2011

A study on the IMO regulatory instruments concerning the evaluation of safety and pollution hazards of chemicals in bulk transported by sea (based on MARPOL Annex II and IBC Code)

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A STUDY ON THE IMO REGULATORY INSTRUMENTS CONCERNING THE EVALUATION OF SAFETY AND POLLUTION HAZARDS OF CHEMICALS IN BULK TRANSPORTED BY SEA

(Based on MARPOL Annex II and IBC Code)

By

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A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE
In
MARITIME AFFAIRS

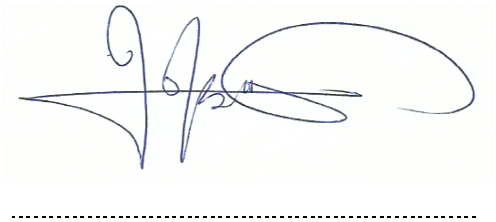
(MARITIME SAFETY AND ENVIRONMENTAL ADMINISTRATION)

2011

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): 

(Date): 24 October 2011

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ACKNOWLEDGEMENTS

First of all, I would like to express my gratitude to my government, the Ministry of Land, Transport and Maritime Affairs, kindly providing me with full fellowship for my studies in World Maritime University (WMU) in Malmo, Sweden, and Jong-eui Kim, the President and CEO of Korea Maritime Dangerous Goods Inspection & Research Institute for giving me a great opportunity to expand my knowledge and experiences in WMU.

I would like to express my special thank to my supervisor, LCDR Mark SAWYER, who led and guided me to accomplish my dissertation work with valuable comments and suggestions, and Inger BATTISTA, who helped me with comments on my English language. My sincere appreciation also goes to Professor Clive COLE, who taught me academic English writing and gave me confidences for my successful studies.

I would like to thank Professor Daniel MOON who has been a supporter for my dissertation and my family's life in Malmo. I would also like to thank Jolyn Tay providing me national regulatory information of the Republic of Singapore for my dissertation. I would like to appreciate An Kwang, Chae Chong Ju, Min Young Hun and their families sharing happiness, knowledge and unforgettable memories of foreign life in Sweden.

Lastly, my sincere thank goes to my wife, Jung Pilhee and my lovely two daughters, Seyoon and Seungah for living together, giving me enthusiasm, smiles and being my happiness all the time of studies in WMU.

ABSTRACT

Title of Dissertation: **A Study on the IMO Regulatory Instruments Concerning the Evaluation of Safety and Pollution Hazards of Chemicals in Bulk Transported by Sea** (Based on MARPOL Annex II and IBC Code)

Degree: **MSc**

The IMO has developed various technical codes to regulate different forms of hazardous substances transported by sea.

This dissertation is a study to find more effective and user-friendly ways to deal with complex IMO regulatory instruments concerning the evaluation of safety and pollution hazards of chemicals in bulk for the benefit of industries and IMO Member States.

A chemical which is not evaluated by its hazard properties should not be transported by ships. Evaluated and approved chemicals are listed in the IBC Code. Each of these chemicals should be assigned carriage requirements and a pollution category before transporting.

The transportation of petroleum products accounts for 11.7 % of world seaborne trade and new products will be transported. Over 98% of these products are hazardous to humans and/or the environment. Therefore, in order to transport new products, the chemical industry should evaluate the hazards of products using international instruments.

However, the IMO's instruments for the evaluation of products are complex and difficult to implement. The lack of comprehensive information and expertise can be a burden for the chemical industry.

Additionally, the frequent revisions of these regulatory instruments make it difficult for IMO Member States to adopt these instruments into their national framework. Most countries merely reference the IMO instruments within national regulations. Consequently, IMO's role as main sources of non-mandatory instruments is important for the industry.

Therefore, possible solutions are suggested in Chapter 6 of this dissertation based on the difficulties and complexities of these instruments to benefit the industry and IMO Member States with a number of recommendations in the concluding Chapter.

Developments of a new Appendix to the IBC Code which references all necessary relevant guidelines will be informative, and a comprehensive electronic version of the guidelines can be a user-friendly tool for all maritime stakeholders.

KEY WORDS: Regulatory instruments, IBC Code, MARPOL Annex II, Evaluation of chemical hazards, Products, Noxious Liquid Substance (NLS), GESAMP Hazard Profiles, Safety, Pollution Category,

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LIST OF ABBREVIATIONS

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AND	European Agreement for the International Carriage of Dangerous Goods by inland Waterway
BC Code	Code of Safe Practice for Solid Bulk Cargoes
BCH Code	Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
BLG	Sub-committee on Bulk Liquids and Gases
CFR	Code of Federal Regulations
DSC	Sub-committee on Dangerous Goods, Solid Cargoes and Containers
ESPH	Working Group on the Evaluation of Safety and Pollution Hazards of Chemicals
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRA	France
GBR	United Kingdom
GC Code	Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GESAMP/EHS	GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GLP	Good Laboratory Practice
IAEA	International Atomic Energy Agency

IBC Code	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
IGC Code	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
ILO	International Labour Organization
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
IMSBC Code	International Maritime Solid Bulk Cargoes Code
INF Code	International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes on Board Ships
ITA	Italy
KOMDI	Korea Maritime Dangerous Goods Inspection and Research Institute
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978
MEPC	Marine Environment Protection Committee
MSC	Maritime Safety Committee
NGO	Non-Governmental Organization
NLS	Noxious Liquid Substances
NOR	Norway
NVIC	Navigation and Vessel Inspection Circular in USA
OECD	Organization for Economic Co-operation and Development
OS	Other Substances
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
ROK	Republic of Korea
SGP	Republic of Singapore
SOLAS	International Convention for the Safety of Life at Sea,

	1974
TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
UN	United Nations
UNSCEGHS	UN Sub-committee of Experts on GHS
UNCETDG	UN Committee of Experts on Transport of Dangerous Goods
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNCTAD	United Nations Conference on Trade And Development
USA	United States of America

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Chemicals, transported by ships are dangerous for crews and the marine environment, because most of these chemicals are hazardous due to their toxic, flammable, explosive, corrosive and reactive properties. Therefore, International Maritime Organization (IMO) has developed various international regulatory instruments to evaluate dangerous chemicals[1] and noxious liquid substances[2] (products[3]) for safe seaborne trade. The MARPOL 73/78 Convention[4] (MARPOL) Annex II, SOLAS 74 Convention[5] (SOLAS) and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) are the primary regulatory instruments for the safe transportation of products.

However, the international regulations, guidelines and procedures concerning the hazard evaluation of the products are complicated and difficult for the chemical manufacturer and the shipping industry to implement. In order to assess a product's hazard for seaborne transport, it should be tested in good laboratories, its hazard should be rated in accordance with international guidance, hazard data should be sent to expert groups for their judgment, and the entire process requires administrative procedures.

In addition, the information in these IMO instruments may not be sufficient for the

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[1] Dangerous chemicals means any liquid chemicals designated as presenting a safety hazard, based on the safety criteria for assigning products to Chapter 17 of the IBC Code

[2] Noxious Liquid Substance means any substance falling into X, Y or Z pollution category under the provision of regulation 6.3 of MARPOL Annex II

[3] Products is the collective term used to cover both Noxious Liquid Substances and Dangerous chemicals

[4] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (IMO)

[5] International Convention for the Safety of Life at Sea, 1974 (IMO)

chemical industry to fully comprehend the regulatory requirements. Furthermore, a comprehensive written study or information for these guidelines is non-existing, although the evaluation of safety and pollution hazards of chemicals has been one of the main agenda items of the Sub-Committee on Bulk Liquids and Gases (BLG) in IMO, supported by a formal Working Group on the Evaluation of Safety and Pollution Hazards of Chemicals (ESPH).

Therefore, considering that these guidelines are highly technical and complex, the lack of enough information and the difficulty in dealing with these guidelines are a great burden and unexpected obstacles for a chemical manufacturer, especially one who is not familiar with maritime regulations.

1.2 Purpose of the study

This dissertation will study the complicated IMO instruments concerning the evaluation of safety and pollution hazards of chemicals. Therefore, the content will be informative for the chemical and shipping industry involved in the maritime trade of bulk liquid chemicals. In addition, this study will provide basic information to make and/or manage effective and user-friendly guidelines which are much simpler than the current complex and scattered guidelines. Furthermore, the results can be valuable references for future amendments of IMO's complex regulatory instruments. Consequently, this study will be beneficial for the industry if the Member States of IMO adopts effective ways to simplify the complex guidelines into a simple consolidated tool.

1.3 Method of the study

This dissertation will combine quantitative and qualitative methodology. However, qualitative methods will prevail throughout this dissertation, focusing on general difficulties in IMO instruments which shipping industries may encounter when transporting new products. Most of the relevant IMO mandatory and non-mandatory instruments will be reviewed and summarized based on Annex II to MARPOL and

the IBC Code. In addition, the interrelationships of these instruments will be analyzed. Furthermore, the international evaluation and laboratory test criteria for chemicals will be summarized and analyzed. The source of information will be based on the various IMO and UN instruments.

The world seaborne trade of products and newly transported bulk liquid chemicals will be reviewed, and the movement of new products in country groups will be analyzed by using statistical data. The products which are listed in the IBC Code and IMO circulars will be analyzed. Furthermore, the pollution categorizations and the hazard information of these products will be analyzed using statistical data.

The administrative aspect of some of the IMO Member States will be reviewed based on the national regulatory systems to find how these countries deal with the complex non-mandatory instruments when incorporating them in their national legal framework.

1.4 Scope of the study

This study will be limited to the transportation of products by sea, mainly focusing on the IMO's regulatory instruments concerning the evaluation of hazardous liquid chemicals in bulk. The complexity of these instruments will be discussed and analyzed. However, the procedural steps of the evaluation and the technical criteria that are contained in those instruments will not be discussed.

The comprehensive summarization of all the relevant sources of the technical information in the various IMO/UN instruments, and to find a more effective tool to deal with those guidelines will be the primary focus of this study.

CHAPTER 2

TRANSPORTATION OF LIQUIDS IN BULK BY SEA

This chapter will review the seaborne trade of dangerous chemicals and Noxious Liquid Substances (NLS) in bulk and analyze newly transported products. Data for the analysis of new products will be supported by MEPC.2/Circulars[6] which were developed and released by the Marine Environment Protection Committee (MEPC) in IMO.

2.1 Seaborne trade of liquid in bulk

Table 1 shows the world seaborne trade from year 2006 to 2009. An average of 930.0 million tons of petroleum products[7] were transported during the last four years. It accounts for 11.7 % of world seaborne trade. The transportation volume of petroleum products has also slightly increased as with many other goods (UNCTAD, 2010).

Table 1 -World seaborne trade (year 2006 to 2009)

Year	Goods Loaded				Goods Unloaded			
	Total	Crude	Products	Dry cargo	Total	Crude	Products	Dry cargo
Unit: millions of tons								
2006	7682.3	1783.4	914.8	4984.1	7885.9	1981.0	894.2	5060.8
2007	7983.5	1813.4	933.5	5236.6	8136.1	1995.5	904.3	5236.3
2008	8210.1	1785.2	946.9	5478.0	8272.7	1942.1	964.1	5366.5
2009	7842.8	1724.5	924.6	5193.6	7908.4	1887.8	957.3	5073.3
Average	**7929.7**	**1776.6**	**930.0**	**5223.1**	**8050.8**	**1951.6**	**930.0**	**5184.2**
Unit: percentage								
2006	100.0	23.2	11.9	64.9	100.0	24.5	11.3	64.2
2007	100.0	22.7	11.7	65.6	100.0	24.5	11.1	64.4
2008	100.0	21.7	11.5	66.7	100.0	23.5	11.7	64.9

[6] Provisional categorization of liquid substances, issued by IMO's MEPC in December every year
[7] Products transported by chemical tankers

2009	100.0	22.0	11.8	66.2	100.0	23.7	12.1	64.2
Average	**100.0**	**22.4**	**11.7**	**65.9**	**100.0**	**24.1**	**11.6**	**64.4**

Source: UNCTAD[8]. (2010). *Review of Maritime Transport 2010*, pp. 10-11

Table 2 shows seaborne trade of petroleum products by country groups[9] in 2009. Half of the petroleum products were loaded in developing country groups and unloaded in developed country groups. Figure 1 shows the percentage of the trade. The developing country group exports (55.3%) more petroleum products than the developed country group (38.0%). However, the developed country group imported more petroleum products (57.1%) than the developing country group. Therefore, petroleum products have been transported from developing countries to developed countries.

Chemical production areas have been expanded to the Middle East and Asia since 2000. Production capacity of these regions was 22 % in 1990s, 39 % in 2005 and expected to occupy 49 % of total production of the world in 2015 (KOMDI[10], 2007)

Table 2 -Seaborne trade of petroleum products by country group in 2009

Unit: millions of tons

Country group	Product loaded	Product unloaded
Developed	355.0	529.4
Transition	41.6	3.0
Developing	528.0	428.8

Source: Data was selected from the UNCTAD. (2010). *Review of Maritime Transport 2010*, pp. 10-11

[8] United Nations Conference on Trade And Development
[9] Countries Group is classified by Annex I of the Review of Maritime Transport 2010, UNCTAD.
[10] Korea Maritime Dangerous Goods Inspection and Research Institute

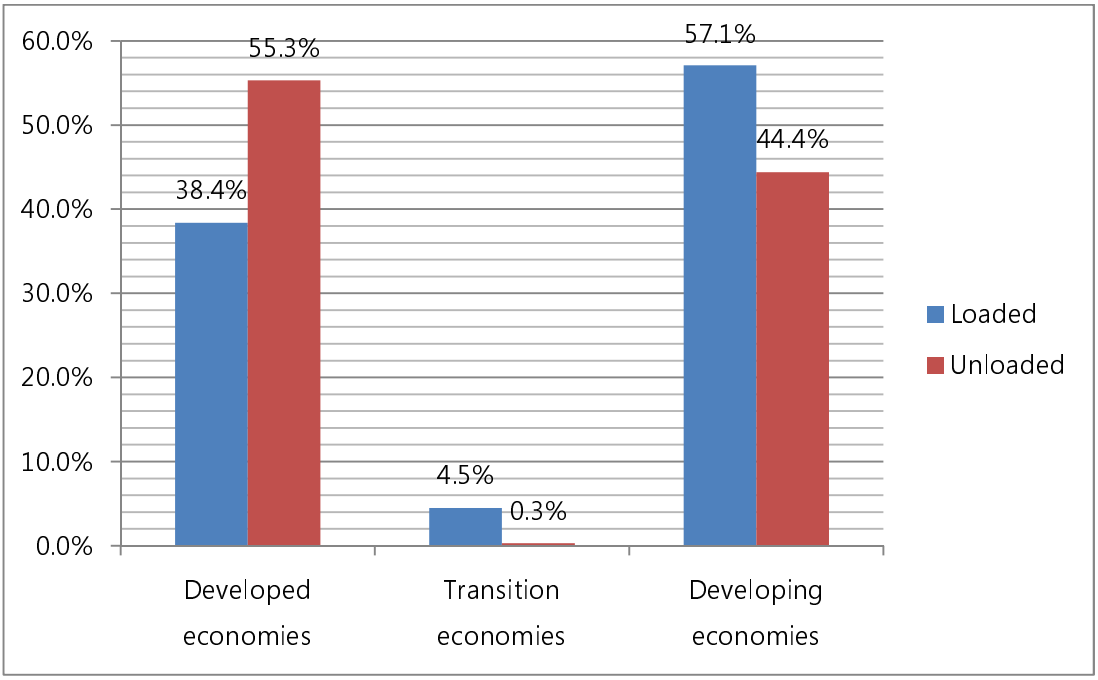

Figure 1 -Seaborne trade of petroleum products by country group in 2009
Source: Drawn by Author based on the table 2

2.2 Newly transported products and major initiating countries

Provisionally or completely assessed and newly transported products are listed in the MEPC.2/Circular before they are included in Chapter 17 or 18 of the IBC Code. The products listed in this circular are divided into lists 1, 2, 3 and 4[11], based on the chemical characteristics or component of the mixtures. Most of these products are transported by Tripartite Agreement[12].

Table 3 shows the number of newly transported products and main exporting countries based on the MEPC.2/Circ.12 to 16, issued by MEPC from 2006 to 2010. List 2 products were excluded from the table, because these products do not need

[11] **List 1**: Pure or technically pure products, **List 2**: Pollutant only mixtures containing at least 99% by weight of components already assessed by IMO, **List 3**: (Trade-named) mixtures containing at least 99% by weight of components already assessed by IMO, presenting safety hazards, **List 4**: Pollutant only mixtures containing one or more components, forming more than 1% by weight of the mixture, which have not yet been assessed by IMO.

[12] Tripartite Agreement is concurrence of the Administrations among the shipping or producing country and the Flag State(s) and receiving countries with product's evaluation result under regulation 6.3 of the Annex II to MARPOL 73/78 before the chemical is transported by ships.

Tripartite Agreement and can simply be transported based upon a calculated pollution hazard[13].

In total 134 different new products were transported in the last five years. This number accounts for 18% of the total products listed in the IBC Code[14]. Major States that initiate the carriage of products are France (FRA), the United States of America (USA), the United Kingdom (GBR) and Norway (NOR) as shown in Figure 2. These four States transported 95 new products, and account for 70% of total newly transported products between 2006 and 2010. The number also increased slightly within the last five years (IMO, 2010).

Table 3 -The number of newly transported products and major countries

Country abbreviations[15]	2006			2007			2008			2009			2010			Total
	Product List			Product List			Product List			Product List			Product List			
	1	3	4	1	3	4	1	3	4	1	3	4	1	3	4	
FRA	3			3	7	7		5		1	1			6		33
USA	1			1	1	2	3			1	10		3	8		30
GBR	4			2	1						12			3		22
NOR				1				1			6			2		10
SGP				1		1							1	2	1	6
ITA														5		5
Other	1	1	0	5	1	1	1	8	0	4	2	0	2	2	0	28
Total	**9**	**1**	**0**	**13**	**10**	**11**	**4**	**14**	**0**	**6**	**31**	**0**	**6**	**28**	**1**	**134**
	10			**34**			**28**			**37**			**35**			

Source: Calculated by Author, based on the products listed in the MEPC.2/Circ.12 to 16 (IMO)

[13] Appendix 6 of the MEPC.1/Circ.512 (2006), contains the example of the calculation method for determination of pollution categories and ship types for mixtures.
[14] In total 748 cargoes are listed in the IBC Code, see table 6 in Chapter 4 of this dissertation.
[15] Country groups are defined by Annex 7 in the MEPC.2/Circular.

