applied by all Contracting Parties to the COTIF, i.e. 42 countries including all western and central European countries, plus certain Middle East and North African countries.

108. The RID Regulations are published by the Central Office for International Rail Transport, which is based in Bern. The RID Regulations are aligned closely with ADR thanks to the work of a Joint Meeting of the UNECE Working Party on the Transport of Dangerous Goods and of the RID Safety Committee, also known as the RID/ADR/ADN Joint Meeting.

109. As for ADR, RID is also made applicable to domestic traffic in the European Union countries through Directive 96/49/EC (as amended).

3. Convention concerning international goods transport by railway (SMGS)

110 The SMGS is administered by the "Committee of the Organization for Railway Cooperation" (OSZhD), and this Convention applies to 25 countries including the Russian Federation, most countries of the former USSR, a few Central European countries, Mongolia, the Socialist Republic of Vietnam, the People's Republic of China and the Democratic People's Republic of Korea. The railways of countries which are parties to SMGS apply the "Rules of the Transport of Dangerous Goods", known as supplement No.2 to SMGS. These rules are being progressively updated by OSZhD, on the basis of RID, but they have not yet been fully aligned.

4. ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways

111. The ADN provisions were until May 2000 recommendations, not mandatory regulations. These recommendations were addressed to the Governments of European countries with inland waterway networks and to the international river Commissions such as the Central Commission for the Navigation of the Rhine (CCNR) and the Danube Commission. These recommendations have now been upgraded to a formal European Agreement, similar to ADR, which was adopted on 25 May 2000 and signed by 10 countries (France, Germany, Italy, Czech Republic, Croatia, Luxembourg, Netherlands, Republic of Moldova, Slovakia and Bulgaria). It entered into force on 29 February 2008, and counts 8 Contracting Parties: Austria, France, Germany, Hungary, Luxembourg, Moldova, Netherlands and Russian Federation. The annexed Regulations, based on the UN Model Regulations, ADR and RID and supplemented with regulations specific to inland waterway transport, will become applicable on 28 February 2009 (see also annex 5).

5. RID/ADR/ADN amendment procedures

112. The intergovernmental bodies responsible for amending RID, ADR and ADN to keep them in line with the UN Recommendations and to update them in the light of technical progress or of specific needs of the European industry or Governments are

- For ADR: the UNECE Inland Transport Committee Working Party on the Transport of Dangerous Goods (WP.15);
- For RID: the OTIF RID Safety Committee;
- For ADN: the UNECE (WP.15)/CCNR Joint Meeting of Experts on the Regulations annexed to ADN, and now the ADN Administrative Committee.

113. The provisions which are common to RID, ADR and ADN are discussed and elaborated first by the so-called "RID/ADR/ADN Joint Meeting".

114. Since the European Commission and the European Committee for Standardization (CEN) are also very active in the area of approximation of EU member States legislation, the RID/ADR/ADN Joint Meeting has established a special working group for cooperation with CEN. The mandate of the working group is to check the compliance of draft EN standards under development with the requirements of RID/ADR/ADN before their adoption.

115. Once compliance has been verified, a reference to a given EN standard is introduced in RID/ADR/ADN according to which compliance with the EN standard is deemed equivalent to compliance with a corresponding provision of RID/ADR/ADN.

116. In short, regulations concerning inland transport in Europe are discussed first by the UN Sub-Committee of Experts if they concern all modes of transport, then by the RID/ADR/ADN Joint Meeting for adaptation, if needed, to the European context, and finally by the intergovernmental body responsible for a given mode of transport. Once adopted by the relevant intergovernmental body, the amendments are still subject to formal adoption by Contracting Parties to ADR, ADN or RID in accordance with the legal amendment procedure laid down in the agreement or convention.

6. ASEAN countries

117. The Economic and Social Commission for Asia and the Pacific (UNESCAP) published, in 1997, Guidelines for the Establishment of National and Regional Systems for Inland Transportation of Dangerous Goods, recommending the implementation of the Recommendations on the Transport of Dangerous Goods. The Transport Ministers of the Association of Southeast Asian Nations (ASEAN) signed, on 20 September 2002, Protocol No. 9 to the ASEAN Framework Agreement on the Facilitation of Goods in Transit. This Protocol provides for the simplification of procedures and requirements for the transit transport of dangerous goods in ASEAN, using the Recommendations on the Transport of Dangerous Goods and ADR.

