



# DRI, Pellets and Regulation

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METAL BULLETIN 5<sup>TH</sup> WORLD DRI & PELLETS CONGRESS

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- **What is IIMA and what does it do?**
- **Overview of the regulatory landscape for chemicals, minerals, metals**
- **Issues for DRI and pellets**
  - Maritime regulations – **emphasis on DRI Fines**
  - Chemical industry regulations – brief overview

# What is IIMA?

**IIMA is the trade association for the ore-based metallics industry.....**

**merchant pig iron, hot briquetted iron, direct reduced iron, granulated iron**



# What does IIMA do?

**As the unified voice of the ore-based metallics industry:**

- **furtheres the interests of members and the industry**
- **promotes ore-based metallics as value-adding feedstock for the steel and ferrous casting industries**
- **identifies and addresses threats to and opportunities for the industry**
- **communicates with stakeholders at industry level**
- **provides regulatory support**
- **provides a forum for exchange of ideas at the scientific and technical levels**

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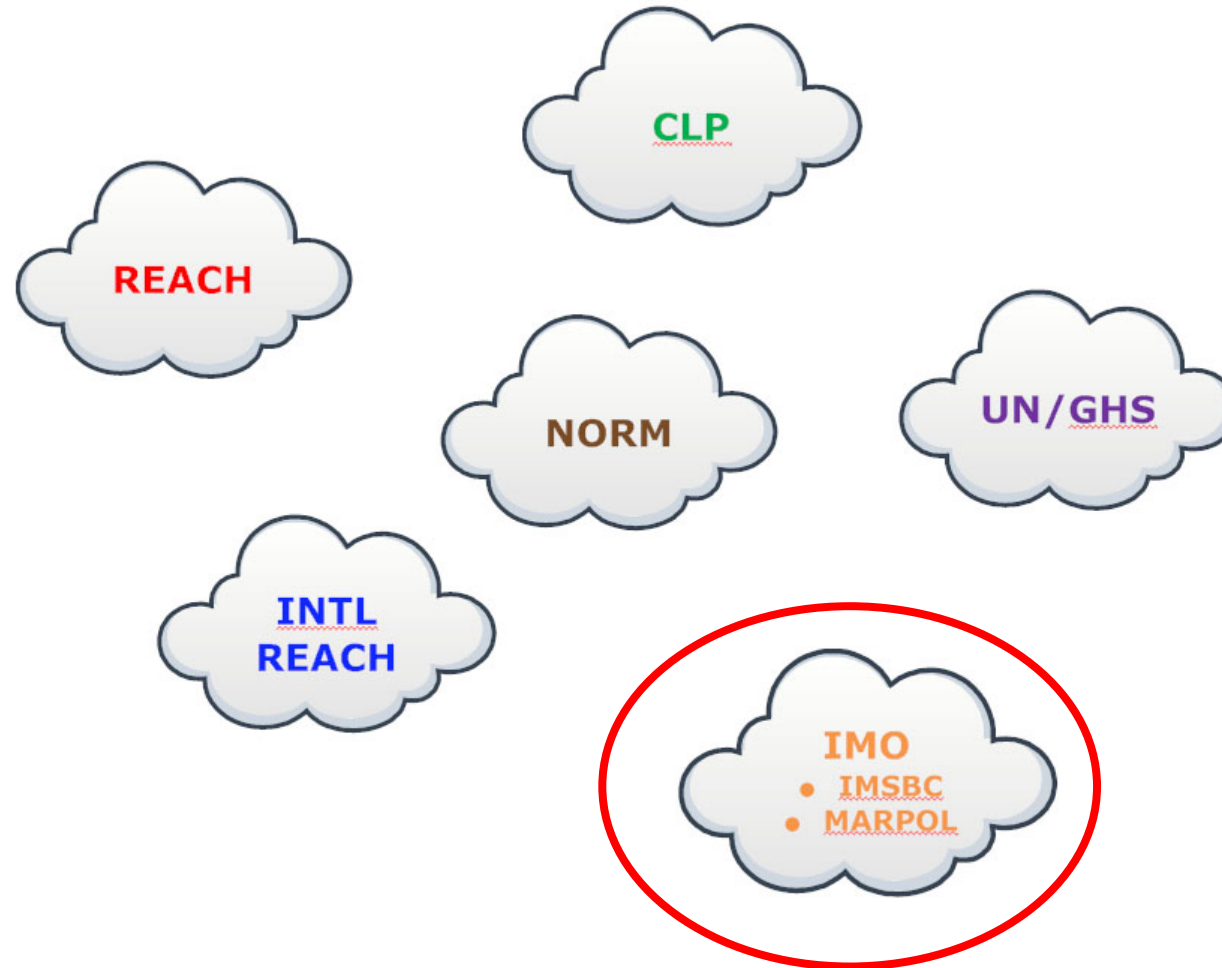
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# The regulatory landscape