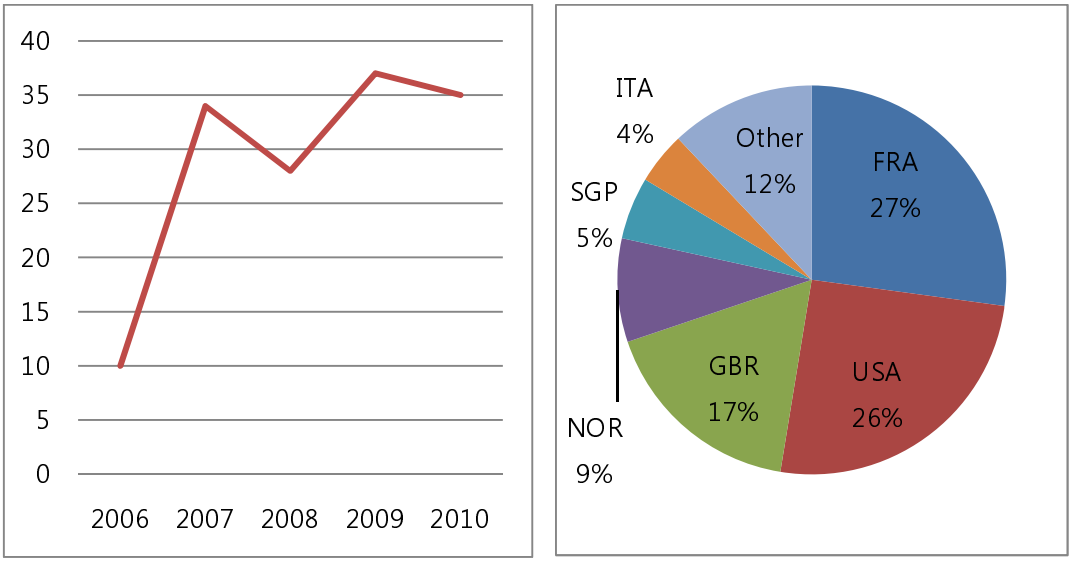

Figure 2 -The number of products and the percentage of major newly transporting countries (year: 2006 – 2010)
Source: Calculated and drawn by Author, based on the table 3

Petroleum products have been transported from developing countries to developed countries as shown in Table 2. However, the new products have been transported the other way, from developed countries to developing countries.

CHAPTER 3

INTERNATIONAL FRAMEWORK FOR THE CARRIAGE OF DANGEROUS GOODS AND HARMFUL SUBSTANCES BY SHIPS

This chapter will review and summarize IMO's international legal framework for the carriage of dangerous goods and harmful substances, such as the IMDG Code[16], the IBC Code and their umbrella Conventions: SOLAS and MARPOL and relevant Codes under both Conventions. Furthermore, the interrelationship of the SOLAS and MARPOL along with the various Codes will be analyzed.

3.1 SOLAS 74 and MARPOL 73/78

Chapter VII of the SOLAS regulates carriage of dangerous goods and the Chapter is divided into four parts, and each part regulates different characteristic of goods, materials or substances. MARPOL Annex II regulates the carriage of NLS in bulk, and Annex III regulates marine pollutants transported in packaged form. Figure 3 shows applications of various IMO Codes under SOLAS or MARPOL. Some of those Codes such as the IMDG Code, the IBC Code and the BCH Code[17] are referenced in both Conventions.

Table 4 shows a summary of the IMO instruments for carriage of dangerous goods and harmful substances. The IMDG Code and the IMSBC Code[18] require the operational carriage requirements of specific dangerous goods or solid bulk cargoes whereas, the IBC Code and the IGC Code[19]regulates a ship's particular requirements of construction and equipment for carriage of dangerous chemicals or gases.

[16] International Maritime Dangerous Goods Code (IMO)
[17] The Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IMO)
[18] International Maritime Solid Bulk Cargoes Code (IMO)
[19] The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IMO)

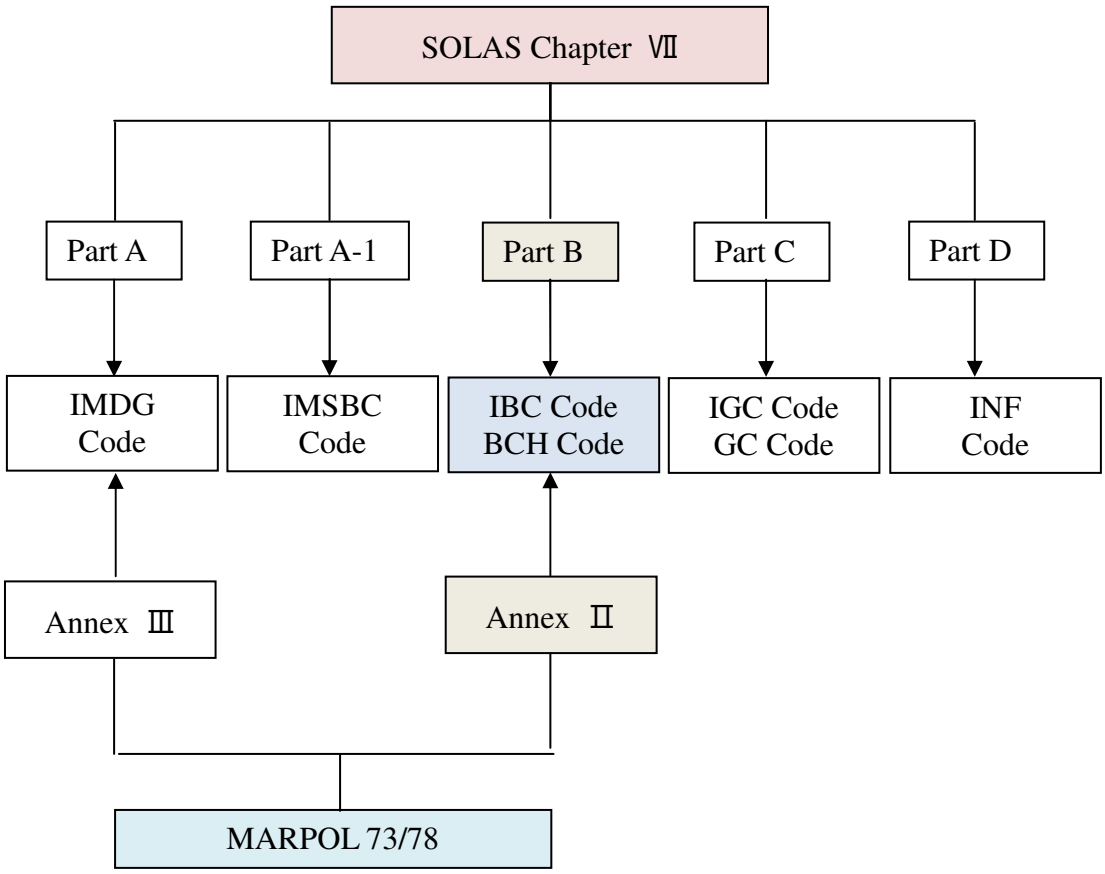

Figure 3 -Application of various Codes under SOLAS 74 and MARPOL 73/78

Source: Drawn by Author, based on the SOLAS and MARPOL Conventions

Table 4 -Summary of the IMO instruments for carriage of dangerous goods and harmful substances

Convention	Part/ Annex	Application	Code	Ship Type
SOLAS Chapter VII "Carriage of Dangerous Goods"	Part A	Carriage of dangerous goods in packaged form	IMDG	Containers Break bulk carriers
	Part A-1	Carriage of dangerous goods in solid form in bulk	IMSBC	Bulk carriers
	Part B	Construction and equipment of ships carrying dangerous liquid chemicals in bulk	IBC BCH	Chemical tankers

	Part C	Construction and equipment of ships carrying liquefied gases in bulk	IGC GC	Gas carriers
	Part D	Special requirement for the carriage of packaged irradiated unclear fuel, plutonium and high-level radioactive wastes on board ships	INF	Ships carrying INF cargoes
MARPOL 73/78	Annex II	Regulations for the control of pollution by noxious liquid substances in bulk	IBC BCH	Chemical tankers
	Annex III	Regulations for the control of pollution by harmful substances carried by sea in packaged form	IMDG	Containers Break bulk carriers

Source: Summarized by Author based on the SOLAS and MARPOL Conventions

3.2 Various International Codes

3.2.1 IMDG Code

The IMDG Code was developed by IMO's Maritime Safety Committee (MSC) Working Group with support of the UN Committee of Experts on Transport of Dangerous Goods (UNCTDG) from 1961 to 1965. The Code was approved by MSC, and the IMO Assembly recommended the Code to the IMO Member States in 1965. The present mandatory text of the Code was adopted by resolution MSC. 122(75)[20] and has been mandatory since 1 January 2004 under SOLAS Chapter VII, Part A. The Code applies only to packaged forms of dangerous goods transported by ships. It has been amended every two years by IMO's Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC) followed by a subsequent amendment of the UN Model Regulation[21].

[20] Adoption of the International Maritime Dangerous Goods (IMDG) Code (24 May 2002)
[21] Recommendations on the Transport of Dangerous Goods, Model Regulation (UN)

As shown in Figure 4, the UN Model Regulations are basic regulatory sources for various modes of dangerous goods transported, such as TI[22], RID[23], ADR[24] and. ADN[25] to provide international uniformity (Kim, 2008).

The IMDG Code is legally binding for IMO Member States signatory to SOLAS and MARPOL. SOLAS Chapter VII, Part A, Regulation 1.3 prohibits the carriage of dangerous goods except in accordance with the Code. MARPOL Annex III Regulation 1.2 prohibits the carriage of harmful substances in ships except in accordance with this Code.

The Code consists of Volumes 1, 2 and a Supplement. The regulations cover principles of classification and definition of classes, listing of the principal dangerous goods, general packing requirements, marking, labeling and transport documents to ensure the safe transportation of the dangerous goods in packaged form (IMO, 2008).

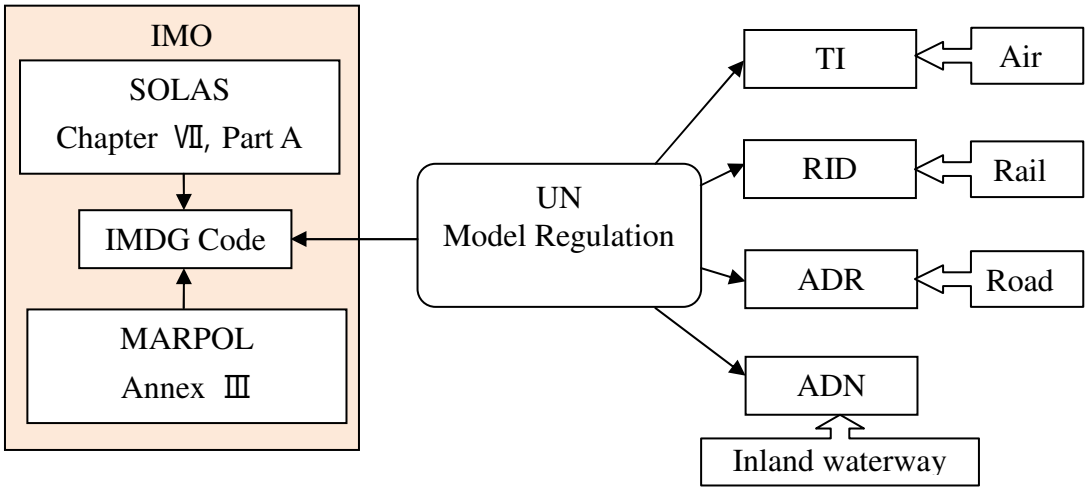

Figure 4 -Regulatory structure of various modes of dangerous goods transportation in packaged forms
Source: Drawn by Author

[22] Technical Instructions for the Safe Transport of Dangerous Goods by Air
[23] Regulations concerning the International Carriage of Dangerous Goods by Rail
[24] European Agreement concerning the International Carriage of Dangerous Goods by Road
[25] European Agreement for the International Carriage of Dangerous Goods by inland Waterway

3.2.2 IMSBC Code

The Code of Safe Practice for Solid Bulk Cargoes (BC Code) was developed by the IMO's DSC Sub-committee and has been published since 1965. The name of the BC Code was changed to the International Maritime Solid Bulk Cargoes Code (IMSBC Code) and it was adopted by resolution MSC.268 (85)[26]. The Code became mandatory under Chapter VI and VII[27] of the SOLAS Convention on 1 January 2011. The Code applies to solid bulk cargoes which are divided into Cargo Group A[28], B[29] and C[30].

Figure 5 shows the regulatory structure of the solid bulk cargoes. Cargoes in Cargo Group B are assigned one of the UN numbers[31] which are used for the dangerous goods listed in the IMDG Code.

The IMSBC Code mainly deals with operational aspects of cargoes before loading, during loading or in transportation, and it contains provisions for loading, carriage and unloading precautions, safety of personnel and ship, assessment of acceptability of consignments for safe shipment and trimming procedures. Especially, Section 13 of the Code references the related information and recommendations and appendixes of the Code containing individual schedules of solid bulk cargoes[32] and laboratory test procedures, associated apparatus and standards[33] (IMO, 2008).

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[26] Adoption of the International Maritime Solid Bulk Cargoes (IMSBC) Code(4 December 2008)
[27] Chapter VII, Part A-1
[28] May liquefy if shipped at moisture content in excess of their transportable moisture limit
[29] Possess a chemical hazard which could give rise to a dangerous situation on a ship
[30] Neither liable to liquefy (Group A) nor to possess chemical hazards (Group B)
[31] Four-digit numbers that identify hazardous substances, and articles (such as explosives, flammable liquids, toxic substances, etc.) in the framework of international transport ,which assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods(http://en.wikipedia.org)
[32] Appendix 1 of the IMSBC Code
[33] Appendix 2 of the IMSBC Code

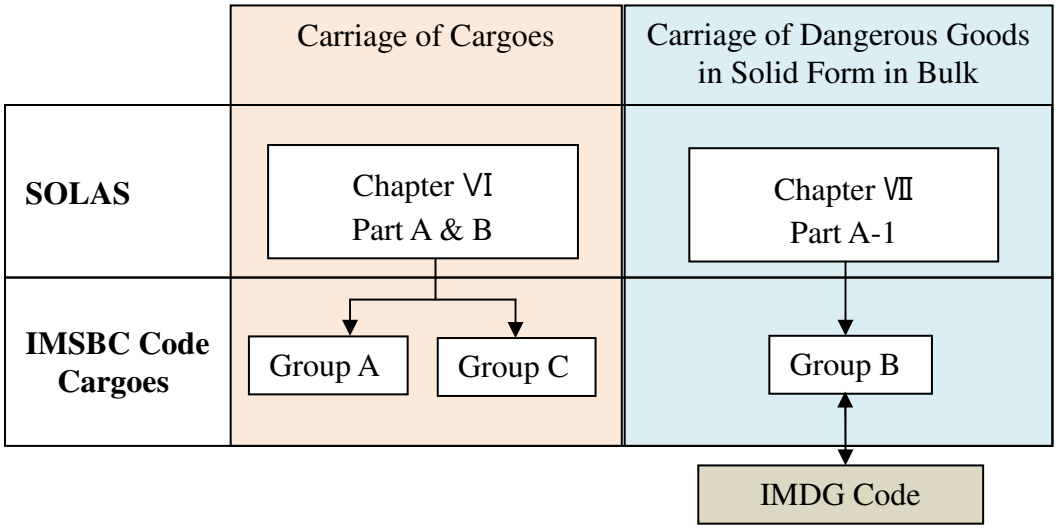

Figure 5 -IMO's regulatory structure of the solid bulk cargoes
Source: Drawn by Author

3.2.3 IBC Code and BCH Code

The IBC Code was adopted by resolution MSC.4 (48)[34]. This Code primarily deals with ship design and equipment for carrying dangerous chemicals listed in Chapter 17 of the Code. The Code also covers marine pollution substances under Annex II to MARPOL by resolution MEPC.19 (22)[35] from 1985. In addition, Chapter 16 of the Code deals with operational requirements such as cargo information, personnel training and opening and entry into cargo tanks (IMO, 2007).

Figure 6 shows the regulatory concept of liquid in bulk transported by ships. SOLAS regulates safety aspects of dangerous chemicals and MARPOL regulates marine pollution aspects of NLS cargoes. The IBC Code contains lists of products which are regulated by two umbrella Conventions. Products listed in Chapter 17 of the Code are under SOLAS. All products which are listed in Chapters 17 or 18 and that are categorized as the X, Y and Z have to meet the MARPOL Annex II. Other Substances (OS) are not regulated by either of the Conventions.