7. Mercosur countries

118. The Common Market of the South (Mercosur) countries (Argentina, Brazil, Uruguay, Paraguay and Venezuela) have concluded an Agreement for the facilitation of the inland transport of dangerous goods (Acuerdo sobre Transporte de Mercancías Peligrosas en el Mercosur, 1994). The annexes to this Agreement are based on the seventh revised edition of the Recommendations on the Transport of Dangerous Goods, RID and ADR. Updating of these annexes is under way.

8. Andean countries

119. The Andean Community (Comunidad Andina) (Bolivia, Colombia, Ecuador and Peru) is considering using the provisions of the 13th revised edition of the Model Regulations and/or ADR and RID for regulating the international carriage of dangerous goods by road and rail.

D. Implementation through national legislation applicable to domestic traffic

120. The UN Recommendations on the Transport of Dangerous Goods are relatively well implemented through national legislation, but the degree of implementation may vary from country to country. National legislation for air and sea transport is based on the ICAO Technical Instructions and the IMDG Code, and therefore is perfectly consistent with the UN Recommendations.

121. For regulations applicable to road/rail domestic traffic (which is usually much more important than international traffic), Governments have progressively adapted their own system to the United Nations system and national regulations in most countries of the world

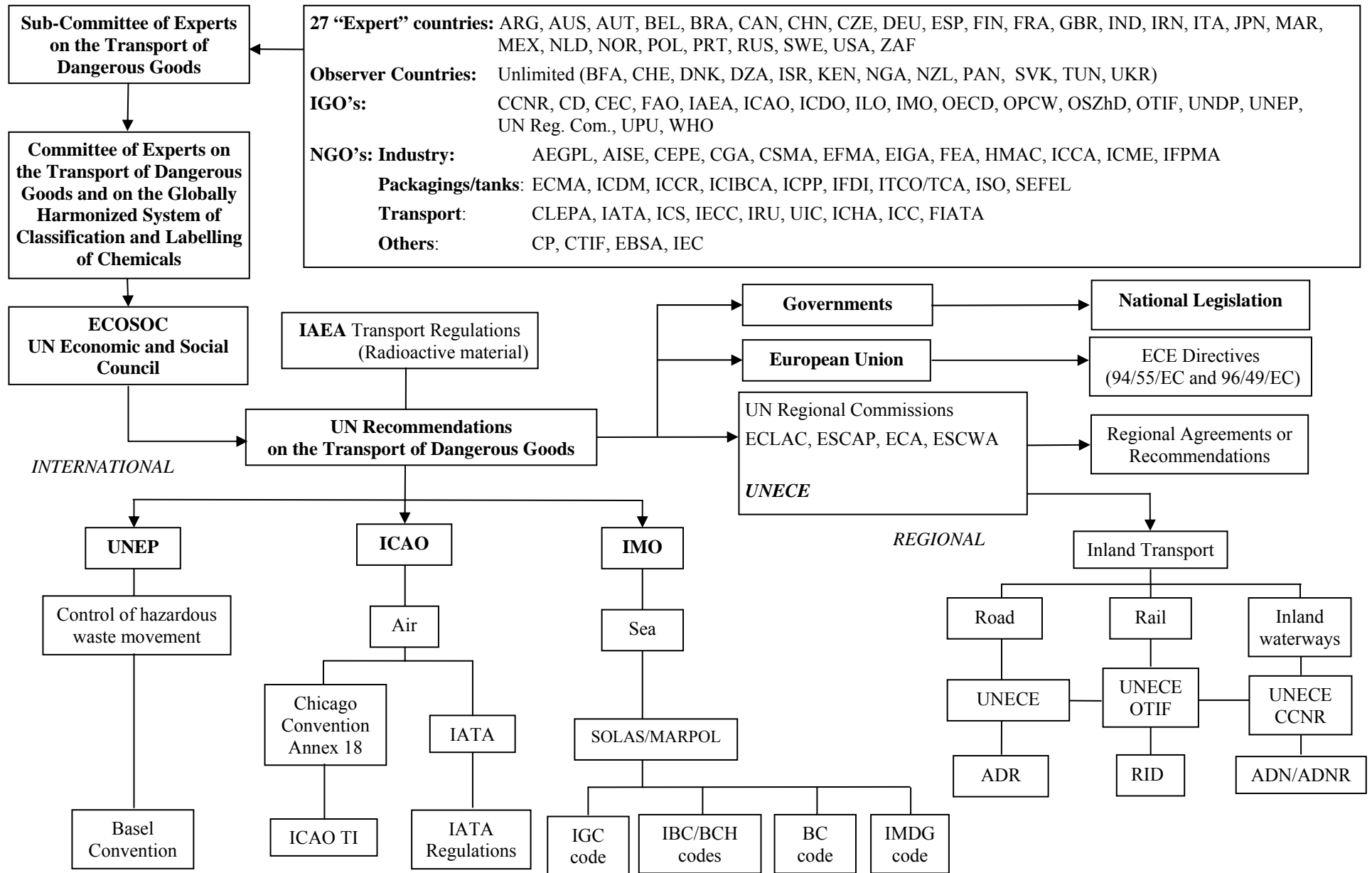
are now based on the UN Recommendations on the Transport of Dangerous Goods, even though variations may exist.