## REGULATORY LANDSCAPE FOR CHEMICALS AND MATERIALS



# International Maritime Organisation

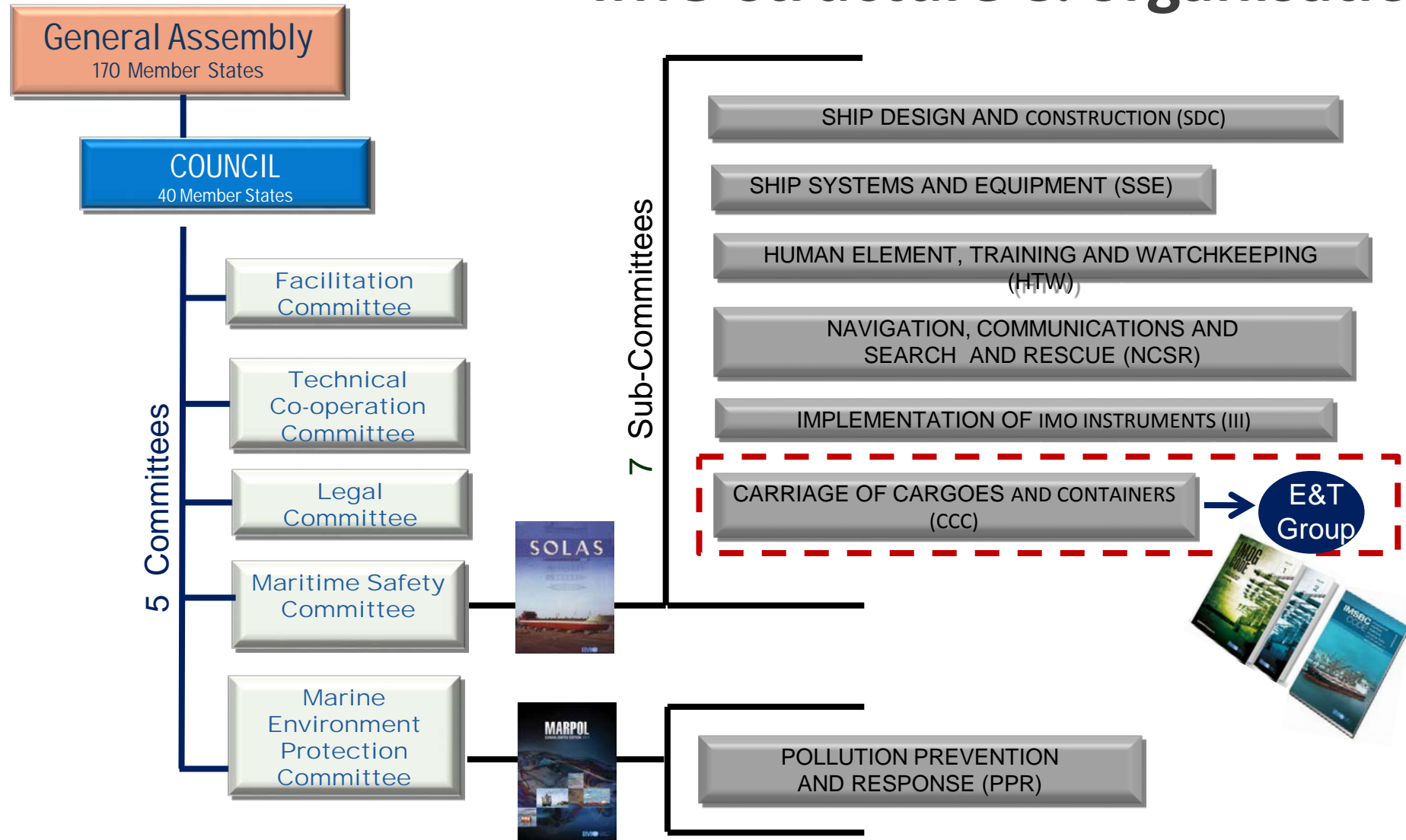


IMO is an intergovernmental body that deals with matters on sea transport, which are referred to it by its Member Governments.

IMO is mainly involved in development of international regulations, on the basis of proposals by Member Governments.

The practical design and application is the responsibility of the maritime Administrations concerned