[34] Adoption of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) (17 June 1983)
[35] Adoption of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) (5 December 1985)

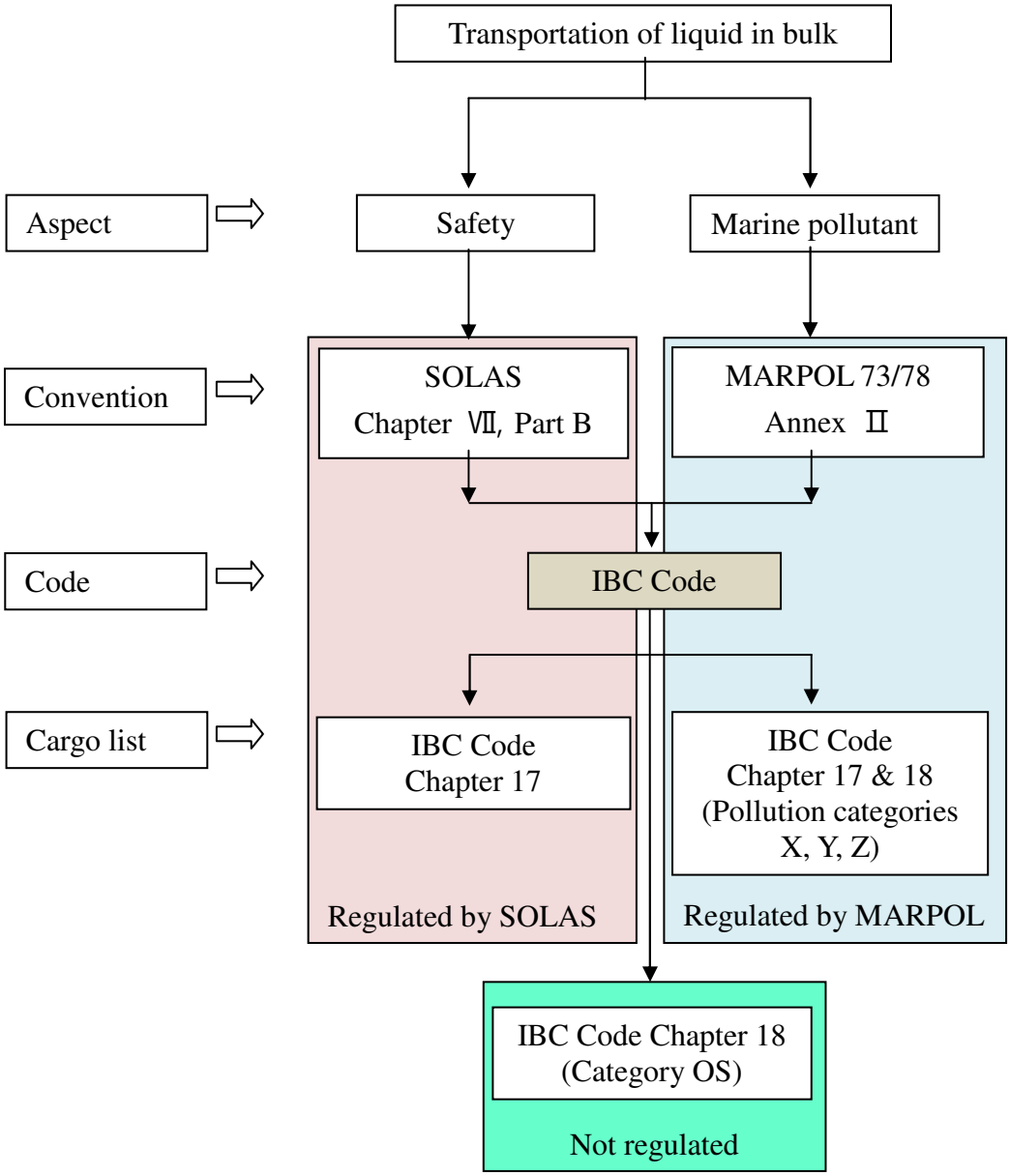

Figure 6 -The regulatory concept of products listed in the IBC Code
Source: Drawn by Author

Figure 7 shows the regulatory concept of the IBC and BCH Codes. The IBC Code applies to chemical tankers built after 1 January 1986 and it is a mandatory instrument under SOLAS and MARPOL Annex II. The BCH Code applies to chemical tankers built before 1 January 1986 and it is mandatory under SOLAS and recommendatory under MARPOL Annex II (IMO, 2006).

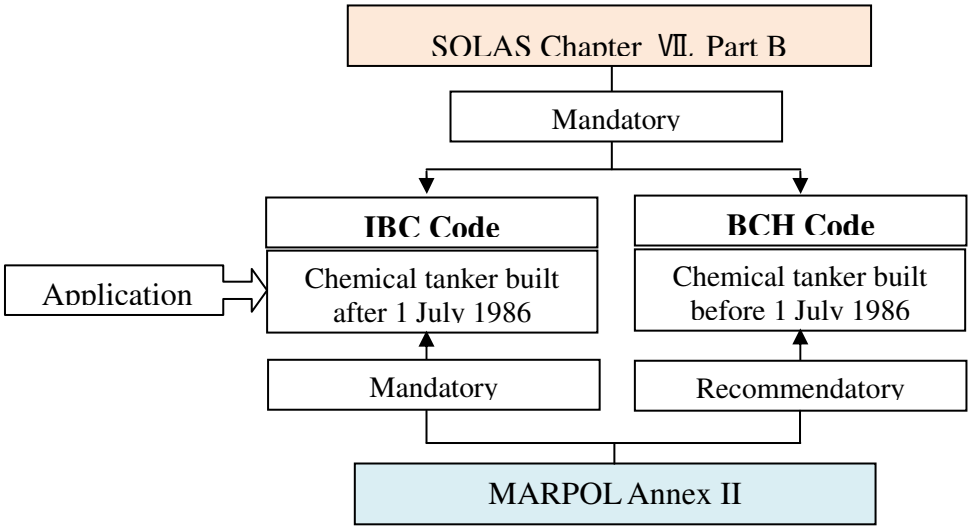

Figure 7 -Regulatory concept and application of IBC Code and BCH Code
Source: Drawn by Author

3.2.4 IGC Code and GC Code

The IGC Code was developed and adopted by the MSC by resolution MSC.5 (48)[36]. This Code regulates ship's construction and equipment to carry liquefied gases listed in Chapter 19 of the Code. It was made mandatory by resolution MSC.6 (48)[37] under Chapter VII, Part C of the SOLAS. Figure 8 shows the regulatory concept of the IGC and the GC Code[38]. The IGC Code applies to gas carriers built after 1 January 1986, and The GC Code applies to gas carriers built before 1 January 1986 and it is recommendatory under SOLAS.

The IGC Code contains general and specific requirements for gas carriers such as ship survival capability, location of cargo tanks, cargo containment material and cargo control and tank venting systems. In addition, Chapter 18 of the Code contains operational requirements (IMO, 1993).

[36] Adoption of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)) (17 June 1983)
[37] Adoption of amendments to the international convention for the safety life at sea, 1974 (17 June 1983)
[38] The Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

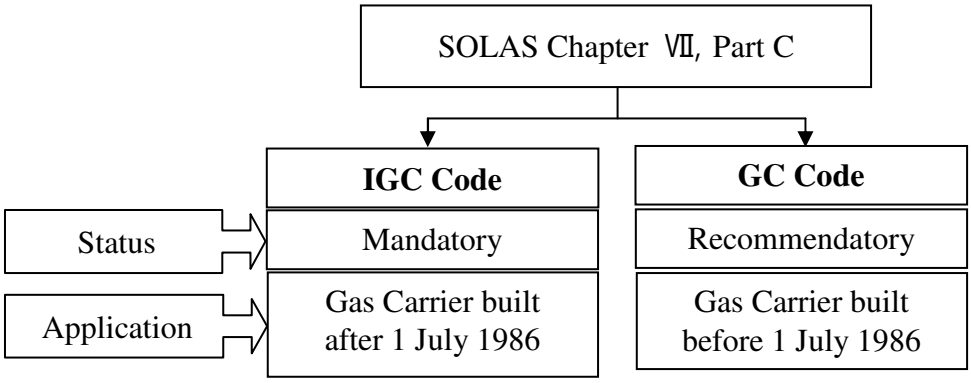

Figure 8 -Regulatory concept and application of IGC Code and GC Code
Source: Drawn by Author

3.2.5 INF Code

The International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes on Board Ships (INF Code) was developed by the joint working group, which consists of IMO, IAEA and UNEP[39] and adopted by resolution A.748 (18)[40] in 1993. The Code has been mandatory since 1 January 2001 by resolution MSC.87 (71)[41] under Part D, Chapter VII of SOLAS Convention. The Code applies to all ships regardless of build date, which are carrying INF cargoes, regulated by the IAEA[42] and classified as class 7[43] under the IMDG Code.

INF cargo ships are assigned to Class INF 1, 2 and 3 ships[44] under the Code, depending on the total radioactivity of INF cargoes carried on board ships. This Code

[39] United Nations Environment Programme (Nairobi)
[40] Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes in Flasks on Board Ships(4 November 1993)
[41] Adoption of Amendments to the International Convention for the Safety of Life At Sea, 1974, as amended (27 May 1999)
[42] International Atomic Energy Agency (Vienna)
[43] Packaged radioactive materials
[44] **Class INF I ship** - Ships which are certified to carry INF cargo with an aggregate activity less than 4,000 TBq. **Class INF 2 ship** - Ships which are certified to carry irradiated nuclear fuel or high-level radioactive wastes with an aggregate activity less than 2×10^6 TBq and ships which are certified to carry plutonium with an aggregate activity less than 2×10^5 TBq. **Class INF 3 ship** - Ships which are certified to carry irradiated nuclear fuel or high-level radioactive wastes and ships which are certified to carry plutonium with no restriction of the maximum aggregate activity of the materials(INF Code, Chapter 1.1.2)

regulates items such as damage stability, fire safety measures, temperature control of cargo space, radiological protection, management and training, shipboard emergency plan and notification in the event of an incident involving INF cargo (IMO, 2007).

CHAPTER 4

IMO'S INSTRUMENTS FOR THE EVALUATION OF SAFETY AND POLLUTION HAZARDS OF CHEMICALS IN BULK TRANSPORTED BY SHIPS

This chapter focuses on the specific IMO instruments concerning evaluation of safety and pollution hazards of chemicals in bulk, specifically all the relevant IMO guidelines and documents under MARPOL Annex II and the IBC Code. In addition, the products which are listed in the IBC Code and relevant IMO documents will be analyzed. The international authorized bodies, including organizational structure and functions of relevant IMO Committees and its Working Group, involved in the evaluation of chemicals will be reviewed. Furthermore, the evaluation criteria and the procedures will be summarized and analyzed based on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) developed by OECD[45].

4.1 International regulations, guidelines and documents

Table 5 shows various regulations, guidelines and documents for the evaluation of safety and pollution hazards of chemicals. Most of these documents are the result of IMO's MEPC or BLG Sub-committee. The GESAMP Report and Study No. 64 was developed by the GESAMP Group[46]. Industries are required to review most of these documents before they transport a new product which is not listed in the IBC Code or the latest version of MEPC.2/Circular. These instruments are binding under the SOLAS Chapter VII, Part B and/or MARPOL Annex II.

[45] Organization for Economic Co-operation and Development (Paris)
[46] Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (sponsored by eight UN Agencies)

Table 5 -Summary of international regulations, guidelines and documents

Instruments	Section	Contents
MARPOL Annex II	Regulation 6	- Marine pollution categorization - Administrative procedures for transportation of new products
	Appendix 1	- Pollution category evaluation criteria
IBC Code	Chapter 21	- Criteria for assigning carriage requirements
MEPC.1/Circ.512(16 May 2006)		- Guidelines for the provisional assessment
MEPC.2/Circs.(Annually issued)		- Provisional Categorization of Noxious Liquid Substances
GESAMP Report and Study No. 64		- The Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships
BLG.1/Circ.33 (09 August 2011)		- Summary of decisions taken on the interpretation of the ratings of GESAMP Hazard Profiles and other related decisions with respect to the categorization and classification of products
Report of the GESAMP/EHS Working Group		- Report of the GESAMP/EHS Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships which is issued annually as BLG.1/Circulars
BLG.1/Circ.27(18 August 2008)		- Tripartite Agreement on the IMO website
BLG.1/Circ.28(18 August 2008)		- The introduction of in charges for product evaluation work undertaken by GESAMP/EHS
GHS		- Basic evaluation and laboratory criteria for Chapter 21 of IBC Code

Source: Summarized by Author

4.1.1 MARPOL 73/78 Annex II

MARPOL Annex II regulates marine pollution aspects when evaluating NLS. Regulation 6 of Annex II to the Convention contains the framework for the pollution categorization and administrative procedures for the transportation of new NLS in bulk by ships. The categorization of NLS and OS are as follows under the Convention.

- ***Category X:*** *Deemed to present a major hazard to either marine resources or human health and, therefore, justify the prohibition of the discharge into the marine environment*
- ***Category Y:*** *Deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and therefore justify a limitation on the quality and quantity of the discharge into the marine environment*
- ***Category Z:*** *Deemed to present a minor hazard to either marine resources or human health and therefore justify less stringent restrictions on the quality and quantity of the discharge into the marine environment*
- ***Category OS:*** *Considered to present no harm to marine resources, human health, amenities or other legitimate uses of the sea when discharged into the sea. "Other Substances" shall not be subject to any requirements of the) Annex*

Regulation 6.3 requires the governments of Parties to the Convention to establish and to agree on a provisional assessment for the proposed operation on the basis of the guidelines[47] for liquid substances in bulk, which have not been categorized. Regulation 6.2 references the guidelines in Appendix 1 to Annex II. In addition, the Regulation requires that when the agreement has been reached among the involved countries, the shipping country has to notify the IMO within 30 days of the

[47] Guidelines in the Appendix 1 of Annex II to MARPOL 73/78

agreement. The notification will be kept by IMO until the next amendment of the IBC Code is carried out (IMO, 2006).

Appendix 1 of Annex II is the guidelines for the categorization of NLS and it details a pollution category evaluation criteria based on the GESAMP Hazard Profiles. The Appendix references MEPC/Circ.265 [48], as amended for the guidelines for provisional assessment of chemicals, which was superseded by MEPC.1/Circ.512. The revised Guidelines for the provisional assessment of liquid substances transported in bulk were approved by the MEPC at its fifty-fourth session in 2006.

4.1.2 IBC Code

Chapter 21 of the IBC Code has guidelines for the criteria for assigning carriage requirements for products to be listed into Chapter 17 of the Code or MEPC.2/Circular. The basic criteria are developed under GHS for a uniform approach. However, it emphasizes that these are only guidelines. The Chapter contains criteria for safety and pollution, and the assignment of minimum carriage requirements for products, such as ship type, tank type and tank environmental control.

4.1.2.1 Products listed in the IBC Code

Table 6 shows the number of products listed in the IBC Code. 709 products are listed in Chapter 17, and 39 products in Chapter 18. In total 748 products are listed in the Code. Figure 9 shows hazard types[49] of products listed in Chapter 17 of the Code. 45.7 % of the products has safety and pollution (S/P) hazards, and 53.88% has only a pollution hazard (P), and less than 0.5% has only safety hazard (S).

[48] The Guideline for Provisional Assessment of Chemicals

[49] "S" means that the product is included in the Code because of its safety hazards; "P" means that the product is included in the Code because of its pollution hazards; and "S/P" means that the product is included in the Code because of both its safety and pollution hazards (IBC Code, Chapter17: explanatory notes)

Table 6 -Products listed in the IBC Code by pollution categories and hazard type

Chapter	Pollution Categories	Hazard type			Total
		S	S/P	P	
17	X	0	30	59	89
	Y	1	244	233	478
	Z	2	50	90	142
	Sub-total	3	324	382	709
18	Z	-	-	-	26
	OS	-	-	-	13
	Sub-total	-	-	-	39
Total		**3**	**324**	**382**	**748**

Source: Calculated by Author, based on the products listed in the IBC Code[50]

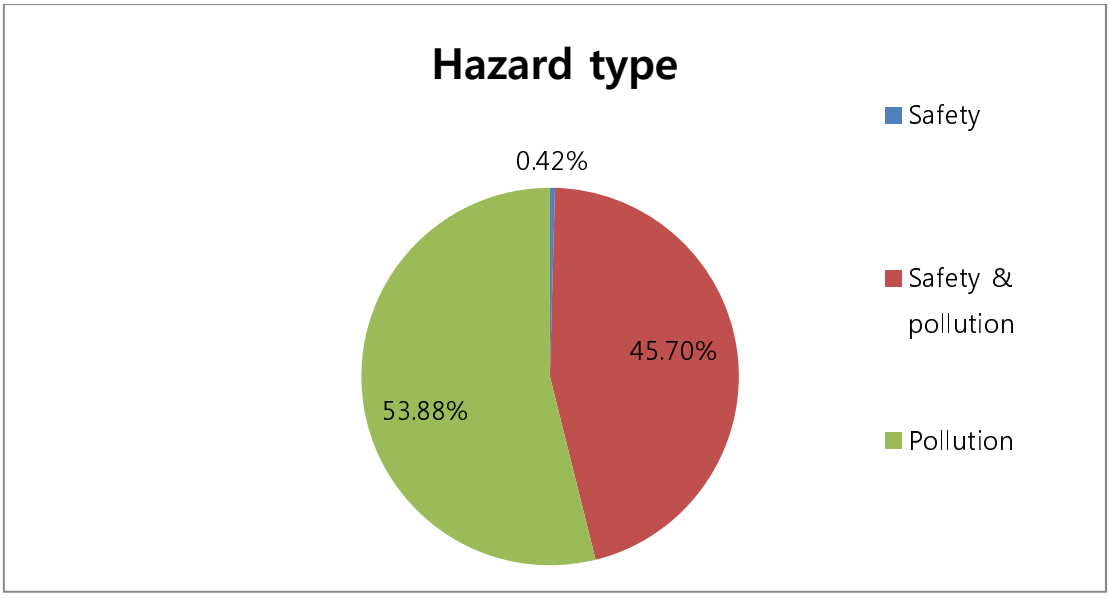

Figure 9 -Hazard types of products listed in Chapter 17 of the IBC Code
Source: Drawn by Author based on the table 6

[50] Published in 2007 and has been mandatory since 1st January 2009

Table 7 shows the number of products under the pollution categorization and ship type[51] in Chapter 17 of the IBC code. The majority of the substances are required to be carried by Type 2 ships, followed by Type 3 ships and Type 1 ships. Figure 10 indicates that pollution category Y substances account for about 63.9 % of all products listed in the Code, followed by Z that occupies 22.5 %, and then X that is 11.9 % of the total listed substances.