122. In the European Union, Directives 94/55/EC and 96/49/EC require Member States of the European Union to approximate their laws with regard to road and rail transport of dangerous goods (including radioactive material) on the basis of the provisions annexed to these directives which are in fact the same as those annexed to ADR and RID. However, for the purposes of national transport operations, Member States may retain provisions in their national law, which differ from those of ADR and RID provided they are consistent with the UN Recommendations on the Transport of Dangerous Goods. These two directives will soon be repealed, and replaced by one single directive applicable to inland transport of dangerous goods (road, rail, inland waterways) which will make the requirements of ADR, RID and ADN applicable to domestic and intracommunautary traffic by reference.

123. For domestic inland transport of dangerous goods in other countries, implementation of the recommendations on the transport of dangerous goods may vary considerably depending on the national procedures for enacting law or updating regulations. For example, the regulations applicable in the United States of America (Title 49 of the Code of Federal Regulations) are normally updated on a yearly basis, and they have been updated to reflect the fourteenth revised edition of the Recommendations on the Transport of Dangerous Goods, with very few exceptions. The Canadian regulations are based on the fourteenth revised edition. The Australian Code for the Transport of Dangerous Goods by Road and Rail is also based on the fourteenth revised edition of the Recommendations. The twelfth revised edition of the Recommendations has been adopted as a national standard in Malaysia and has been implemented through national legislation in Brazil and Thailand.

124. Although international transport of dangerous goods is facilitated by the harmonization of the major international conventions or agreements concerning transport of dangerous goods with the Model Regulations, and their simultaneous updating, the fact that certain national regulations applicable to inland transport are not brought into line simultaneously, or completely, is still causing problems in international trade, in particular in the case of multimodal transport

Annex 1
UN mechanisms for harmonizing transport of dangerous goods regulations
(See following organigram)



Instruments

Basel Convention:	Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
Chicago Convention:	Convention on International Civil Aviation
ICAO TI:	ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air
IATA Regulations:	IATA Dangerous Goods Regulations
SOLAS:	International Convention for the Safety of Life at Sea, 1974, as amended
MARPOL:	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, thereto, as amended
IBC Code:	International Bulk Chemicals Code (International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk)
IGC Code:	International Gas Carrier Code (International Code for the Construction and Equipment of Ships carrying Liquefied Gases in Bulk)
BC Code:	Bulk Cargoes Code (Code of Safe Practice for Solid Bulk Cargoes)
BCH Code:	Bulk Chemicals Code (Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk)
IMDG Code:	International Maritime Dangerous Goods Code
ADR:	European Agreement Concerning the International Carriage of Dangerous Goods by Road
RID:	Regulations Concerning the International Carriage of Dangerous Goods by Rail
ADN:	European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways
ADNR:	Regulations for the Transport of Dangerous Substances on the Rhine

27 “Expert” Countries:	Observer Countries (unlimited):
ARG: Argentina	BFA: Burkina Faso
AUS: Australia	BGR: Bulgaria
AUT: Austria	BHS: Bahamas
BEL: Belgium	CHE: Switzerland
BRA: Brazil	DNK: Denmark
CAN: Canada	DZA: Algeria
CHN: China, People’s Republic of,	GR: Greece
CZE: Czech Republic	ISR: Israel
DEU: Germany	KEN: Kenya
ESP: Spain	NGA: Nigeria
FIN: Finland	NZL: New Zealand
FRA: France	PAN: Panama
GBR: United Kingdom of Great Britain and Northern Ireland	SVK: Slovakia
IND: India	THA: Thailand
IRN: Islamic Republic of Iran	TUN: Tunisia
ITA: Italy	UKR: Ukraine
JPN: Japan	
MEX: Mexico	
MAR: Morocco	
NLD: Netherlands	
NOR: Norway	
POL: Poland	
PRT: Portugal	
RUS: Russian Federation	
SWE: Sweden	
USA: United States of America	
ZAF: South Africa	