# IMO structure & organisation



# IMO regulatory framework

## INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA

### SOLAS

#### Chapter VII - Carriage of Dangerous Goods

##### Part A, Carriage of dangerous goods in packaged form

**IMDG Code**

##### Part A-1, Carriage of dangerous goods in solid form in bulk

**IMSBC Code**

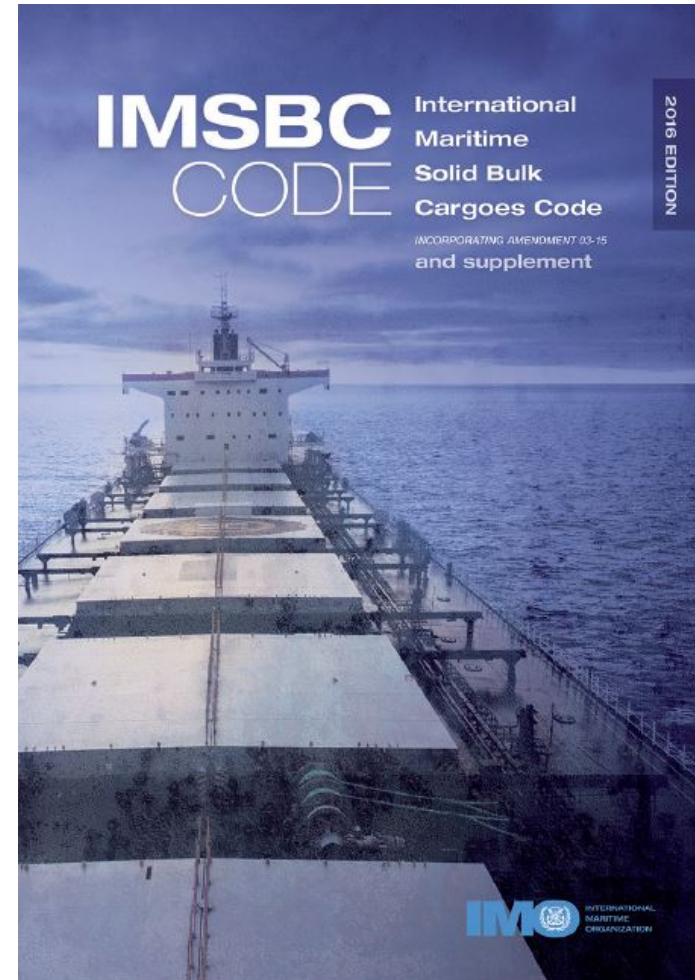


**Provisions facilitate the safe  
stowage and shipment of solid bulk  
cargoes,**

**Updated every two years**

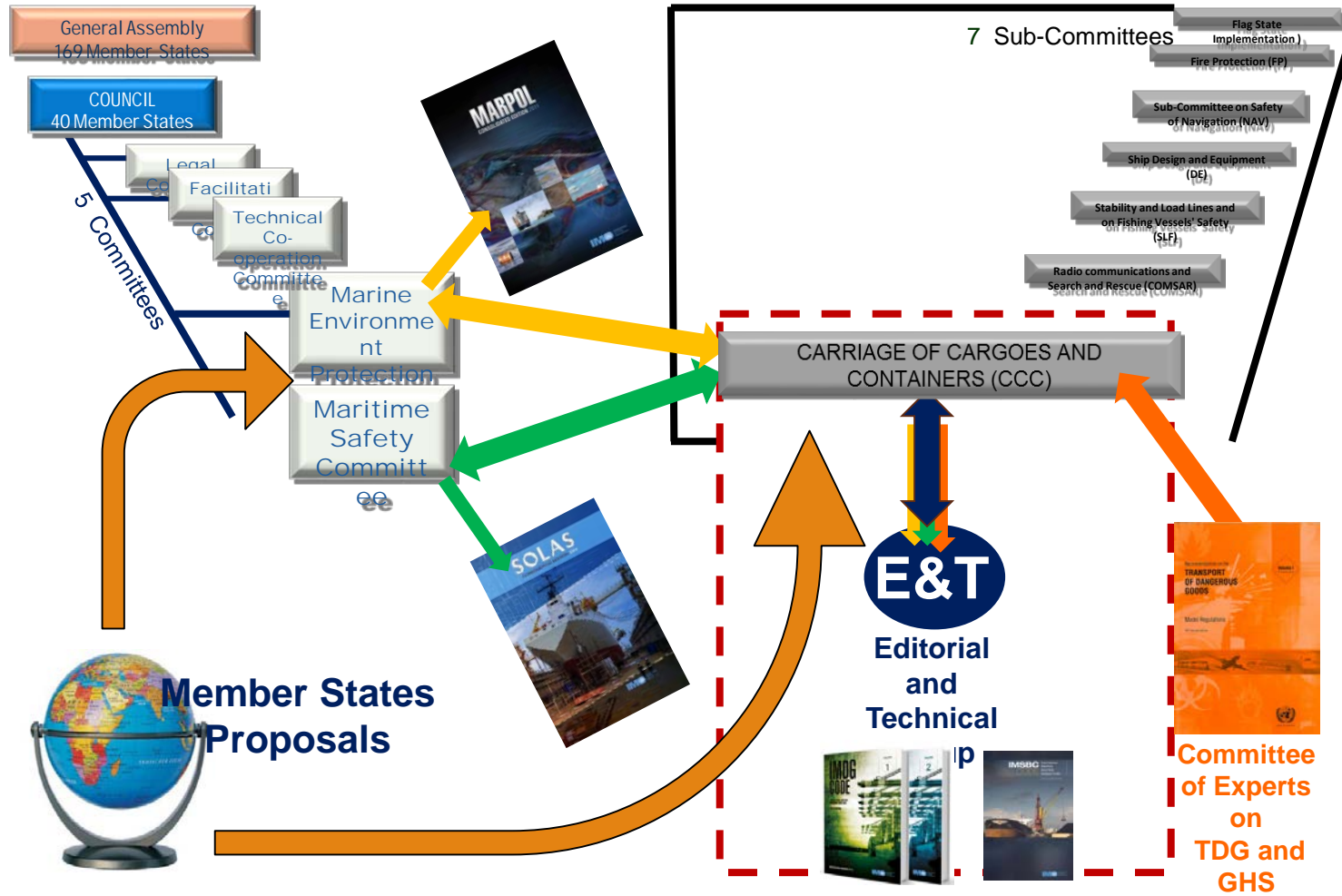
**E&T Group deal with amendments to  
IMSBC Code**

**\*Member State proposals to new regulation or  
amendment to existing one.**





# IMO process flow



# IMSBC Code hazard classification

- **Group A: cargoes which may liquify**
- **Group B: cargoes with chemical hazard**
  - Class 4.1: Flammable solids
  - Class 4.2: Substances liable to spontaneous combustion
  - Class 4.3: Substances which, in contact with water, emit flammable gases
  - Class 5.1: Oxidizing substances
  - Class 6.1: Toxic substances
  - Class 7: Radioactive materials
  - Class 8: Corrosive substances
  - Class 9: Miscellaneous dangerous substances and articles.
- **Group C: cargoes which are neither liable to liquefy nor possess chemical hazards**
- **Materials Hazardous only in Bulk (MHB)**
  - Combustible solids (CB)
  - Self-heating solids (SH)
  - Solids that evolve flammable gas when wet (WF)
  - Solids that evolve toxic gas when wet (WT)
  - Toxic solids (TX)
  - Corrosive solids (CR)
  - Other hazards (OH)