Table 7 -Products listed in the Chapter 17 of IBC Code by pollution categories and ship type

Chapter	Pollution Categories	Ship type			Total
		1	2	3	
17	X	22	67	0	89
	Y	3	307	168	478
	Z	0	13	129	142
	Total	25	387	297	709

Source: Calculated by Author, based on the Chapter 17 of the IBC Code

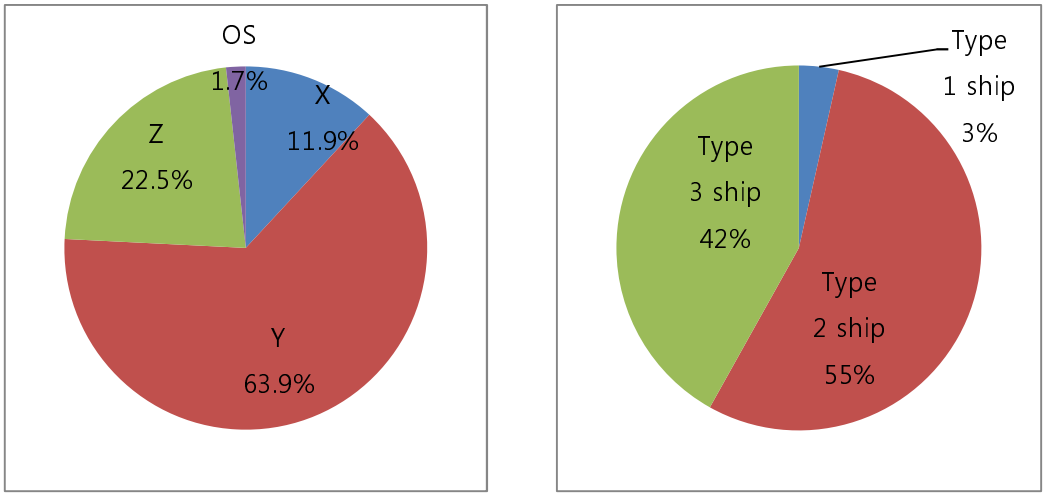

Figure 10 -Percentage of the pollution categories and ship type
Source: Drawn by Author

[51] **A type 1** ship is a chemical tanker intended to transport chapter 17 products with very severe environmental and safety hazards which require maximum preventive measures to preclude an escape of such cargo. **A type 2** ship is a chemical tanker intended to transport chapter 17 products with appreciably severe environmental and safety hazards which require significant preventive measures to preclude an escape of such cargo. **A type 3** ship is a chemical tanker intended to transport chapter 17 products with sufficiently severe environmental and safety hazards which require a moderate degree of containment to increase survival capability in a damaged condition (IBC Code, Chapter 2.1.2)

Figure 11 shows the number of products that are regulated under both Conventions. 709 substances have to meet the IBC Code requirements under SOLAS and 735 substances have been assigned one of the pollution categories X, Y and Z under MARPOL Annex II. Only 13 OS products (1.7%) do not have safety or pollution hazard. Therefore, more than 98% of the products listed in the IBC Code are hazardous substances to human beings and/or the environment.

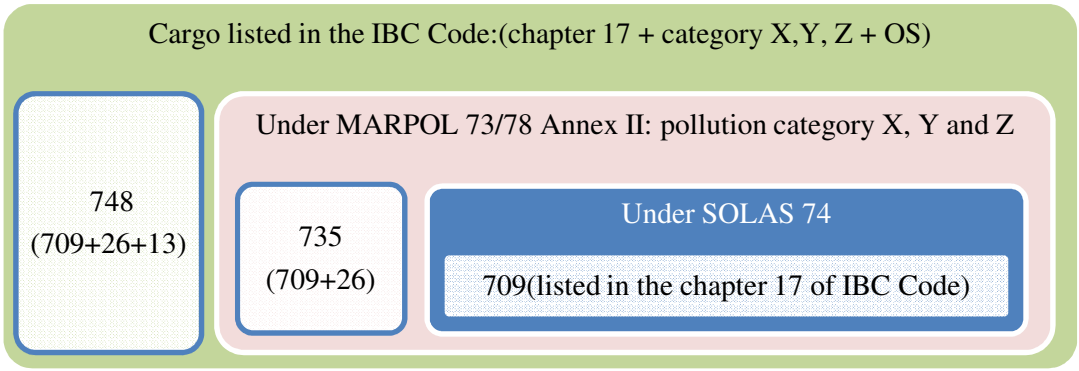

Figure 11 -The number of products that regulated by tow Conventions
Source: Compiled by Author, based on the products listed in the IBC Code

Considering most of the products listed in the IBC are subject to both the IBC Code and Annex II to MARPOL. Therefore, integration of the separated guidelines both in Appendix 1 of the Annex II to MARPOL and Chapter 21 of the IBC Code into a single instrument may be considered in the future, including all relevant evaluation criteria referenced in those IMO instruments.

4.1.3 MEPC.2/Circulars

MEPC.2/Circulars are revised annually under Regulation 6.3 of the MARPOL Annex II and have 10 annexes. Annexes 1 through 5 provide lists of NLS. Annex 6 has synonyms for vegetable oils and Annex 7 and 8 have information to support the reporting of Tripartite Agreements as shown in Table 8.

Table 8 - List of Annexes in MEPC.2/Circular

Annex	Contents
1	List 1: Pure or technically pure products
2	List 2: Pollutant only mixtures containing at least 99% by weight of components already assessed by IMO
3	List 3: (Trade-named) mixtures containing at least 99% by weight of components already assessed by IMO, presenting safety hazards
4	List 4: Pollutant only mixtures containing one or more components, forming more than 1% by weight of the mixture, which have not yet been assessed by IMO
5	List 5: Substances not shipped in pure form but as components in mixtures
6	Synonyms for vegetable oils
7	Country abbreviations
8	Tripartite contact addresses
9	Manufacturers authorized to conduct pollutant-only assessments by calculation
10	Cleaning additives

Source: IMO. (2010). *Provisional Categorization of Liquid Substances* (MEPC.2/Circ.16)

4.1.3.1 Products listed in the MEPC.2/Circular

This circular contains substances which have not been listed in the IBC Code since the latest amendment of the Code and are currently being transported. The amendment of the 2007 IBC Code included substances which were listed in the MEPC 2/Circ.13[52]. Therefore, Circulars which have been issued since 2008 contain substances which were not included in the current edition of the IBC Code[53]. Table 9 shows the number of products listed in MEPC.2/Circulars between 2008 and 2010. 403 products were listed at the end of 2010.

[52] Issued in 17th December 2007

[53] The latest version of IBC Code, published in 2008 and entered into force from 1st of January in 2009

Table 9 -Products listed in MEPC.2/Circulars (year 2008 to 2010)

Year	Circ. No.	Noxious Liquid Substances(NLS)				Total
		List 1	List 2	List 3	List 4	
2010	16	58	268	76	1	403
2009	15	52	367	56	7	482
2008	14	40	374	25	9	448
Average		**50**	**336**	**52**	**6**	**444**

Source: Calculated by Author, based on the products listed in the MEPC.2/Circ.14 to 16(IMO)

4.1.4 MEPC.1/Circ.512

MEPC.1/Circ.512 is the revised guidelines for the provisional assessment of liquid substances transported in bulk which were approved by the MEPC fifty-fourth session in 2006. These guidelines contain information concerning the evaluation, and its procedures for assigning the carriage requirements for all new products. Table 10 shows the contents of the guidelines in the MEPC.1/Circ.512. In addition, this circular is a main source of all the relevant other guidelines for evaluation criteria.

Table 10 -Information in the annex of the MEPC.1/Circ.512

Contents	Information and guidance
Section 1	- Definition of the liquid products and application of the guidelines
Section 2	- Identification of the assessed products
Section 3	- Division of the unassessed products groups and general information for the provisional assessment
Section 4	- Guidance for the Administration to assess the pure or technically pure product's pollution, safety hazard, and Administrative aspect for the Tripartite Agreement
Section 5	- Guidance for the calculation of the Pollution Category for pollutant only mixtures containing products already assessed by IMO to assign the carriage requirements
Section 6	- Guidance for assessment of trade named mixtures presenting

	safety hazards containing only products already assessed by IMO
Section 7	- Assessment of mixtures containing one or more components which have not yet been assessed by IMO
Section 8	- Necessary information to submit data to GESAMP/EHS and IMO
Appendix 1	- Procedural diagrams for the assessments and its administration
Appendix 2	- Example of an addendum to the ship's certificate of fitness/International certificate of fitness/International pollution prevention certificate for the carriage of Noxious Liquid Substances in bulk
Appendix 3	- Format for proposing Tripartite Agreements for provisional assessment of liquid substances
Appendix 4	- BLG Products Data Reporting Form
Appendix 5	- Guidelines on the completion of the BLG Product Data Reporting Form
Appendix 6	- Example of the calculation method for determination of pollution categories and ship types for mixtures

Source: IMO. (2006 May 16). *Revised guidelines for the provisional assessment of liquid substances transported in bulk* (MEPC.1/Circ.512)

4.1.5 GESAMP Report and Study No. 64

The GESAMP Report and Study No. 64 is the Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships, which was developed by GESAMP in consultation with OECD for the harmonization with the GHS. The first draft publication was in 1998[54].

These guidelines are closely linked to Appendix 1 of the MARPOL Annex II. It contains the hazard evaluation rationale, procedures and laboratory test information, especially focused on human and environmental hazards. In addition, it offers advice to manufacturers and administrations, such as submitting data to GESAMP based on

[54] GESAMP Report and Study No. 64, p. v

scientific aspects. Furthermore, it contains detailed evaluation criteria such as bioaccumulation and biodegradation, aquatic toxicity, acute mammalian toxicity, skin corrosion and long term health effects (GESAMP, 2002).

The recommended guidance on the required quality standards of test reports are as follows[55].

- *Laboratories carrying out such studies are registered as being in compliance with OECD GLP [56] or have appropriate alternative accreditation, e.g. for testing physical properties*
- *The reports of such studies contain a quality assurance statement and*
- *The tests met the stated validity criteria of the appropriate test Guidelines.*

Therefore, the contents of these guidelines are significantly important for the chemical manufacturer to collect the necessary evaluation data and laboratory test information. Especially, considering that the GESAMP/EHS meeting is only held once a year. The quality of data, which is submitted to the GESAMP/EHS might determine the period of time for evaluation. Improper submission of required data to the GESAMP/EHS may make the manufacturer wait one more year for re-submission, delaying the time of entry to the IBC Code.

4.1.6 Report of the GESAMP/EHS Working Group

The Report of the GESAMP/EHS Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships is circulated normally once a year after the Group's meeting as BLG.1/Circulars[57]. This report deals with various matters which arise from IMO relating to the results of the ESPH Working Group, BLG Sub-

[55] GESAMP Report and Study No. 64, p. 23
[56] Good Laboratory Practice is a quality system for reliable and efficacy laboratory tests, outlined by OECD
[57] The latest circular is BLG.1/Circ.31(20 April 2011), IMO

committee and MEPC Committee, concerning the evaluation of harmful substances under MARPOL Annex II.

The report contains the resultant hazard profiles for those products which become basic data for the assignment of carriage requirements for the specific substance. Annex 6 of the report also has an updated composite list of hazard profiles for the chemical industry to check whether the chemicals which are supposed to be carried by ships were already evaluated or not. If the chemical composite hazard profile is available in the list, the industry does not need to further evaluate the chemical. Therefore, the information in the composite list is a valuable source for the industry to find chemical hazard evaluation data (GESAMP/EHS, 2011).

4.1.7 BLG.1/Circ.33 (09 August 2011)

This Circular contains decisions with regard to the categorization and classification of products which are based on the interpretation of the ratings of GESAMP Hazard Profiles and other related decisions with respect to the categorization and classification of new products. This interpretation was developed by the ESPH Working Group for the evaluation of NLS. It has all the summarized relative decisions form BLG meeting documents and report of the GESAMP/EHS Working Group, such as “NI”, or “ratings in brackets” in the GESAMP Hazard Profiles and the procedures for estimating acute inhalation toxicity ratings. Therefore, this Circular can be valuable information for the chemical industry for the chemical hazard evaluation, especially to understand the GESAMP Hazard Profiles (IMO, 2011).

4.1.8 BLG.1/Circ.27 (18 August 2008)

This Circular (see **Appendix A**) was proposed by the BLG, in 2007[58] to ensure that

[58] BLG 11/3/8(23 February 2007), proposed by INTERTANKO

information on provisional assessments is available on IMO's public website[59] to reduce unnecessary burdens on both the industry and IMO Member States. Because the MEPC.2/Circulars have been updated in December each year; therefore, the Member States may not know the Tripartite Agreement information for the transportation of certain products between subsequent MEPC.2/Circulars are released. This Circular was circulated in 2008. Therefore, the industry can check its new product whether it has been transported or not on the IMO's website before initiating new Tripartite Agreement (IMO, 2008).

4.1.9 BLG.1/Circ.28 (18 August 2008)

This Circular (see **Appendix B**) is an introduction of product evaluation work undertaken by GESAMP/EHS. The industry requires the GESAMP Hazard Profile for evaluation of unassessed substances. However, the GESAMP/EHS Working Group had worked, on behalf of industry, to assess the hazards of chemicals and had issued the hazard profile for the industry without an evaluation fee. Therefore, considering the work performed by the Group and for the long-term funding solution, the MEPC at its fifty-sixth session in 2007 agreed to share the funding costs with IMO and the industry. Therefore, the industry incurs costs[60] for the chemical evaluation (IMO, 2008).

4.1.10 GHS

GHS was developed through efforts from many countries and international and intergovernmental organizations such as OECD, ILO[61], UNSCETDG, FAO[62] and EU[63] to enhance the protection of human health and the environment through harmonized hazard communication. It was adopted by UNCETDG and GHS in 2002

[59] IMO website: Marine Environment/Carriage of Chemicals/Tripartite Agreements
[60] The industry should pay non-refundable fee of US$6,500 in advance for each component of chemicals directly to the GESAMP/EHS as the same way for the submission of data to the Group
[61] International Labour Organization
[62] Food and Agriculture Organization of the United Nations
[63] European Union

and the first edition was published in 2003. It has been amended by UNSCEGHS[64]. GHS provides harmonization of standards for regulations on chemical related matters (UNECE[65] website, 2011).

Chapter 3 of the GHS provides criteria and recommended laboratory test methods, which are referenced in Chapter 21 of the IBC Code, such as acute mammalian toxicity, toxic to mammals by prolonged exposure, skin sensitization/corrosive and respiratory sensitization, which have become the principal information for hazard evaluation of substances (UN, 2009).

4.2 Relevant international bodies relating to the evaluation

Figure 12 shows the organizational structure of the international authorized bodies that are directly involved in the development of regulations and guidelines for the evaluation criteria and procedures of liquids in bulk. MSC deals with safety aspects concerning SOLAS, and MEPC handles the marine pollution related matter concerning MARPOL. The BLG Sub-committee considers technical details for the safe carriage of harmful liquids in bulk under the MSC and MEPC Committees. The ESPH Working Group deals with various technical matters relating to the evaluation of safety and pollution hazards of chemicals.

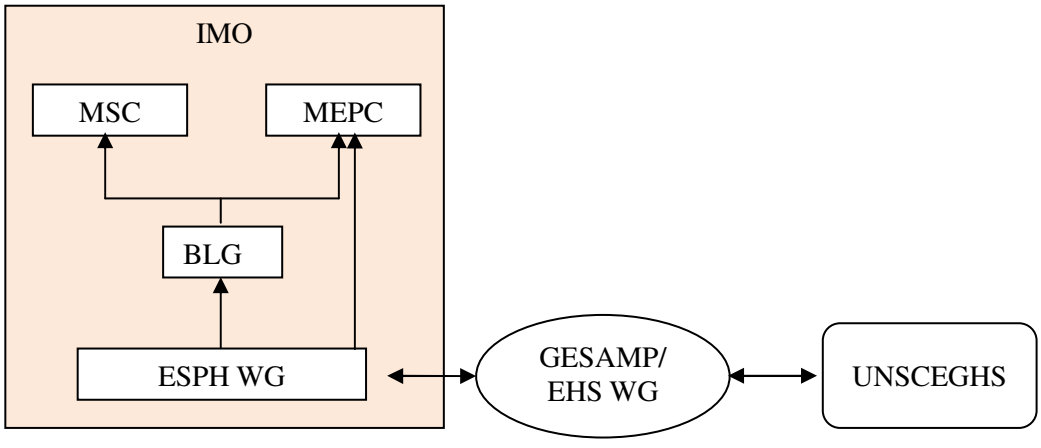

Figure 12 -Organizational structure of the international authorized bodies
Source: Drawn by Author

[64] UN Sub-committee of Experts on GHS
[65] United Nations Economic Commission for Europe

4.2.1 BLG Sub-committee

The BLG Sub-committee, which was organized in 1996, works under MSC and MEPC. The BLG considers various matters related to the prevention of marine pollution from ships involved in the technical aspects of handling and transporting dangerous chemicals and NLS in bulk. Therefore, BLG's main work is the amendment and preparation of relevant regulatory instruments, such as MARPOL Annex II, IBC Code, IGC Code and their non-mandatory guidelines. Consideration of the evaluations and carriage requirements of newly transported substances has been one of the main working agenda items of the BLG. In addition, BLG shares and discusses scientific and technical aspect of marine pollution matters with GESAMP.

4.2.2 ESPH Working Group

The ESPH is a formal Working Group that works under the MEPC and the BLG in IMO. The Group consists of member governments of IMO and NGO[66]. Meetings are normally held twice a year. One is an intercessional meeting, normally held in October and the other is a working group meeting which is held during the BLG Sub-committee meeting. The Group's work particularly focuses on the issues relating to the evaluation of new products and their carriage requirements, as well as evaluation of cleaning additives. Additionally, the Group reviews the MEPC.2/Circular and any other matters as instructed by the BLG Sub-committee. The Group's meeting report or working paper is reported to the BLG or directly to the MEPC for further consideration.

4.2.3 GESAMP/EHS Working Group

GESAMP is an advisory body, which consists of specialized experts nominated by the sponsoring agencies[67]. The Group was established in 1967[68] by the United Nations Agencies and provides scientific advice concerning marine environment

[66] Non-Governmental Organization
[67] IMO, FAO, UNESCO-IOC, WMO, WHO, IAEA, UN, UNEP
[68] Source by IMO website

protection. The GESAMP/EHS[69] evaluates the hazards of liquid substances carried by ships under MARPOL Annex II. The GESAMP/EHS has developed the GESAMP Hazard profiles for the substances during their meeting based on the chemical data[70] submitted by the industry, and returns the profile to the industry. The Group's meeting is normally held every year between February and April in the IMO building. The Group meeting report has been circulated as BLG.1/Circulars[71].

4.3 International evaluation criteria

Figure 13 shows the international laboratory test guidelines and evaluation criteria for hazardous substances. The criteria basically consist of three steps, namely laboratory test, evaluation of chemical hazards and assignment of carriage requirements and a pollution category. The principal guidelines for the laboratory and evaluation are GHS. The GESAMP Report and Study No. 64 were developed for the chemical industries based on the GHS. In addition, the GHS is guidance for the criteria in Chapter 21 to the IBC Code. The GESAMP/EHS Working Group considers the technical information of the specific substances during their meetings and develops the GESAMP Hazard Profiles based on the data submitted by the chemical industry. The Hazard Profiles contain necessary hazard rating information for further evaluations by Administrations and the BLG Sub-committee to assign a pollution category and carriage requirements of a specific chemical.