Non-Governmental Organizations	
Industry	
AISE:	International Association of the Soap, Detergent and Maintenance Products Industry
AEGPL:	European Liquefied Petroleum Gas Association
CENCC:	European Conference of Fuel Distributors
CEFIC:	European Chemical Industry Council
CEPE:	European Printing Ink and Artists' Colours Manufacturer's Associations
CGA:	Compressed Gas Association
CSPA:	Chemical Specialities Products Association
CROPLIFE INTERNATIONAL	
EBRA:	European Battery Recycling Association
EFMA:	European Fertilizers Manufacturers Association
EIGA:	European Industrial Gases Association
FEA:	Federation of European Aerosol Associations
DGAC:	Dangerous Goods Advisory Council
ICC:	International Chamber of Commerce
ICCA:	International Council of Chemical Associations
ICCTA:	International Council of Chemical Trade Associations
ICME:	International Council on Metals and the Environment
ICMM:	International Council on Mining and Metals
IFPCM:	Industrial Federation Paints and Coats of Mercosul
IFPMA:	International Federation of Pharmaceutical Manufacturers Associations
IPIECA:	International Petroleum Industry Environmental Conservation Association (IPIECA)
IPPIC:	International Paint and Printing Ink Council
SDA:	Soap and Detergent Association (SDA)
Transport	
FIATA:	International Federation of Freight Forwarders Associations
IATA:	International Air Transport Association
ICC:	International Chamber of Commerce
ICHCA:	International Cargo Handling Coordination Association
ICS:	International Chamber of Shipping
IECC:	International Express Carriers Conference
IFSMA:	International Federation of Shipmasters' Associations
IRU:	International Road Transport Union
UIC:	International Union of Railways
IAR:	International Consortium of Rhine Inland Navigation
VOHMA:	Vessel Operators Hazardous Materials Association, Inc.
WNTI:	World Nuclear Transport Institute
Packaging/Tanks	
ECMA:	European Cylinder Makers' Association
ITCO:	International Tank Container Organization
ICCR:	International Confederation of Container Reconditioners
ICDM:	International Confederation of Drums Manufacturers
ICIBCA:	International Council of Intermediate Bulk Container Associations
ICPP:	International Confederation of Plastics Packaging Manufacturers
IFDI:	International Fibre Drum Institute
ISO:	International Organization for Standardization
SEFEL:	International Secretariat of Manufacturers of Light Metal Packagings
Shipbuilding, classification	
IACS	International Association of Classification Societies
Vehicle Manufacturers	
CLCCR:	Liaison Committee of Coachwork Trailer Builders
CLEPA:	European Association of Automotive Suppliers
OICA:	International Organization of Motor Vehicle Manufacturers
Others	
ABSA:	American Biological Safety Association
CP:	Standing Committee of European Doctors
CONCAWE:	The Oil Companies European Organization for Environment, Health and Safety
CTIF:	International Technical Committee for the Prevention and Extinction of Fire
EBSA	European Bio-Safety Association (EBSA)
IEC:	International Electrotechnical Commission
IOHA:	International Occupational Hygiene Association
WFCC:	World Federation for Culture Collections

Annex 2
Dangerous goods labels

5.2.2.2.2 *Specimen labels*

CLASS 1
Explosive substances or articles



(No. 1)
Divisions 1.1, 1.2 and 1.3
Symbol (exploding bomb): black; Background: orange; Figure '1' in bottom corner



(No. 1.4)
Division 1.4



(No. 1.5)
Division 1.5



(No. 1.6)
Division 1.6

Background: orange; Figures: black; Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm x 100 mm); Figure '1' in bottom corner

** Place for division - to be left blank if explosive is the subsidiary risk

* Place for compatibility group - to be left blank if explosive is the subsidiary risk

CLASS 2
Gases



(No. 2.1)
Division 2.1
Flammable gases

Symbol (flame): black or white;
(except as provided for in 5.2.2.2.1.6 (d))
Background: red; Figure '2' in bottom corner



(No. 2.2)
Division 2.2

Non-flammable, non-toxic gases
Symbol (gas cylinder): black or white;
Background: green; Figure '2' in bottom corner



CLASS 3
Flammable liquids



(No. 2.3)
Division 2.3
Toxic gases

Symbol (skull and crossbones): black;
Background: white; Figure '2' in bottom corner



(No. 3)
Symbol (flame): black or white;
Background: red; Figure '3' in bottom corner

CLASS 4



(No. 4.1)
Division 4.1
Flammable solids
Symbol (flame): black;
Background: white with
seven vertical red stripes;
Figure '4' in bottom corner



(No. 4.2)
Division 4.2
Substances liable
to spontaneous combustion
Symbol (flame): black;
Background: upper half white,
lower half red;
Figure '4' in bottom corner



(No. 4.3)
Division 4.3
Substances which, in contact
with water, emit flammable gases
Symbol (flame): black or white;
Background: blue;
Figure '4' in bottom corner



CLASS 5



(No. 5.1)
Division 5.1
Oxidizing substances
Symbol (flame over circle): black;
Background: yellow;
Figure '5.1' in bottom corner



(No. 5.2)
Division 5.2
Organic peroxides
Symbol (flame): black or white;
Background: upper half red; lower half yellow;
Figure '5.2' in bottom corner



CLASS 6



(No. 6.1)
Division 6.1
Toxic substances
Symbol (skull and crossbones): black;
Background: white; Figure '6' in bottom corner



(No. 6.2)
Division 6.2
Infectious substances
The lower half of the label may bear the inscriptions: 'INFECTIOUS SUBSTANCE'
and 'In the case of damage or leakage immediately notify Public Health Authority';
Symbol (three crescents superimposed on a circle) and inscriptions: black;
Background: white; Figure '6' in bottom corner

CLASS 7
Radioactive material



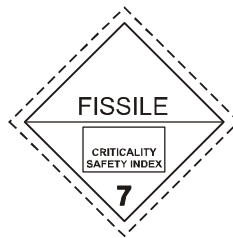
(No. 7A)
Category I - White
Symbol (trefoil): black;
Background: white;
Text (mandatory): black in lower half of label:
'RADIOACTIVE'
'CONTENTS'
'ACTIVITY'
One red bar shall
follow the word 'RADIOACTIVE';
Figure '7' in bottom corner



(No. 7B)
Category II - Yellow
Symbol (trefoil): black;
Background: upper half yellow with white border, lower half white;
Text (mandatory): black in lower half of label:
'RADIOACTIVE'
'CONTENTS'
'ACTIVITY'
In a black outlined box: 'TRANSPORT INDEX';
Two red vertical bars shall follow the word 'RADIOACTIVE';
Figure '7' in bottom corner

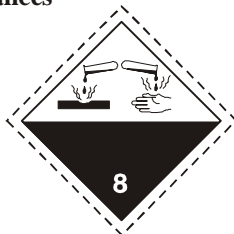


(No. 7C)
Category III - Yellow
Symbol (trefoil): black;
Background: upper half yellow with white border, lower half white;
Text (mandatory): black in lower half of label:
'RADIOACTIVE'
'CONTENTS'
'ACTIVITY'
In a black outlined box: 'TRANSPORT INDEX';
Three red vertical bars shall follow the word 'RADIOACTIVE';
Figure '7' in bottom corner



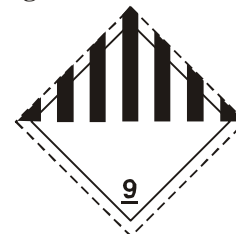
(No. 7E)
Class 7 fissile material
Background: white;
Text (mandatory): black in upper half of label: 'FISSILE';
In a black outlined box in the lower half of the label:
'CRITICALITY SAFETY INDEX'
Figure '7' in bottom corner

CLASS 8
Corrosive substances



(No. 8)
Symbol (liquids, spilling from two glass vessels
and attacking a hand and a metal): black;
Background: upper half white;
lower half black with white border;
Figure '8' in bottom corner

CLASS 9
Miscellaneous dangerous substances and articles



(No. 9)
Symbol (seven vertical stripes in upper half): black;
Background: white;
Figure '9' underlined in bottom corner

Annex 3

UN Recommendations on the Transport of Dangerous Goods – Table of contents

RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Nature, purpose and significance of the Recommendations
Principles underlying the regulation of the transport of dangerous goods
Classification and definitions of classes of dangerous goods
Consignment procedures
Emergency response
Compliance assurance
Transport of radioactive material
Reporting of accidents and incidents
Figure 1: Data sheet to be submitted to the United Nations for new or amended classification of substances

ANNEX: MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Part 1. GENERAL PROVISIONS, DEFINITIONS, TRAINING AND SECURITY

Chapter 1.1 - General provisions

1.1.1 Scope and application

1.1.2 Dangerous goods forbidden from transport

Chapter 1.2 - Definitions and units of measurement

1.2.1 Definitions

1.2.2 Units of measurement

Chapter 1.3 - Training

Chapter 1.4 Security provisions

1.4.1 General provisions

1.4.2 Security training

1.4.3 Provisions for high consequence dangerous goods

Chapter 1.5 General provisions concerning Class 7

1.5.1 Scope and application

1.5.2 Radiation protection programme

1.5.3 Quality assurance

1.5.4 Special arrangement

1.5.5 Radioactive material possessing other dangerous properties

1.5.6 Non-compliance

Part 2. CLASSIFICATION

Chapter 2.0 - Introduction

- 2.0.0 Responsibilities
- 2.0.1 Classes, divisions, packing groups
- 2.0.2 UN numbers and proper shipping names
- 2.0.3 Precedence of hazard characteristics
- 2.0.4 Transport of samples