[69] GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships

[70] Data based on the GESAMP/EHS Product Data Reporting Form

[71] The latest version: BLG.1/Circ.31 (20 April 2011), Report of the forty-eighth session of the GESAMP/EHS Working Group On the Evaluation of the Hazards of Harmful Substances Carried by Ships, by IMO

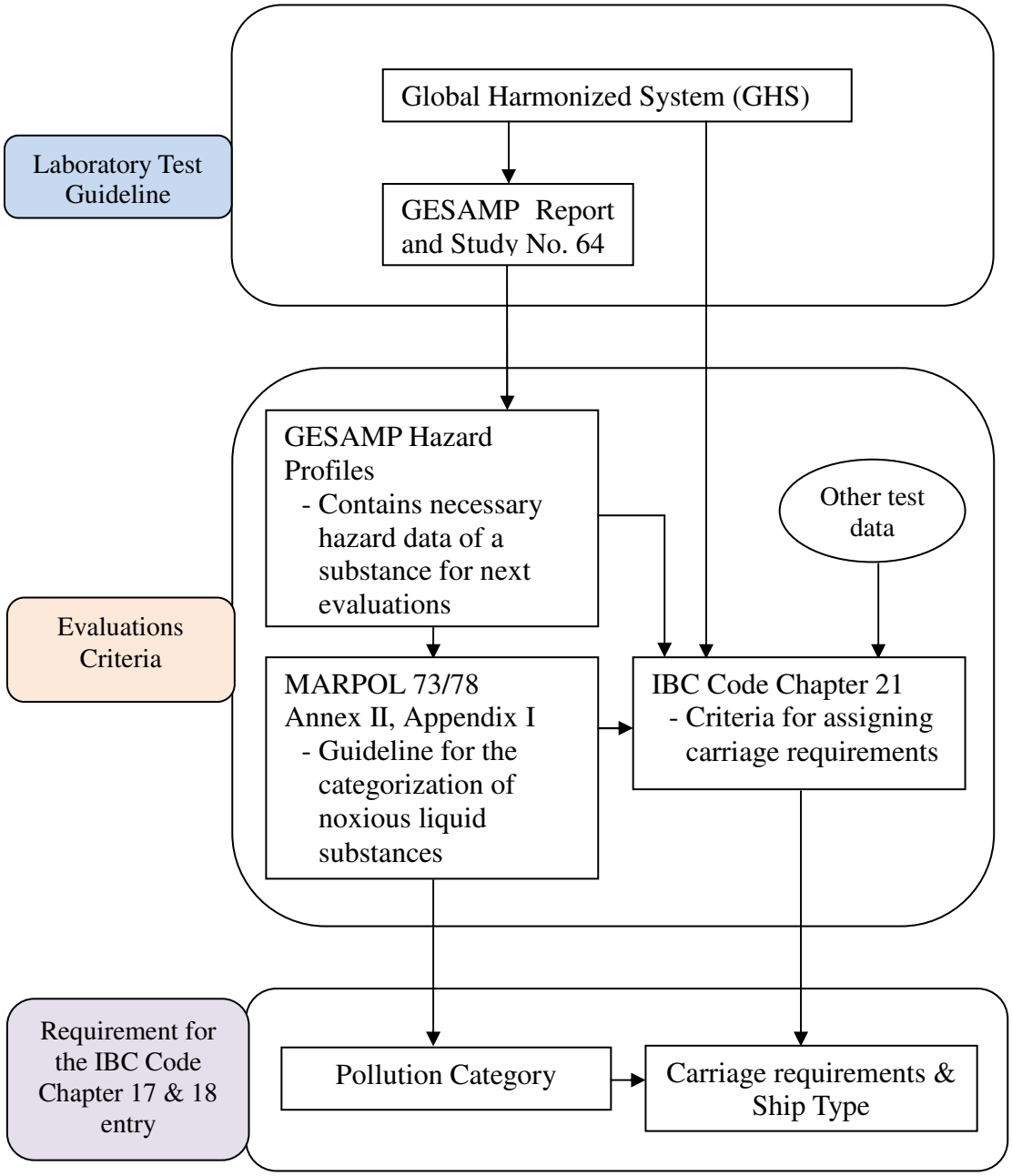

Figure 13 -International laboratory test guideline and evaluation criteria for the hazardous substances
Source: Drawn by Author

4.3.1 GESAMP Hazard Profiles

GESAMP Hazard Profiles[72] provides hazard information for each NLS and the

[72] The latest circulation was in Annex 6 of the BLG.1/Circ.31(20 April 2011)

criteria for the categorization of the respective product. This Profile is reviewed annually by the GESAMP/EHS Working Group. The assignment of marine pollution aspect ship types are also based on the Hazard Profile. Figure 14 shows the composite of Hazard Profiles. Among the information in the profiles the A1, A2, B1, B2, D3 and E2 are used to define pollution categories under the Appendix I of the Annex II to MARPOL.

EHS Name TRN Name	EHS TRN	A1a	A1b	A1	A2	B1	B2	C1	C2	C3	D1	D2	D3	E1	E2	E3
Acetic acid	13	0	0	0	R	1	NI	1	1	1	3C	3			D	3
Acetic acid	64		RTECS No		AF1225000				CAS No		64-19-7					
Acetic anhydride	12	0	0	0	R	1	NI	1	0	2	3	3	A		D	3
Acetic anhydride	65		RTECS No		AK1925000				CAS No		108-24-7					
Acetochlor (ISO)	2047	3	2	2	NR	4	NI	1	0	(1)	0	0			S	2
Acetochlor	66		RTECS No		AB5457000				CAS No		34256-82-1					

Figure 14 -GESAMP/EHS Composite List GESAMP Hazard Profiles
Source: IMO. (20 April 2011). *Annex 6 of the BLG.1/Circ.31*

4.3.2 MARPOL 73/78 Annex Ⅱ, Appendix I

Appendix I of Annex II to MARPOL (see **Appendix C**) contains criteria for the categorization of the NLS based on the GESAMP Hazard Profiles. The detailed information for the criteria and test procedures are made in the GESAMP Report and Study No.64. Table 11 shows the requirements of hazard information in the Appendix I and their test guidance in the GESAMP Report and Study No.64. Most data are principally based on the test results, except some criteria such as chronic toxicity and long term health effects which are strongly dependent on reliable evidence, human experiences and the expert's judgment. Therefore, the GESAMP Group is playing an important role as an expert group for the judgment of chemical hazards.

The GESAMP Report has sufficient information for the evaluation of the severity of the hazards as well as the test criteria to collect data for pollution categorization of chemicals. The severity of chemical hazards are defined as X, Y, Z or OS

categorizations based on the Appendix I of Annex II to MARPOL.

Table 11 -Criteria for pollution categorization and laboratory test information

Criteria for categorization Appendix I to Annex II		**Criteria and laboratory test information in GESAMP Report and Study No.64**	
Symbol	Criteria for categorization	Subsection	Guidance for test or collection of hazard evidence
A1	Bioaccumulation	4.1.1 Sub-column A1	- Box 2 Guidance for experimentally measuring and calculating the log Pow - Box 3 Guidance for measuring bioconcentration in fish
A2	Biodegradation	4.1.2 Sub-column A2	- Box 4 Guidance for measuring ready biodegradability
B1	Acute toxicity	4.2.1 Sub-column B1	- Box 5 Guidance for measuring acute aquatic toxicity
B2	Chronic toxicity	4.2.2 Sub-column B2	- Box 6 Guidance for measuring chronic aquatic toxicity
D3	Long-term health effects	4.4.3 Sub-column D3	- Animal experiments - Depend on reliable evidence and on expert judgment.
E2	Effects on marine wildlife and on benthic habitats	4.5.2 Sub-column E2	- Supported by data on environmental and human health hazards from columns A to D

Source: Summarized by Author

4.3.3 IBC Code Chapter 21

Chapter 21 of the IBC Code has guidelines for the minimum safety and pollution criteria in determining carriage requirements of products subject to Chapter17 (see **Appendix D**). The criteria are based on the GHS. In addition, the GESAMP Report and Study No.64 have most of the information that are required by Chapter 21 of the

IBC Code as shown in Table 12. However, some information such as air reactive substances is not available in the GHS[73] or the GESAMP Report.

Table 12 -Required chemical data for the entry to the IBC Code and the test information and criteria in the GHS and GESAMP Report and Study No.64

Evaluation criteria for the products subject to the IBC Code	Test information and criteria	
	GHS Chapter	GESAMP Report and Study No.64 subsection
Acute mammalian toxicity - Oral toxicity (LD_{50}[74]) - Dermal toxicity (LD_{50}) - Inhalations toxicity(LC_{50}[75])	Chapter 3.1	4.3 Column C - 4.3.2 Sub-column C1 - 4.3.3 Sub-column C2 - 4.3.4 Sub-column C3
Toxic to mammals by prolonged exposure - C, M, R, N, and I[76]	Chapter 3.5, Chapter 3.6, Chapter 3.7	4.4.3 Sub-column D3:
Skin sensitization/corrosive	Chapter 3.2	4.4.1 Sub-column D1
Respiratory sensitization	Chapter 3.3	Nil
Water reactive substance	Chapter 2.12	Nil
Air reactive substance	Nil	Nil

Source: Summarized by Author

4.4 International evaluation procedures

The step-by-step procedures for the evaluation of safety and pollution hazards depend on the property of chemicals. However, normally the manufacturer has to collect all necessary information and laboratory test results based on guidelines.

[73] Based on the third edition of GHS published in 2009 (UN)
[74] LD50, lethal dose to 50% of the exposed population
[75] LC50, lethal Concentration to 50% of the exposed population
[76] Stand for Carcinogen, Mutagen, Reprotoxic, Neurotoxic and Immunotoxic

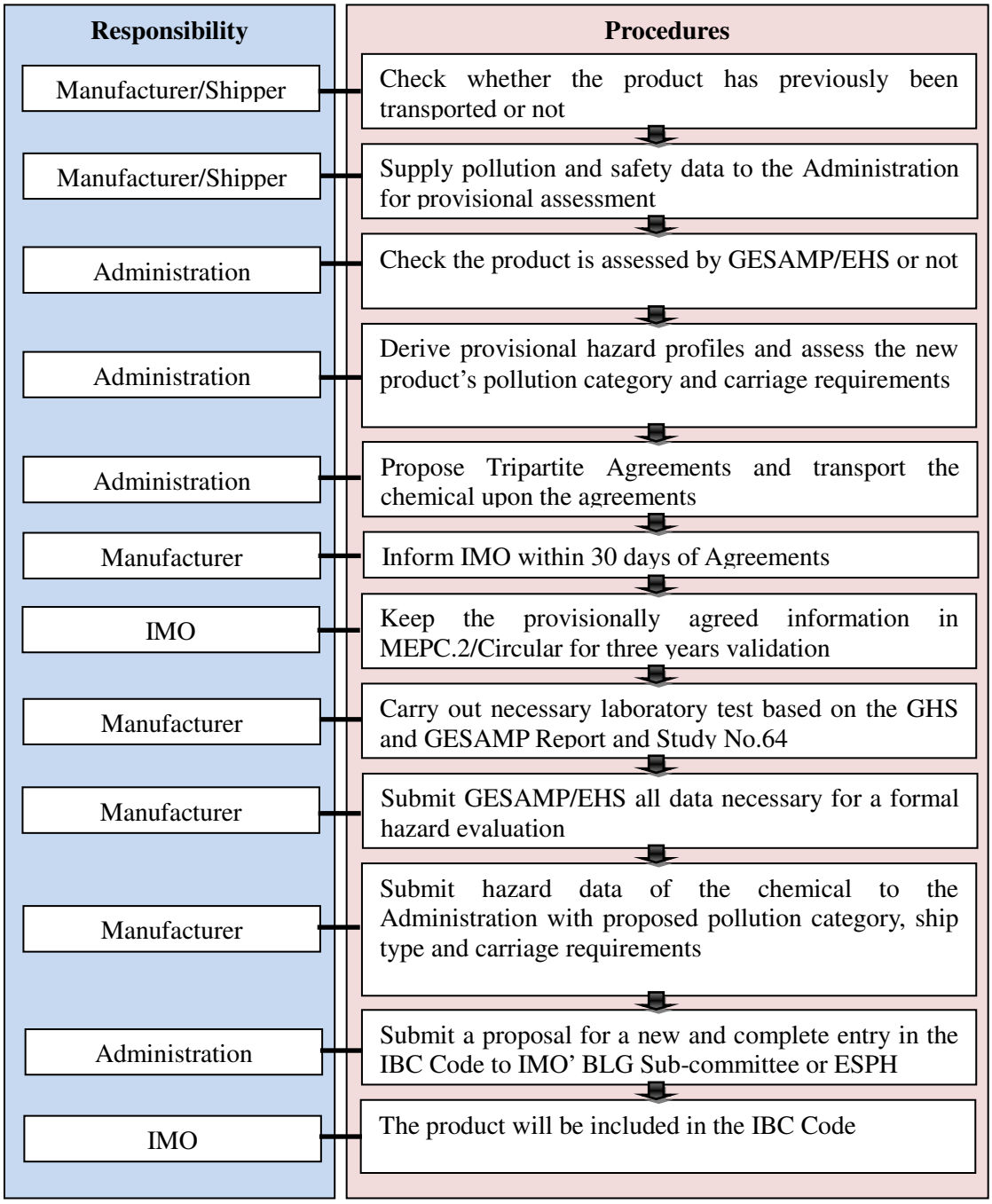

Figure 15 -Procedural steps for the evaluation and carriage requirements
Source: Drawn by Author based on MEPC.1/Circ.512

Figure 15 shows the evaluation procedures for a pure or technically pure product based on MEPC.1/Circ. 512. First, a manufacturer or shipper should check the IBC Code Chapters 17, 18, 19 and the latest version of MEPC.2/Circular to identify whether the chemical to be carried by ships has previously been transported or not.

If the chemical was not carried previously by ships and it is expected to be transported before a full assessment of hazards, the manufacturer and Administration have to assess provisional hazards of the product. Then the exporting government should propose the provisionally assessed pollution category, ship type and carriage requirements of the product to Flag State and receiving governments for the Tripartite Agreement and seek their consent under regulation 6.3 of Annex II of MARPOL as shown in Figure 16.

The receiving governments and Flag State should respond to the proposed evaluation results when they receive the Tripartite Agreement proposal from the exporting government. If there is no response from the related parties within 14 days of the proposed date, the proposal is deemed to be accepted. If there is no agreement associated with the proposal, the most severe condition should be assigned for the provisional carriage requirements. Figure 17 shows a detailed procedural diagram for the Tripartite Agreement.

Consequently, the chemical can be transported by ship in bulk only amongst agreed countries with issuance of ship's certificate for shipment of the chemicals by Flag State. After establishing a Tripartite Agreement, the exporting government should communicate the Tripartite Agreement information to IMO within 30 days of the agreement date.

IMO should list the product name and agreed provisional carriage requirements in the MEPC.2/Circular or IMO website. If the chemical manufacturer expects to transport the chemical beyond the three years expiration date of the agreement, the chemical should be formally evaluated by GESAMP/EHS Working Group. The Group will develop the GESAMP Hazard Profiles for the new product based on the test data submitted by the manufacturer.

The final step is to bring the BLG Products Reporting Form to the BLG Sub-committee with proposed pollution category, ship type and carriage requirements by the Administration for the final approval. The ESPH Working Group will review the proposal. Finally, the product will be included in Chapter 17 or 18 of the IBC Code or MEPC.2/Circular without expiration date of transport. See **Appendix E** for detailed procedures for the pure or technically pure product or aqueous solution.

A manufacturer has to face a relatively long route and complex procedures for the evaluation. In order to understand the full procedures and criteria for effective evaluation, the collection of all necessary information will be the first step for the manufacturer.

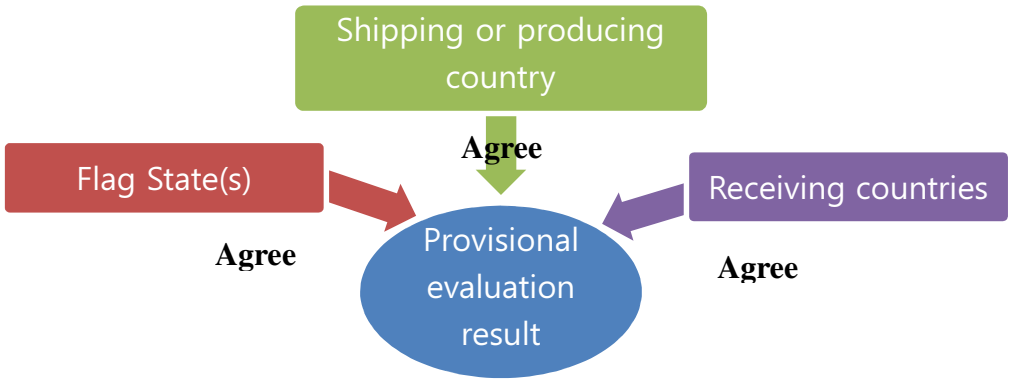

Figure 16 -Concept of Tripartite Agreement
Source: Drawn by Author

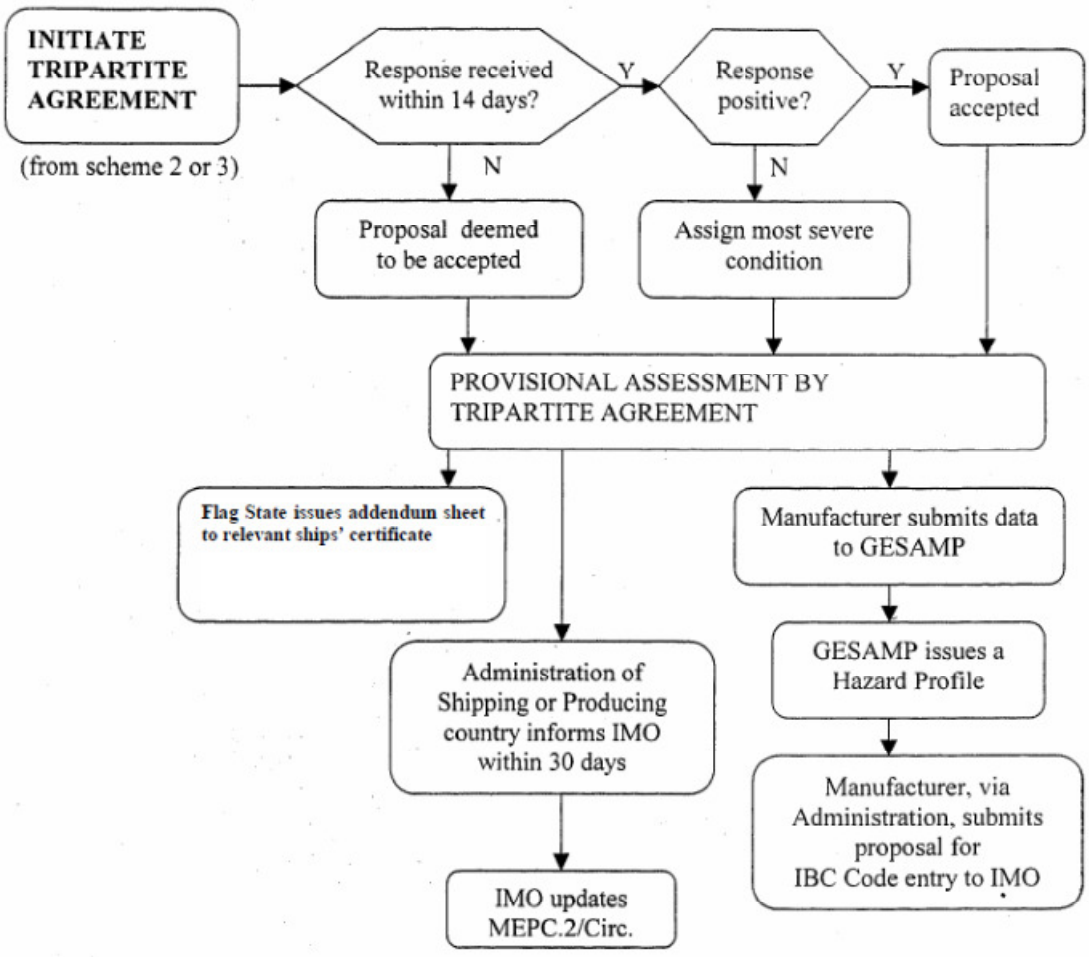

Figure 17 -The procedural diagram for the Tripartite Agreement.
Source: IMO. (2006 May 16). *Revised guidelines for the provisional assessment of liquid substances transported in bulk* (MEPC.1/Circ.512)

CHAPTER 5

MEMBER STATES IMPLEMENTATION

This chapter will review national regulatory systems of some Member States to determine how they adopt and implement these complex international instruments into their national systems. The study will be based on the legal framework of those governments. In addition, the difficulty and effectiveness of implementation of these complex guidelines will be discussed.