Chapter 2.1 - Class 1 - Explosives

- 2.1.1 Definitions and general provisions
- 2.1.2 Compatibility groups
- 2.1.3 Classification procedure

Chapter 2.2 - Class 2 - Gases

- 2.2.1 Definitions and general provisions
- 2.2.2 Divisions
- 2.2.3 Mixtures of gases

Chapter 2.3 - Class 3 - Flammable liquids

- 2.3.1 Definition and general provisions
- 2.3.2 Assignment of packing groups
- 2.3.3 Determination of flash point

Chapter 2.4 - Class 4 - Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases

- 2.4.1 Definitions and general provisions
- 2.4.2 Division 4.1 - Flammable solids, self-reactive substances and solid desensitized explosives
- 2.4.3 Division 4.2 - Substances liable to spontaneous combustion
- 2.4.4 Division 4.3 - Substances which in contact with water emit flammable gases
- 2.4.5 Classification of organometallic substances

Chapter 2.5 - Class 5 - Oxidizing substances and organic peroxides

- 2.5.1 Definitions and general provisions
- 2.5.2 Division 5.1 - Oxidizing substances
- 2.5.3 Division 5.2 - Organic peroxides

Chapter 2.6 - Class 6 - Toxic and infectious substances

- 2.6.1 Definitions
- 2.6.2 Division 6.1 - Toxic substances
- 2.6.3 Division 6.2 - Infectious substances

Chapter 2.7 - Class 7 - Radioactive material

- 2.7.1 Definitions
- 2.7.2 Classification

Chapter 2.8 - Class 8 - Corrosive substances

- 2.8.1 Definition
- 2.8.2 Assignment of packing groups

Chapter 2.9 - Class 9 - Miscellaneous dangerous substances and articles

- 2.9.1 Definitions
- 2.9.2 Assignment to Class 9
- 2.9.3 Environmentally hazardous substances (aquatic environment)

Part 3. DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND EXCEPTIONS

Chapter 3.1 - General

- 3.1.1 Scope and general provisions
- 3.1.2 Proper shipping name
- 3.1.3 Mixtures and solutions containing one dangerous substance

Chapter 3.2 - Dangerous goods list

- 3.2.1 Structure of the dangerous goods list
- 3.2.2 Abbreviations and symbols

Chapter 3.3 - Special provisions applicable to certain articles or substances

Chapter 3.4 - Dangerous goods packed in limited quantities

Chapter 3.5 - Dangerous goods packed in excepted quantities

- 3.5.1 Excepted quantities
- 3.5.2 Packagings
- 3.5.3 Tests for packages
- 3.5.4 Marking of packages
- 3.5.5 Maximum number of packages in any freight vehicle, railway freight wagon or multimodal freight container
- 3.5.6 Documentation

APPENDICES

- Appendix A - List of generic and N.O.S. proper shipping names
- Appendix B - Glossary of terms

ALPHABETICAL INDEX OF SUBSTANCES AND ARTICLES

Part 4. PACKING AND TANK PROVISIONS

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PART 2 CLASSIFICATION

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PART 6 REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS (INCLUDING IBCS AND LARGE PACKAGINGS), TANKS AND BULK TRANSPORT UNITS

PART 7 REQUIREMENTS CONCERNING LOADING, CARRIAGE, UNLOADING AND HANDLING OF CARGO

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7.1.0 General requirements

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Chapter 7.2 Tank vessels

7.2.0 General requirements

7.2.1 Mode of carriage of goods

7.2.2 Requirements applicable to vessels

7.2.3 General service requirements

7.2.4 Additional requirements concerning loading, carriage, unloading and other handling of cargo

7.2.5 Additional requirements concerning the operation of vessels

PART 8 PROVISIONS FOR VESSEL CREWS, EQUIPMENT, OPERATION AND DOCUMENTATION

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8.1.1 *(Reserved)*

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8.1.3 *(Reserved)*

8.1.4 Fire-extinguishing arrangements

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8.1.10 Loading journal

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Chapter 8.2 Requirements concerning training

8.2.1 General requirements concerning training of experts

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Chapter 8.3 Miscellaneous requirements to be complied with by the crew of the vessel

- 8.3.1 Persons authorized on board
- 8.3.2 Portable lamps
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- 8.3.4 Prohibition on smoking, fire and naked light
- 8.3.5 Risk of sparking

Chapter 8.4 (Reserved)

Chapter 8.5 (Reserved)

Chapter 8.6 Documents

- 8.6.1 Certificate of approval
- 8.6.2 Certificate of special knowledge of ADN according to 8.2.1.2, 8.2.1.4 or 8.2.1.5
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PART 9 RULES FOR CONSTRUCTION

Chapter 9.1 Rules for construction of dry cargo vessels

- 9.1.0 Rules for construction applicable to dry cargo vessels

Chapter 9.2 Rules for construction applicable to seagoing vessels which comply with the requirements of the SOLAS 74 Convention, Chapter II-2, Regulation 19 or SOLAS 74, Chapter II-2, Regulation 54

Chapter 9.3 Rules for construction of tank vessels

- 9.3.1 Rules for construction of type G tank vessels
- 9.3.2 Rules for construction of type C tank vessels
- 9.3.3 Rules for construction of type N tank vessels

Annex 6

Project proposal 1

Project title Implementation of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)

Objective: The objective of the project is to monitor the effective implementation of ADR in volunteer countries that have recently acceded to ADR but which do not participate regularly in related UNECE activities

Background: ADR is an international agreement intended to increase safety during international transport of dangerous goods. International transport is permitted when the conditions contained in Annexes A and B of ADR are complied with. It is also an important facilitation tool for international transport. When the conditions of ADR are complied with, Contracting Parties retain the right to regulate or prohibit the entry of dangerous goods into their territory, **but only for reasons other than safety during carriage.** Experience shows that there are still a number of problems in certain ADR countries where ADR transport operations remain subject to additional requirements (e.g. special authorizations, etc.) which are often not well justified and cause transport facilitation problems. Participation in meetings of the UNECE Working Party on the Transport of Dangerous Goods (WP.15) gives a good opportunity to competent authorities to exchange experience and to discuss questions of interpretation, etc. Fact-finding missions to ADR Contracting Parties, which do not have regular contacts with other Contracting Parties through participation in WP.15 meetings would allow to detect sources of misunderstandings in certain countries which have recently acceded to ADR. Seminars or workshops with representatives of the relevant administrations (transport administration, packaging/tank/vehicle approval authorities, enforcement authorities) and representatives of the industry and the transport sector would allow to clarify certain issues related to the proper interpretation and enforcement of ADR.

Excepted accomplishments

The implementation of the project would result in:

- (a) Identification of implementation problems in countries which are Contracting Parties to ADR;
- (b) Implementation of best administrative practices for the proper enforcement of ADR;
- (c) Elimination of international transport facilitation problems linked to the lack of administrative structures or improper interpretation of ADR.

Proposed activities

The following activities would be carried out:

- (1) Development of a questionnaire intended to facilitate the appraisal process in a consistent manner, with questions in the following areas:
 - (a) Legislative and governmental responsibilities;
 - (b) The authority, responsibilities and functions of the regulatory body(ies);

- (c) The organization of the regulatory body(ies);
 - (d) The approval process, notably with respect to:
 - classification of dangerous goods where appropriate;
 - approval of packaging design types;
 - approval of tank-containers, portable tanks and tank-vehicles;
 - driver training and certification;
 - dangerous goods safety adviser training and certification.
 - (e) Review and assessment;
 - (f) Inspection and enforcement;
 - (g) The development of regulations and guides;
 - (h) Emergency preparedness.
- (2) A preparatory session for the appraisal team (Geneva).
- (3) An appraisal mission in the country, including:
- (a) A meeting with representatives of competent authorities in charge of implementation, of the industry (manufacturers/consignors of dangerous goods), the transport sector (carriers, freight forwarders), control authorities, customs, emergency responders;
 - (b) Discussions to obtain clarification;
 - (c) Preparation of draft findings;
 - (d) Ongoing feedback on updates to the draft findings;
 - (e) Visits to the offices of relevant bodies (administration; testing/approval bodies – packagings, tanks; vehicles; training bodies; emergency services; customs transport controllers);
 - (f) A meeting to present and discuss the findings;
 - (g) Drafting of the mission report and recommendations.
- (4) Drafting of the final report.
- (5) Follow-up mission to monitor implementation of recommendations.

Budget estimate

The estimated cost of the project is US\$250,000 per country.

Annex 7

Project proposal 2

Project title: Harmonization of national regulations for the transport of dangerous goods by road with ADR

Objective: The objective of the project is to harmonize the national transport of dangerous goods by road regulations with those contained in ADR in volunteer countries.