According to the data analyzed in Chapter 2 of this study, the USA and the United Kingdom are major exporters of new products and the Republic of Singapore represents the leading major new chemical exporter in East Asia. Therefore, these four countries including the Republic of Korea were selected to be analyzed.

5.1 Republic of Korea (ROK)

As shown in Table 13, the ROK adopted MARPOL Annex II into the Marine Environment Management Act and the detailed requirements are specified by the Regulation for the Prevention of Marine Pollution from Ships. The Regulation for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk regulates carriage of dangerous chemicals and ship's specific requirements under the Ship Safety Act. In addition, the Regulation accepts the products listed in the MEPC.2/Circular and references MEPC.1/Circ.512 as provisional guidelines without placing it into a national regulatory framework.

Table 13 -The legal framework of ROK for the carriage of liquid in bulk

IMO instruments	Legal framework
MARPOL Annex II	- Marine Environment Management Act, Chapter 3, Section 2, Article 27 - Regulation for the Prevention of Marine Pollution from Ships (pollution categories X,Y, Z and OS)

IBC Code	- Ship Safety Act, Article 41 - Regulation for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
MEPC.1/Circ.512	- Not adopted into national regulation or guidelines. However, directly bind and accept the international guidelines[77]
Other documents	- MEPC.2/Circular products: accepted[78]

Source: Summarized by Author

5.2 The United States of America (USA)

As shown in Table 14, the Code of Federal Regulations (CFR) Titles 33 and 46 adopted the MARPOL Annex II and the IBC Code respectively. NVIC[79] 03-06 is guidelines developed to assist the industry, the public, the Coast Guard, and other regulatory bodies. Enclosure 4 of this circular has detailed information regarding the MEPC.1/Circ.512. In addition, the Enclosure 4 demonstrates each step to be taken by the manufacturer for provisional assessment of a new product. However, all necessary information and documents regarding full assessment by GESAMP/EHS and final entry to the IBC Code might not be enough for the industry.

Table 14 -The legal framework of USA for the carriage of liquids in bulk

IMO instruments	Legal framework
MARPOL Annex II	- CFR Titles 33, Parts 151 and 158
IBC Code	- CFR Titles 46, Parts 30, 98, 151 and 153
MEPC.1/Circ.512	- Guidance Regarding Classification of Product and Tripartite Agreements (Enclosure (4) in NVIC 03-06)
Other documents	- MEPC.2/Circular products: accepted by NVIC 03-06

Source: Summarized by Author

[77] Regulation for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, Chapter 3, Section 1, Article 124, attached Table 5
[78] Regulation for the prevention of marine pollution from ships Article 3, Paragraph 5
[79] Navigation and Vessel Inspection Circular

5.3 The United Kingdom of Great Britain and Northern Ireland (GBR)

The GBR adopted MARPOL Annex II and IBC Code into the Merchant Shipping Regulation 1994 as shown in Table 15**.** These Regulations are closely linked to the mandatory IMO instruments and has been their national framework.

Table 15 -The legal framework of GBR for the carriage of liquid in bulk

IMO instruments	Legal framework
MARPOL Annex II	- The Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) (Amendment) Regulations 1994
IBC Code	- Merchant Shipping (IBC Code) (Amendment) Regulations 1994

Source: Summarized by Author

5.4 Republic of Singapore (SGP)

SGP adopted MARPOL Annex II and IBC into the Prevention of Pollution of the Sea (Noxious Liquid Substances in Bulk) Regulations 2006 under the Prevention of Pollution of the Sea Act and the Regulations reference MEPC/Circ.265 as guidelines for provisional assessment of chemicals. The Maritime and Port Authority of Singapore Act adopted the IBC Code as national legal framework as shown in Table 16.

Table 16 -The legal framework of SGP for the carriage of liquid in bulk

IMO instruments	Legal framework
MARPOL Annex II	- Prevention of Pollution of the Sea Act (Chapter 243), Prevention of Pollution of the Sea (Noxious Liquid Substances in Bulk) Regulations 2006
IBC Code	- Maritime and Port Authority of Singapore Act (Chapter 170A), Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum and Explosive) Regulations 2005

MEPC.1/Circ.512	- Appendix 1 of the Prevention of Pollution of the Sea (Noxious Liquid Substances in Bulk) Regulations 2006 references the Guidelines for provisional assessment of chemicals, MEPC/Circ.265 as amended

Source: Summarized by Author

This chapter found that most of the IMO Member States do not provide detailed guidance within their national framework. They just referenced the MEPC.1/Circ.512 and/or MEPC.2/Circular because IMO's evaluation instruments are not mandatory. Furthermore, the documents are too complex to be adopted and need administrative work to update the latest information. Therefore, just referencing the IMO guidelines require the chemical industries to search and study the necessary information by themselves with support by experts. Therefore, IMO's non-mandatory instruments are significantly important as the main sources of information.

CHAPTER 6

DIFFICULTIES IN USING OR UNDERSTANDING IMO INSTRUMENTS AND POSSIBLE SOLUTIONS

This chapter will analyze and discuss the complexities of the current IMO instruments. The difficulties to find regulations and guidelines as well as expertise will be discussed. In addition, the possible ways for more effective and user-friendly guidelines will be proposed to the IMO and the Administrations who are interested and might find it beneficial.

6.1 Difficulties in IMO instruments

6.1.1 Complexity of guidelines in usage

Figure 18 shows the brief necessary steps to evaluate chemical hazards. Each step requires sources of information and guidance.

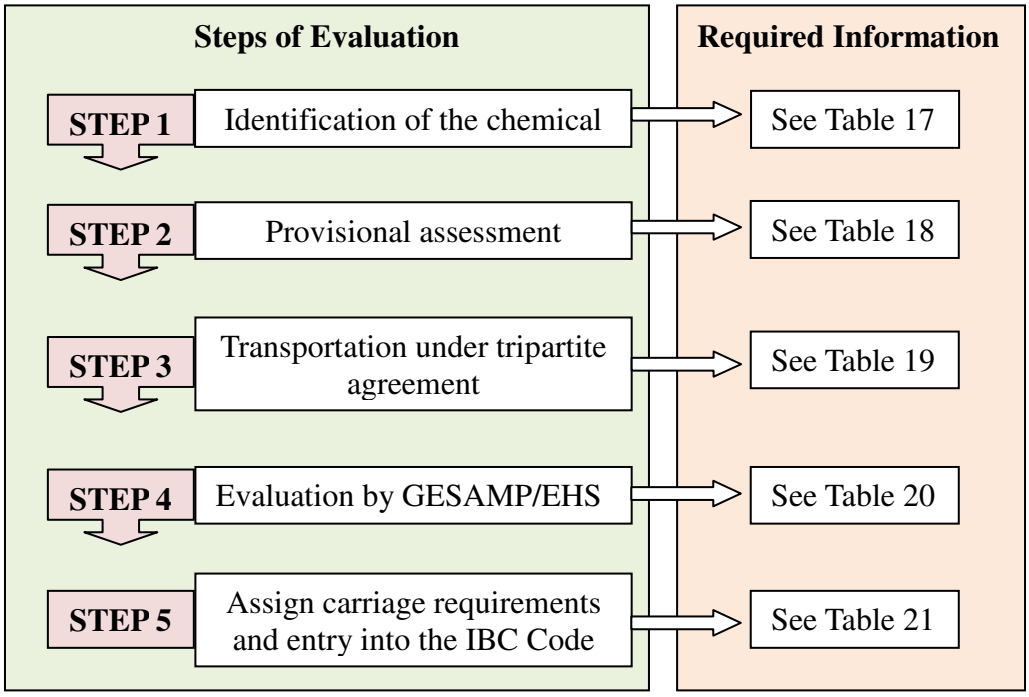

Figure 18 -Brief steps for the evaluation of chemical hazards
Source: Drawn by Author

Table 17 shows the necessary sources to identify a product (**STEP 1**) whether it was previously transported or not. The industry has to check Chapters 17, 18, 19 and the latest version of MEPC.2/Circular, including the IMO website to check if there is a Tripartite Agreement on that chemical.

Table 17 -Information required for identification of a new product[80]

Procedural tasks (Responsibility)	Required information	Source
Check whether the product is transported or not before or currently (Manufacturer/Shipper)	- IBC Code(Ch.17, 18 & 19) - Products listed in the latest version of MEPC.2/Circular	- IBC Code - MEPC.2/Circular
Check IMO, if there is Tripartite Agreement on that chemical (Manufacturer/Shipper)	- Tripartite Agreement on the IMO website (Marine Environment/ Carriage of Chemicals/Tripartite Agreements)	- BLG.1/Circ.27

Source: Compiled by Author

Table 18 shows the information required for provisional assessment (**STEP 2**). A manufacturer or shipper should supply available chemical hazard data to the Administration. The Administration should check the composite list of hazard profiles of substances carried by ships which is annexed in the latest report of the GESAMP/EHS Working Group Report. In addition, in order to assess provisional hazards of the chemical, the Administration should follow the guidelines in Appendix 1 of Annex II to MARPOL and Chapter 21 of the IBC Code.

[80] A pure or technically pure product or mixture containing more than 1% by weight of unassessed components

Table 18 -Information required for provisional assessment

Procedural tasks (Responsibility)	Required information	Source
Supply pollution and safety data to the Administration (Manufacturer/Shipper)	- Nil	
Check the product/components are assessed by GESAMP/EHS or not (Administration)	- Composite list of hazard profiles of substances carried by ships	- The latest Report of the GESAMP/EHS Working Group (BLG.1/Circular)
Derive provisional hazard profile and assess the new product's pollution hazard (Administration)	- MARPOL, Annex II, appendix 1	- MARPOL
Assess presents a safety hazard and assign Ship Type and carriage requirements (Administration)	- Chapter 21 of the IBC Code	- IBC Code

Source: Compiled by Author

Table 19 contains information for the Tripartite Agreement (**STEP 3**). The Administration should be well aware of the procedures in the MEPC.1/Circ. 512 to complement the Tripartite Agreement. Furthermore, the Administration should check the governments contact point in the MEPC.2/Circular. A ship owner has to check how to issue the relevant ship's certificate to transport the provisionally agreed chemicals when necessary.

Table 19 -Information required for transportation under Tripartite Agreement

Procedural tasks (Responsibility)	Required information	Source
Propose tripartite agreements and inform IMO (Administration)	- Appendix 3 of the MEPC.1/Circ.512, - MEPC.2/Circular for Governmental contact point information	- MEPC.1/Circ.512 - MEPC.2/Circular
Relevant ship's certificate may be issued (Ship owner)	- Appendix 2 of the MEPC.1/Circ.512	- MEPC.1/Circ.512

Source: Compiled by Author

Table 20 shows the information for formal evaluation of chemicals by the GESAMP/EHS Working Group **(STEP 4)**. In order to submit the necessary chemical hazard data to the GESAMP/EHS Group, a manufacturer should know what hazard data and laboratory test are required. Additionally, available test facilities and their standards should be checked. Furthermore, the manufacturer should be well aware of the procedures, evaluation fees and document forms for submission. Therefore, Chapter 21of the IBC Code, GHS, Appendix 1 to Annex II to MARPOL, GESAMP Report and Study No. 64 and BLG.1/Circ. 28 should be checked.

Table 20 -Information required for evaluation by GESAMP/EHS

Procedural tasks (Responsibility)	Required information	Source
Submit GESAMP/EHS all data necessary for a formal hazard evaluation (Manufacturer)	- Chapter 21of IBC Code and GHS laboratory test information - Appendix 1 of Annex II to MARPOL and GESAMP Report and Study No. 64 - BLG.1/Circ.28: The	- IBC Code - GHS - MARPOL - BLG.1/Circ.28 - ESAMP Report and Study No. 64

	introduction of in charges for product evaluation work undertaken by GESAMP/EHS - GESAMP/EHS Data Reporting From	

Source: Compiled by Author

Table 21 shows sources for final approval of IMO and to assign carriage requirements of the product (**STEP 5**). A manufacturer should use the BLG Product Data Reporting Form, and has to review the relevant guidelines to assign all carriage requirements in Chapter 17 of the IBC Code based on the GESAMP Hazard profiles.

Table 21 -Information that required for assignment of carriage requirements and entery into the IBC Code

Procedural tasks (Responsibility)	Required information	Source
Submit to the Administration a completed BLG Product Data Reporting Form (Manufacturer)	- BLG Product Data Reporting Form which can be downloaded from IMO website	- IMO website www.imo.org
Proposed assessment for Pollution Category and Ship Type and carriage requirements (Manufacturer)	- MARPOL, Annex II, appendix 1 - Chapter 21 of the IBC Code - BLG.1/Circ.33: Summary of decisions taken on the interpretation of the ratings of GESAMP Hazard Profiles	- IBC Code - MARPOL - BLG.1/Circ.33
Submit a proposal	- Appendix 4 of the	- MEPC.1/Circ.512

including the form for a new and complete entry in the IBC Code to IMO (Administration)	MEPC.1/Circ.512	

Source: Compiled by Author

As shown in Table 17 through Table 21, most of the guidelines and documents can be found in different sources, such as IMO's publications, website and circular documents, and most of these instruments are linked to GESAMP guidelines and GHS, and even each other. Considering that most product manufacturers are not familiar with maritime affairs, this complex and separated IMO instruments can place a great burden and unnecessary difficulty on the industry.

6.1.2 Difficulties in finding information

The MARPOL Annex II, Regulation 6.2 referenced the guidelines for the categorization of NLS in accordance with Appendix 1 to the Annex II, and the Appendix references the MEPC/Circ.265, as amended. However, this guideline had been superseded by the MEPC.1/Circ.512, the revised guidelines in 2006. Chapter 21 of the IBC Code also does not reference the revised guidelines. Only IMO's published IBC Code contains MEPC.1/Circ.512. However, the guideline is not sufficient for all information on the evaluation and transportation of hazardous liquid substances in bulk.

Considering that provisional assessment should review the criteria for assigning carriage requirements in Chapter 21 of the IBC Code and most products are subject to Chapter 17 of the IBC Code; therefore, referencing all sources of relevant guidelines in the IBC Code would be beneficial for the industry.

The procedures and information in the guidelines are mainly focused on the administrative aspect rather than the industry. For example, the industry should

supply the pollution and safety data to the Administration for the provisional assessment. However, there is no specific guideline for how the industry achieves the necessary data for submission and its reporting form. In addition, the manufacturer should submit GESAMP/EHS data necessary for a formal hazard evaluation. However, the guidelines only reference GESAMP Reports and Studies No. 64.

6.1.3 Lack of experts to deal with

Evaluation of chemical hazards and assignment of carriage requirements are highly technical. Therefore, in order to achieve full compliance for the entry into the IBC Code, it requires chemical experts, the shipping industry and Administrations who are well aware of all the IMO regulatory instruments concerning MARPOL Annex II, IBC Code and their relevant guidelines.

However, lack of information may result in a lack of expertise. Consequently, only those who have attended IMO's ESPH Working Group meetings or have similar experiences can properly deal with these complex procedures and instruments. Therefore, looking for an expert might be another burden for the industry.

6.1.4 The time allotted for acquiring the documents for evaluation

Numerous instruments and circulars are required to complete the evaluation process. Chemical manufacturers are not intimately familiar with the shipping industry. They may not have IMO publications such as MARPOL and IBC Code. In addition, they have difficulties finding the sources of necessary guidelines for the chemical evaluation and transportation.

Even when the chemical industry contacts an expert in the Administration and has sufficient information concerning the evaluation, the industry should also locate and study all these technical instruments. Therefore, the time for seeking these documents takes a lot of efforts, which cost valuable money and resources.

6.1.5 Difficulty in Member State implementation

The complexity and frequent update of newly transported product information and the revision of guidelines make it difficult for Member State implementation, adopting these non-mandatory IMO instrument into their national legal framework or guidance. Therefore, as reviewed in Chapter 5 of this dissertation, most countries reference the IMO instruments directly or indirectly within national regulations.

Furthermore, in order to assist the industry, the Administration should keep track of all international criteria for evaluation and test facilities. However, the scattered sources of information might require extra workload on the Administration which decreases ability for consultation on the matter.

6.2 Possible solutions to the current system

6.2.1 Sufficient references of guidance on the Convention and Code

First, Appendix 1 of Annex II to MARPOL should reference MEPC.1/Circ.512 instead of MEPC/Circ.265, because MEPC/Circ.265 is not used any more. In addition, MEPC/Circ.265 does not reference the revised MEPC.1/Circ.512, which provides step-by-step procedures for evaluation of new chemicals including most relevant guidance and criteria. Therefore, the industry has difficulties locating the revised new guidelines without any further information.

Therefore, the current reference; *"Reference is made to the Guidelines for provisional assessment of chemicals, MEPC/Circ.265 as amended*" in Appendix 1 of Annex II to MARPOL should be amended as *"Reference is made to the revised Guidelines for the Provisional assessment of liquid substances transported in bulk, MEPC.1/Circ.512 as amend, and the present circular supersedes MEPC/Circ.265".*

Second, there should be made a new Appendix to the IBC Code which contains necessary sources of documents and information, including the locations of their

sources. For example, the IMSBC Code Section 13 has a reference list to the IMO instruments relevant to the requirements to the Code. Furthermore, Appendix 2 of the Code has laboratory test procedures, associated apparatus and standards.

Therefore, a possible new Appendix to the IBC Code which references necessary IMO/UN instruments for evaluation of chemical hazards, and their locations and subject is suggested in Table 22**.** This Appendix will be beneficial for IMO Member States and their chemical and shipping industry.

Table 22 -A possible new Appendix to the IBC Code

<A: References relating to Appendix 1 of Annex II to the MARPOL>

Reference to IMO/UN instruments	**Reference to subsection**	**Subject**
Report of the GESAMP/EHS Working Group	GESAMP Hazard Profiles	- Chemical hazard rating information for pollution categorization of NLS ※ *Issued annually as BLG.1/Circulars*
GESAMP Report and Study No. 64	4.1.1: Sub-column A1	- GESAMP hazard profile rating scheme for bioaccumulation (A1) - Guidance on the required quality standards of test reports for A1 - Guidance for experimentally measuring and calculating the log Pow - Guidance for measuring bioconcentration in fish
	4.1.2: Sub-column A2	- Rating scheme for ready biodegradability (A2) - Guidance for measuring ready biodegradability

Reference to IMO/UN instruments	Reference to subsection	Subject
	4.2.1: Sub-column B1	- GESAMP rating scheme for acute toxicity(B1) - Guidance for measuring acute aquatic toxicity
	4.2.2: Sub-column B2	- Ratings information for chronic aquatic toxicity (B2) - Guidance for measuring chronic aquatic toxicity
	4.4.3: Sub-column D3	- Ratings information for long-term health effects(D3)
	4.5.2: Sub-column E2	- GESAMP hazard profile ratings for determining potential effects on wildlife and benthic habitats (E2)

<B: References relating to the Chapter 21 of the IBC Code>

Reference to IMO/UN instruments	Reference to subsection	Subject
GHS	Chapter 3.1	● Ratings and test information for acute mammalian toxicity - Oral toxicity (LD50[81]) - Dermal toxicity (LD50) - Inhalations toxicity(LC50[82])
	Chapter 3.5 Chapter 3.6, Chapter 3.7	● Rating information for toxic to mammals by prolonged exposure - C, M, R, N, and I[83]

[81] LD50, lethal dose to 50% of the exposed population
[82] LC50, lethal Concentration to 50% of the exposed population
[83] Stand for Carcinogen, Mutagen, Reprotoxic, Neurotoxic and Immunotoxic

Reference to IMO/UN instruments	Reference to subsection	Subject
		● Laboratory test guidance
	Chapter 3.2	- Test procedure and rating scheme information for skin sensitization/corrosive
	Chapter 3.3	- Test procedure and rating scheme information for respiratory sensitization
	Chapter 2.12	- Definition and criteria information for water reactive substance

<C: References relating to the MEPC.1/Circ.512>

Reference to IMO/UN instruments	Reference to subsection	Subject
IBC Code	Chapter.17	- Products lists subject to IBC Code
	Chapter.18	- Products lists not subject to IBC Code
	Chapter.19	- Index of products carried by bulk with synonyms for products listed in IBC Code
	Chapter.21	- See the references relating to the Chapter 21 of IBC Code ※ See *"B: References relating to the Chapter 21 of IBC Code"* of this Table in detail references
MEPC.2/Circular	Annex 1 to 5	- Provisionally assessed products lists
	Annex 6	- Information for synonyms for vegetable oils
	Annex 7	- Country abbreviations information

Reference to IMO/UN instruments	Reference to subsection	Subject
	Annex 8	- Tripartite contact addresses information
	Annex 9	- Information for manufacturers authorized to conduct pollutant-only assessments by calculation
	Annex 10	- Information for cleaning additives
BLG.1/Circ.27	IMO website	- Tripartite Agreement information on IMO website(Marine Environment/ Carriage of Chemicals/Tripartite Agreements)
The Report of the GESAMP/EHS Working Group	Annex 7 (GESAMP/EHS Composite List)	- Information for the product/components which already assessed by GESAMP/EHS
MARPOL 73/78	Appendix 1 of Annex II	- Information for provisional assessment for a new product's pollution category ※ See *"A: References relating to the Appendix 1 of Annex II to the MARPOL"* of this Table in detail references)
GESAMP Report and Study No. 64	Annex VII	- Information for submitting data GESAMP/EHS for a formal hazard evaluation - GESAMP Product Data Reporting Form
BLG.1/Circ.28	-	- The introduction of in charges for product evaluation work undertaken

Reference to IMO/UN instruments	Reference to subsection	Subject
		by GESAMP/EHS
BLG Product Data Reporting Form	-	- The form should be used for submission of proposed carriage requirement of chemical to IMO' BLG to be included in the IBC Code.
BLG.1/Circ.33	-	- Information for interpretation of the ratings of GESAMP Hazard Profiles

Source: Developed by Author

6.2.2 Establishment of the integrated electronic version of guidelines

Internet is a great tool today. Using advanced technology supports the IMO's environmentally-friendly policy. It can decrease the time spent looking for complex documents and to make separate puzzle pieces into a comprehensive box format, just clicking the name of the relevant documents and check or achieve the necessary information which is supplied by linkages to the electronic documents, especially if the complex cross checking is required to complete processes.

Electronic versions of the guidelines can be a great benefit for the industry and the Administration. It can integrate complex relevant information on IMO's public website. Table 23 shows the advantages and disadvantages of electronic guidelines.

Table 23 -The advantages and disadvantages of electronic guidelines

Advantage	Disadvantage
- Not require to collect all instruments - Save time to locate information - Effective guidance - Easy to check cross linkage for necessary data	- IMO should maintain the system - Must keep in update of amendments

- User-friendly tool - Environmentally-friendly tool	

Source: Author

Therefore, IMO should consider development of electronic guidelines. It can be developed by the IMO or respective Administrations supported by very simple techniques and can be a very effective, user-friendly tool for the industry. The ESPH Working Group can review the detailed technical documents that are required and basic concepts of systems for electronic linkages and its function. MEPC.1/Circ.512 can be a main source to achieve and link all the necessary sources as shown in Figure 19**,** as an example of document linkages.

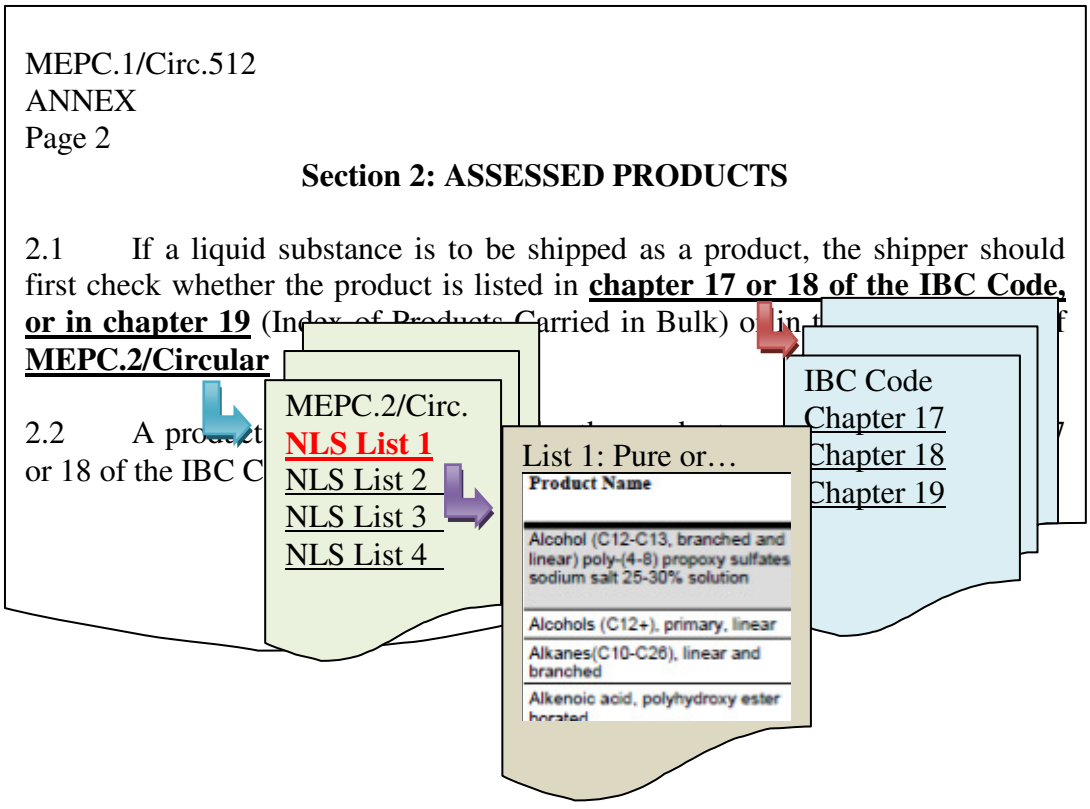

Figure 19 -Example of documents linkages
Source: Drawn by Author

Figure 20 shows the concept of document linkages in electronic version. The basic functions may include as follows:

- All forms must be provided with an example for respective guidance.
- All product lists must be provided with necessary links and search functions for the product list in the IBC Code, its Index, and MEPC.2/Circular. Lists must be updated by IMO.
- The latest version of the GESAMP Composite Hazard profiles must link to the product list if possible.
- Pollution categorization criteria must link to the test standards in the GESAMP Studies and Reporter No. 64.
- IBC Code Chapter 21 must link to the laboratory test criteria in the GHS if possible.

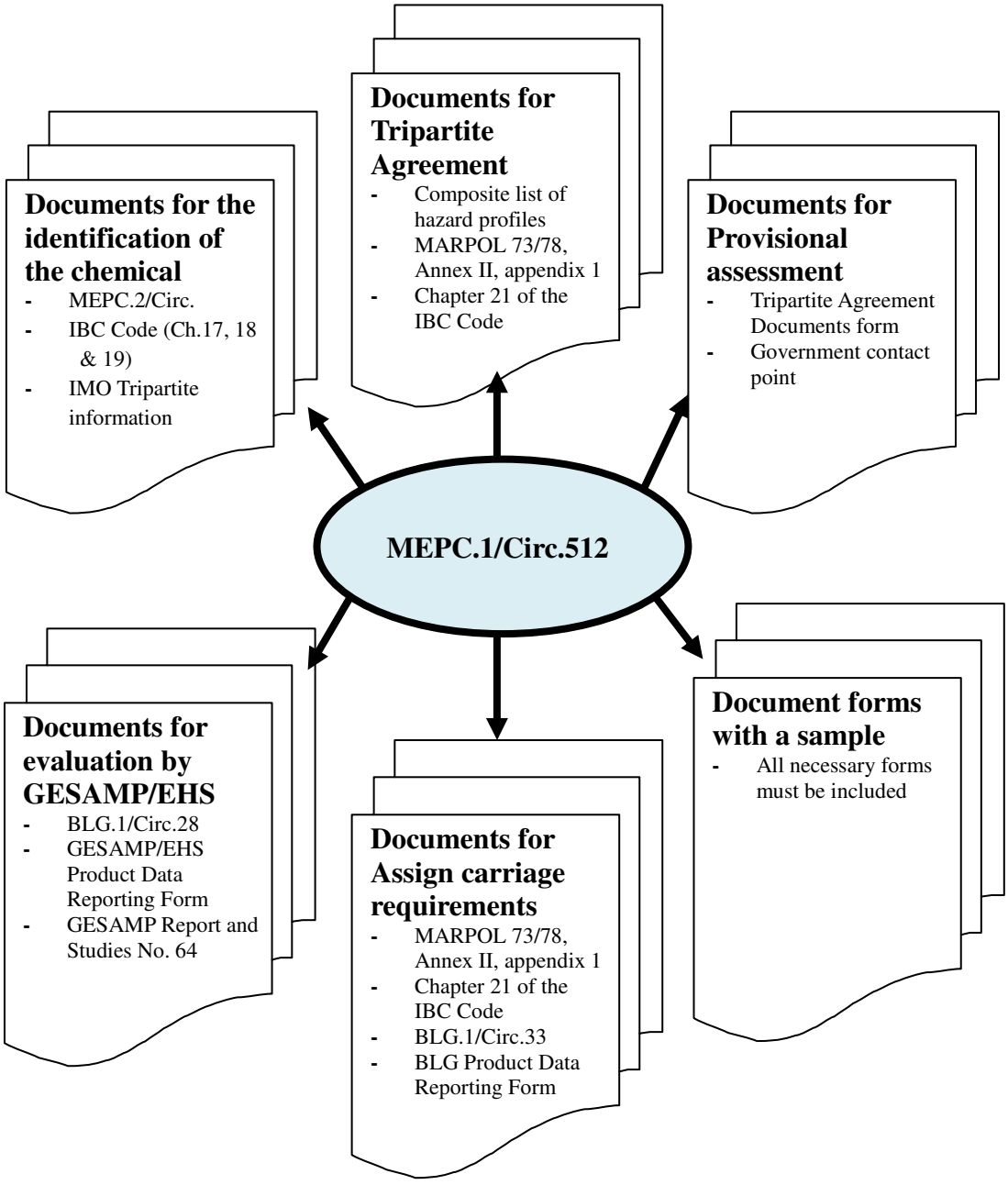

Figure 20- The concept of documents linkage for electronic version of guideline
Source: Drawn by Author

6.2.3 Development of an integrated single combined guideline

Development of an integrated single guideline by combining all guidelines and circulars under MARPOL Annex II and IBC Code which is related to the evaluation of products except periodical circulars could be a viable solution to the complexity.

According to the statistical data in Chapter 4.1.2 of this dissertation, most products listed in the IBC are subject to both the IBC Code and Annex II to MARPOL. Therefore, integration of the separate guidelines; *Appendix 1 of Annex II to MARPOL and Chapter 21 of the IBC Code,* should be taken into account for a possible long term solution. Furthermore, the single guideline can be attached to the IMO's published version of the IBC Code as a new Supplement to the IBC Code.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

The transportation of petroleum products account for 11.7% of world seaborne trade and the transportation volume has been increasing every year, not to mention new bulk chemicals that are continuously transported by sea. 98% of these products are hazardous substances to human beings and/or the environment, because most of these chemicals have hazardous properties. This dissertation found that 748 products are listed in the IBC Code and 45.7% of these products have safety and pollutions hazard together, 53.88% have only pollution hazards and less than 0.5% have safety hazards. Pollution category Y accounts for about 63.9 % of all products followed by Z (22.5%) and X (11.9%). Only 1.7% (13 substances) does not have safety or pollution hazards.

IMO has developed various international regulatory instruments to protect crew and the marine environment from these harmful substances. The SOLAS, Chapter VII regulates carriage of dangerous chemicals, MARPOL Annex II regulates carriage of NLS in bulk, and Annex III regulates marine pollutants in packaged form. In addition, there are various technical Codes such as the IMDG Code, the IMSBC Code, the IBC Code, the IGC Code and the INF Code and all these Codes apply to different forms of products transported by sea.

Liquid bulk substances are regulated by MARPOL Annex II and Part B of the Chapter VII in the SOLAS. SOLAS regulates safety aspects of chemicals and MARPOL regulates marine pollution aspects. The IBC Code provides specific technical requirements under both Conventions. Products listed in Chapter 17 of the IBC Code are under SOLAS and all X, Y and Z category substances are regulated by MARPOL Annex II.

Sea transportation of a new product requires evaluation of the hazards and minimum carriage requirements before it is carried by ships. Appendix 1 of Annex II to MARPOL has the pollution category evaluation criteria based on the GESAMP Hazard Profiles. Chapter 21 of the IBC Code has guidelines for the criteria for assigning carriage requirements based on the GHS standards. In addition, there are many international non-mandatory instruments concerning evaluation of safety and pollution hazards of chemicals as follows but not exclusive.

- MEPC.1/Circ.512 contains various information concerning the evaluation and procedures for ascertaining the carriage requirements.
- MEPC.2/Circular provides lists of NLS information to support the reporting of Tripartite Agreements.
- The GESAMP Report and Study No.64 is closely linked to the Appendix 1 of the MARPOL Annex II and contains hazard evaluations rational, procedures and laboratory test information.
- The Report of the GESAMP/EHS Working Group has the composite list for the industry to find chemical hazard evaluation data.
- BLG.1/Circ.33 contains decisions on the interpretation of the ratings of GESAMP Hazard Profiles and categorization and classification of new products.
- GHS provides criteria and laboratory test information for the Chapter 21 of the IBC Code

The amendments to those IMO instruments and evaluation of hazardous substances have been a main agenda item of the BLG. In addition, the ESPH technical working group deals with evaluation of chemicals and assignment of carriage requirements of the substances. The GESAMP/EHS develops a GESAMP Hazard profile based on the chemical data and considers various matters relating to the evaluation of substances under MARPOL Annex II.

The complexity and frequent updates of newly transported product information and the revision of guidelines make it difficult for Member States to adopt these non-mandatory instruments into their national framework. Therefore, IMO's regulatory instruments are significantly important as central sources of information for chemical and shipping industries.

However, MARPOL Annex II and the IBC do not contain sufficient information on the guidelines. Consequently, the industry should find and study all these necessary sources. Locating these documents may take significant time and effort. In addition, these documents are highly technical and complex, which requires several experts. Therefore, looking for experts might be another monetary burden for the industry.

In conclusion, this dissertation found possible solutions to the benefit of the industry and Member States. Therefore, based on these solutions in Chapter 6, the author recommends that:

- Appendix 1 of Annex II to MARPOL should reference MEPC.1/Circ.512 instead of MEPC/Circ.265.

- A separate new Appendix should be made to the IBC Code which references necessary IMO/UN instruments for evaluation of safety and pollution hazards of chemicals, and their locations and subject.