Background: Transport of dangerous goods regulations are very complex. They cover a wide range of issues, from classification of dangerous goods to delivery to the consignee, through packaging, tank, vehicle certification, consignment procedures, etc. International transport of dangerous goods by sea, air, road, rail and inland navigation is greatly facilitated when the conditions specified in the UN Model Regulations on the Transport of Dangerous Goods are reflected in all the various regulations that may apply in a chain of transport. Yet several countries continue to make a distinction between national and international transport. Complying with the safety provisions contained in the UN Model Regulations on the Transport of Dangerous Goods and related instruments such as the IMDG Code, ICAO Technical Instructions, ADR, RID and ADN is a pre-requisite for ensuring transport safety. As shown by the statistics, road transport accounts for nearly 80% of all transport of dangerous goods shipments. Except for direct delivery from ship or rail-wagons to industrial plants, road transport is the essential and unavoidable link between all modes of transport and therefore plays the major role either in pre-delivery, intermediate delivery or final delivery of dangerous goods to consignees. Although many countries have ratified or acceded to various conventions governing the international transport of dangerous goods by various modes of transport, some countries in the UNECE region have not adapted accordingly their national rules and regulations so as to make road transport safe. The use of appropriate transport equipment and training of all involved is paramount for ensuring road transport safety. Fact-finding missions and seminars/workshops in countries which are party to ADR but which do not apply its provisions to domestic traffic would allow the identification of obstacles to the implementation of suitable safety requirements.

Expected accomplishment: The implementation of the project would result in:

- (a) Identification of divergences between national legislation and international legislation as regards transport of dangerous goods by road;
- (b) Development of suitable regulations, harmonized with the international framework, applicable to domestic transport of dangerous goods by road and related administrative structures, which would improve safety of transport of dangerous goods by road;
- (c) Improved enforcement through harmonization of national and international rules.

Proposed activities

The following activities would be carried out:

- (1) Development of a questionnaire intended to identify the differences between ADR and national road transport regulations;

- (2) Translation of the answers;
- (3) Analysis of the answers;
- (4) Identification of problems, gaps, reasons for divergences, etc;
- (5) One preparatory meeting with a team of experts;
- (6) Development of proposals for harmonization;
- (7) One week workshop involving the team of experts, 1 UNECE representative, 1 consultant, and country representatives from all administrations concerned, industry and transport;
- (8) Drafting of a report and recommendations;
- (9) One follow-up mission (1 week workshop).

Budget estimate

The estimated cost of the project is US\$250,000 per country.

Annex 8

Project proposal 3

Project title: Accession to ADR

Objective: The objective of the project is to assist volunteer Member States of the UNECE which have not yet become Contracting Parties to ADR to do so

Background: The ADR is intended to improve safety during international transport of dangerous goods. 42 UNECE member States plus Morocco are Parties to it. Out of the 56 Member States of UNECE, the only countries which are not parties are:

- Countries not linked by road to Europe: Canada, Iceland, United States of America;
- Countries linked by road to Europe: Andorra, Armenia, Georgia, Israël, Kyrgyzstan, Monaco, Uzbekistan, Tajikistan, San Marino, Turkey, Turkmenistan.

In view of the foreseen development of transport through Euro-Asia transport linkages, it would be appropriate that all countries which have roads belonging to the main Euro-Asian road linkages become parties to the ADR as soon as possible, in order to avoid national regulations in such countries becoming technical barriers to international transport and trade. This is also of utmost importance for those countries which produce chemicals and energy products for facilitating exports to third countries, since such exports can only be made if the requirements laid down in international legal instruments based on the UN Recommendations on the Transport of Dangerous Goods are fully met.

Expected accomplishments:

- (a) Evaluation of the situation in the concerned countries;
- (b) Development of adequate administrative structures for approval of packagings and transport equipment in full respect of international requirements in order to improve the safety of the transport of dangerous goods and to facilitate exports to third countries;
- (c) Accession to ADR in order to facilitate international transport to, from and through the country in safe conditions.

Proposed activities:

The following activities would be carried out:

- (1) Development of a questionnaire to assess the situation;
- (2) Analysis of the answers and preparation of draft recommendations;
- (3) Workshop with country representatives of all sectors concerned, relevant administrations, industry, road carriers, customs, emergency responders,

controllers) to explain the scope and purposes of ADR and to make recommendations for accession.

- (4) One meeting with country focal points for assessment of follow-up action and support needed.

Budget estimate

The estimated cost of the project is US\$100,000 per country.