- IMO should take into consideration developing an electronic version of the guidelines and put it in the IMO's public website to give benefits for the chemical and shipping industry and the Member States.

- Integration of the all separate guidelines under both MARPOL Annex II and the IBC Code as a single guideline should be taken into account for a long term solution, including all relevant laboratory test guidance referenced in those IMO/UN instruments.

Furthermore, development of electronic version of guidelines for other complex IMO non-mandatory instruments should be taken into account in the future to benefit all maritime stakeholders.

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Appendix A

Ref. T5/5.01

BLG.1/Circ.27
18 August 2008

TRIPARTITE AGREEMENTS ON THE IMO WEBSITE

1 The Sub-Committee on Bulk Liquids and Gases (BLG), at its eleventh session (16 to 20 April 2007), proposed that information on provisional assessments should be made available on IMO's public website.

2 The Marine Environment Protection Committee (MEPC), at its fifty-sixth session (9 to 13 July 2007), endorsed the BLG Sub-Committee's proposal and agreed that key information for all new provisional Tripartite Agreements should accordingly be presented on the website.

3 The purpose of this action is to overcome the time gap that can exist between when a Tripartite Agreement is concluded and its appearance in the subsequent MEPC.2/Circular (issued in December each year) since during this time interested parties may not be aware that a particular Tripartite Agreement has been established. In such cases, as checks need to be made to identify recent agreements, this can place an unnecessary burden on Administrations, the industry and the Organization.

4 With respect to the key information to be provided, recognizing the need to keep any additional administrative requirements to a minimum, it was agreed that for Tripartite Agreements concluded under Lists 1, 3 and 4 of the MEPC.2/Circular, the name of the product, the submitting country and the list number should be provided, while for those assessments concluded under List 2, the name of the product, the contains name, the n.o.s. entry number and the reporting country should be made available.

5 In accordance with the above, Tripartite Agreements arising since the last MEPC.2/Circular have now been placed on the IMO public website and this information may be found under the section for Marine Environment/Carriage of Chemicals/Tripartite Agreements.

6 As notifications for new provisional tripartite agreements are received by the Organization, the summary lists on the website will be updated accordingly and at the end of each annual cycle all old entries for the year will be deleted once they have been published in the latest release of the MEPC.2/Circular.

7 Member Governments are invited to note the arrangements as described above and to bring this information to the attention of all concerned.

Appendix B

Ref. T5/2.01

BLG.1/Circ.28
18 August 2008

THE INTRODUCTION OF CHARGES FOR PRODUCT EVALUATION WORK UNDERTAKEN BY GESAMP/EHS

Background

1 In accordance with the Guidelines for the provisional assessment of liquid substances transported in bulk which were approved by the Marine Environment Protection Committee at its fifty-fourth session (20 to 24 March 2006) and which are detailed in MEPC.1/Circ.512, there are provisions under section 8 of the Guidelines which require that, when a provisional assessment has been made of a pure or technically pure product or mixture containing more than 1% by weight of unassessed components, the manufacturers should submit relevant data to GESAMP/EHS in order to develop a GESAMP Hazard profile (GHP) for the substance(s) concerned.

2 In a similar manner, in the tank cleaning additives guidance note issued under MEPC.1/Circ.590 which was developed as a consequence of the revision of MARPOL Annex II and was approved by the Marine Environment Protection Committee at its fifty-sixth session (9 to 13 July 2007) there is a requirement that, if any components of a cleaning additive do not have the required GHP, the manufacturer should submit these components to GESAMP/EHS on an "owner pays principle".

3 In considering the long-term funding of the GESAMP/EHS Working Group, it was agreed at MEPC 56 that costs should be split between the organization and industry (the latter being the beneficiary having the cargo interest) and that accordingly, a fixed fee should be paid each time an evaluation is carried out on a product. This fee should apply equally to products to be carried in bulk or to those used as a component in a mixture and to the evaluation of components in cleaning additives so as to ensure identical treatment within the evaluation system.

4 In deciding to set a fixed fee, it was noted that whilst the GESAMP/EHS Working Group members had in the past offered their specialized services on a voluntary basis, for the future a payment to Working Group members should be made in order to ensure that the high level of professional expertise available within the Group can be sustained.

5 As a further principle in the process, it was agreed that the method of payment for the fee should be direct from the manufacturer without the involvement of governments, following the same path as that used for the submission of data to GESAMP/EHS.

Evaluation by GESAMP/EHS

6 In accordance with the decisions outlined above, for all future product evaluation work carried out by GESAMP/EHS, a non-refundable fee of US$6,500 should now be paid in advance of the evaluation work being undertaken by the Working Group.

7 Product submissions, in the first instance, should follow the guidance as given in GESAMP Reports and Studies No.64 with respect to the technical information to be supplied.

8 Submissions should be made to the GESAMP/EHS Technical Secretariat who will process all applications and then arrange for an invoice to be subsequently despatched to the initiating party.

9 Once the payment has been settled, GESAMP/EHS will address the product evaluation at the next scheduled meeting of the Working Group.

Date of next GESAMP/EHS meeting

10 The next meeting of the GESAMP/EHS Working Group is tentatively scheduled for 20 to 24 April 2009.

11 Member Governments are invited to note the new arrangements as described above and to bring this information to the attention of all concerned.

Appendix C

GUIDELINES FOR THE CATEGORIZATION OF NOXIOUS LIQUID SUBSTANCES*

Products are assigned to Pollution Categories based on an evaluation of their properties as reflected in the resultant GESAMP Hazard Profile as shown in the table below:

Rule	A1 Bio-accumulation	A2 Bio-degradation	B1 Acute toxicity	B2 Chronic toxicity	D3 Long-term health effects	E2 Effects on marine wildlife and on benthic habitats	Cat
1			≥ 5				
2	≥ 4		4				
3		NR	4				
4	≥ 4	NR			CMRTNI		***X***
5			4				
6			3				
7			2				
8	≥ 4	NR		Not 0			
9				≥ 1			**Y**
10						Fp,F or S If not Inorganic	
11					CMRTNI		
12	Any product not meeting the criteria of rules 1 to 11 and 13						**Z**
13	All products identified as: ≤2 in column A1; R in column A2; blank in column D3; not Fp, F or S (if not organic) in column E2; and 0 (zero) in all other columns of the GESAMP Hazard Profile						**OS**

Abbreviated legend to the revised GESAMP Hazard Evaluation Procedure

Columns A and B - Aquatic Environment					
	A			B	
	Bioaccumulation and Biodegradation			Aquatic Toxicity	
Numerical Rating	A 1* Bioaccumulation		A 2* Biodegradation	B 1* Acute Toxicity	B 2* Chronic Toxicity
	log Pow	BCF		LC/EC/IC_{50} (mg/l)	NOEC (mg/l)
0	<1 or > ca. 7	not measurable	R: readily biodegradable NR: not readily Biodegradable	>1000	>1
1	≥1 - <2	≥1 - <10		>100 - ≤1000	>0.1 - ≤1
2	≥2 - <3	≥10 - <100		>10 - ≤100	>0.01 - ≤0.1
3	≥3 - >4	≥100 - <500		>1 - ≤10	>0.001 - ≤0.01
4	≥4 - <5	≥500 - <4000		>0.1 - ≤1	≤0.001
5	≥5	≥4000		>0.01 - ≤0.1	
6				≤0.01	

Columns C and D - Human Health (Toxic effects to mammals)						
	C			D		
	Acute Mammalian Toxicity			Irritation, Corrosion & Long term health effects		
Numerical Ratings	C 1 Oral Toxicity LD_{50} (mg/kg)	C 2 Percutaneous Toxicity LD_{50} (mg/kg)	C 3 Inhalation Toxicity LC_{50} (mg/l)	D 1 Skin irritation & corrosion	D 2 Eye irritation & corrosion	D3* Long term health effects
0	>2000	>2000	>20	not irritating	not irritating	C - Carcinogen M - Mutagenic R - Reprotoxic S - Sensitizing A -Aspiration haz. T - Target organ systemic toxicity L - Lung injury N - Neurotoxic I - Immunotoxic
1	>300 - ≤2000	>1000 - ≤2000	>10 - ≤20	mildly irritating	mildly irritating	
2	>50 - ≤300	>200 - ≤1000	>2 - ≤10	irritating	irritating	
3	>5 - ≤50	>50 - ≤200	>0.5 - ≤2	3 Severely irritating or corrosive 3A Corr. (≤4hr) 3B Corr. (≤1hr) 3C Corr. (≤3m)	severely irritating	
4	≤5	≤50	≤0.5			

Column E Interferences with other Uses of the Sea			
E 1 Tainting	E 2* Physical effects on Wildlife & benthic habitats	E 3 Interference with Coastal Amenities	
		Numerical Rating	Description & Action
NT:not tainting (tested) T: tainting test positive	Fp: Persistent Floater F: Floater S: Sinking Substances	0	no interference **no warning**
		1	slightly objectionable **warning, no closure of amenity**
		2	moderately objectionable **possible closure of amenity**
		3	highly objectionable **closure of amenity**

Source: Appendix 1 of the Annex II to the MARPOL

Appendix D

21.3 Minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code

21.3.1 Products are deemed to be hazardous and subject to chapter 17 of the IBC Code if they meet one or more of the following criteria:

.1 inhalation $LC_{50} \leq 20$ mg/*l*/4 h (see definitions in paragraph 21.7.1.1);

.2 dermal $LD_{50} \leq 2000$ mg/kg (see definitions in paragraph 21.7.1.2);

.3 oral $LD_{50} \leq 2000$ mg/kg (see definitions in paragraph 21.7.1.3);

.4 toxic to mammals by prolonged exposure (see definitions in paragraph 21.7.2);

.5 cause skin sensitization (see definitions in paragraph 21.7.3);

.6 cause respiratory sensitization (see definitions in paragraph 21.7.4);

.7 corrosive to skin (see definitions in paragraph 21.7.5);

.8 have a Water Reactive Index (WRI) of ≥1 (see definitions in paragraph 21.7.6);

.9 require inertion, inhibition, stabilization, temperature control or tank environmental control in order to prevent a hazardous reaction (see definitions in paragraph 21.7.10);

.10 flash point <23°C; and have an explosive/flammability range (expressed as a percentage by volume in air) of ≥20%;

.11 autoignition temperature of ≤200°C; and

.12 classified as pollution category X or Y or meeting the criteria for rules 11 to 13 under paragraph 21.4.5.1.

Source: Chapter 21 of the IBC Code (IMO)

Appendix E

Guidance for the provisional assessment of pure or technically pure products in Section 4 of the MEPC.1/Circ.512

Section 4: PROVISIONAL ASSESSMENT OF
PURE OR TECHNICALLY PURE PRODUCTS

4.1 In case of pure or technically pure products, the Administration of the shipping or producing country should provisionally assess the Pollution Category, the Ship Type and the carriage requirements, on the basis of the pollution and safety data supplied by the manufacturer/shipper.

4.2 **Pollution aspects**

The following reference documents provide guidance for the Administration to assess the new product's pollution hazard:

.1 Guidelines for the Categorization of Noxious Liquid Substances (MARPOL 73/78, Annex II, appendix 1);

.2 Abbreviated Legend to the revised GESAMP Hazard Evaluation Procedure (MARPOL 73/78, Annex II, appendix 1); and

.3 Relevant parts of chapter 21 of the IBC Code: "Criteria for assigning carriage requirements for products subject to the IBC Code", from a marine pollution point of view.

4.3 The first step for the Administration is to check the latest composite list of hazard profiles of substances carried by ships, issued periodically by IMO under cover of a BLG circular.

4.4 If a hazard profile can be found for the product in question, its Pollution Category should be derived from it in accordance with references 4.2.1. The Ship Type and carriage requirements, in so far as the pollution hazard is concerned, should be derived from references 4.2.3.

4.5 If no hazard profile exists, all the available data to establish a provisional one should be reviewed.

4.6 When adequate data are available, a provisional hazard profile should be derived, following the criteria developed by GESAMP/EHS (see reference 4.2.2). The provisional Pollution Category should be derived from this provisional hazard profile in accordance with 4.2.1. The Ship Type and carriage requirements, based upon its pollution hazard, should be derived in accordance with 4.2.3.

4.7 When sufficient data are not available, the Administration should make an assessment by analogy to chemically similar substances from the following sources:

.1 the IBC Code including the Index;

.2 the MEPC.2/Circular referred to in paragraph 2.5, listing the substances assessed by IMO and those provisionally assessed by tripartite agreement; and

.3 the BLG circular referred to in paragraph 4.3, listing the substances for which a hazard profile exists.

When several alternative analogies are possible, the most severe should prevail.

Safety aspects

4.8 After assessment of the pollution hazards, the possible safety hazards of the product should be assessed.

4.9 For this assessment reference is made to the relevant parts of chapter 21 of the IBC Code: "Criteria for assigning carriage requirements for products subject to the IBC Code", from a safety point of view.

4.10 If the product to be provisionally assessed presents a safety hazard, the Administration should assign carriage requirements in accordance with the above-mentioned criteria. These requirements have to be integrated with those previously assigned for pollution prevention purposes only and the most stringent set has to be adopted. If necessary, the Administration should revise the Ship Type previously assigned for pollution considerations only.

Administrative Aspects

4.11 At this point, the Administration of the shipping or producing country, having provisionally assessed the product in question, should seek the concurrence of the Administrations of the Flag State(s) and receiving countries with its evaluation, by providing information on which the provisional pollution and safety hazard assessment has been based. For this purpose, the standard format for proposing tripartite agreements for the provisional assessment of liquid substances, reproduced in appendix 3, should be used.

4.12 In the absence of an interim or final response to the notification from any of the other Parties involved within 14 days of the despatch, the proposed provisional assessment made by the Administration of the shipping or producing country should be deemed to have been accepted. In this respect it should be noted that those contact points which have not informed the Organization of their latest contact details should be deemed to have accepted the tripartite agreements whilst other contact points should still follow regulation 6(3) of Annex II of MARPOL 73/78 and these guidelines (reference is made to resolution MEPC.109(49)).

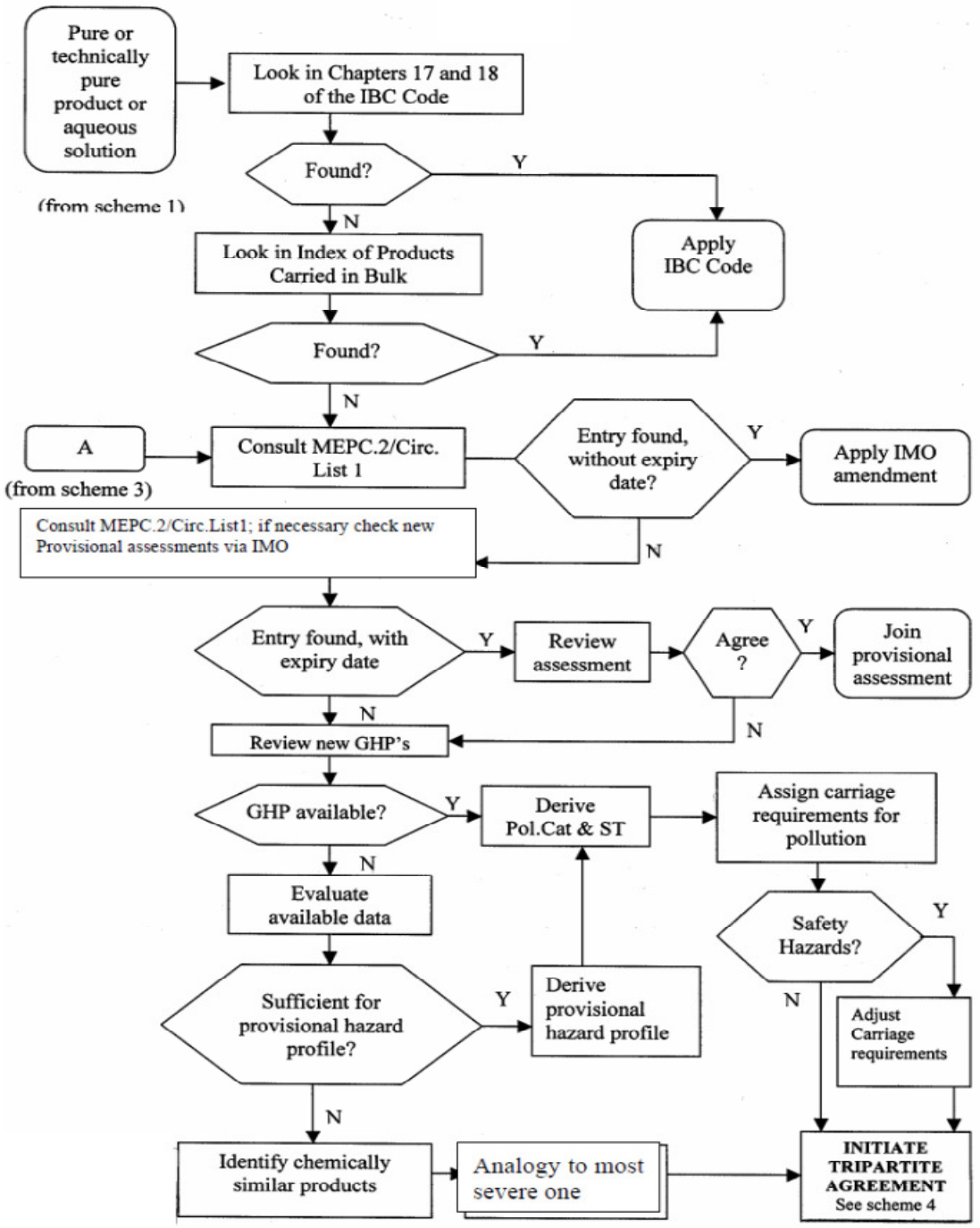
4.13 In the event of disagreement the most severe conditions proposed should prevail to obtain the tripartite agreement.

4.14 After express or tacit agreement has been reached, the proposing Administration should inform IMO, as required by regulation 6.3 of Annex II (i.e. within 30 days but preferably as soon as possible). It is recommended to use the format, referred to in 4.11, for this purpose.

4.15 After establishing a tripartite agreement, an addendum to the relevant ship's certificate may be issued.

4.16 The manufacturer should then promptly forward to GESAMP/EHS all data necessary for a formal hazard evaluation (see section 8).

<Procedural diagram for the pure or technically pure product>



Source: Scheme 2 of Appendix 1 to MEPC.1/Circ.512 (2006 May 16),