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# IMSBC Code schedules for iron ore

- **Mineral concentrates [Group A]**
  - Iron concentrate, pellet feed, sinter feed
  - Iron concentrates [pellet feed]
  - Iron concentrate [sinter feed]
- **Iron Ore [excludes Iron concentrate] [Group C]**
- **Iron ore fines [ $\geq 10\%$   $< 1$  mm and  $\geq 50\%$   $< 10$  mm] [Group A]**
- **Iron ore pellets [Group C]**
- **Taconite pellets [Group C]**



# IMSBC Code schedules for direct reduced iron

- **Direct Reduced Iron (A) - briquettes, hot-moulded = HBI**
  - MHB, Class B (self-heating, evolution of H<sub>2</sub> when in contact with water)
  - Surface ventilation, natural or mechanical, as necessary during voyage
- **Direct Reduced Iron (B) - lumps, pellets, cold-moulded briquettes = DRI**
  - MHB, Class B (self-heating, evolution of H<sub>2</sub> when in contact with water)
  - Shipped under inert atmosphere
- **Direct Reduced Iron (C) - by-product fines**
  - MHB, Class B (self-heating, evolution of H<sub>2</sub> when in contact with water)
  - Shipped under inert atmosphere
  - Maximum moisture 0.3%
  - Average particle size <6.35 mm
  - No particles > 12 mm

# What's wrong with the DRI(C) schedule?

## Direct Reduced Iron (C) - by-product fines

- MHB, Class B (self-heating, evolution of H<sub>2</sub> when in contact with water) - **should also be Class A, cargoes which may liquefy if shipped at a moisture content above their Transportable Moisture Limit.**
- Shipped under inert atmosphere - **experience has shown that mechanical ventilation is more effective for fines**
- Maximum moisture 0.3% - **such a material does not exist in the commercial world**
- No particles > 12 mm - **with screening at 9.5 mm there is some carryover of oversize - aim is max 5% +12.5 mm**

# Current practice for DRI Fines - exemptions

## Article 1.5.1 of the IMSBC Code

**“Where this Code requires that a particular provision for the transport of solid bulk cargoes shall be complied with, a competent authority or competent authorities (port State of departure, port State of arrival or flag State) may authorise any other provision by exemption if satisfied that such provision is at least as effective and safe as that required by this Code. Acceptance of an exemption authorised under this section by a competent authority not party to it is subject to the discretion of that competent authority. Accordingly, prior to any shipment covered by the exemption, the recipient of the exemption shall notify other competent authorities concerned.”**

## **1.5.2: a competent authority which has initiated an exemption shall:**

- 1.5.2.1: send a copy to the IMO
- 1.5.2.2: take action to amend the Code to include the provision covered by the exemption, as appropriate

**1.5.3: period of an exemption not to be more than five years from date of authorisation, but an exemption not covered by 1.5.2.2 can be extended**

**1.5.4: copy of the exemption to be maintained on board each ship transporting solid bulk cargoes in accordance with the exemption**

**1.5.5: contact info for the main designated national competent authorities is given in a separate document issued by the IMO**

# Proposed DRI (D) description

<p><b>Description</b>          Direct reduced iron (DRI) (D) is a porous, black/grey odourless metallic material generated as a by-product of the manufacturing and handling processes of DRI (A) and/or DRI (B) which has been aged for at least 30 days prior to loading. The density of direct reduced iron (DRI) (D) is less than 5,000 kg/m<sup>3</sup>.</p>		
<p><b>Characteristics</b></p>		
Angle of repose	Bulk density (kg/m <sup>3</sup> )	Stowage factor (m <sup>3</sup> /t)
Not applicable	1,850 to 3,300	0.30 to 0.54
Size	Class	Group
Fines and small particles with an average size less than 6.35 mm, particles larger than 12.5 mm not to exceed 5% by weight	MHB (WF), (OH)	A and B
<p><b>Hazard</b>          There is a risk of explosion during loading, transport and discharge due to the fact that this cargo reacts with moisture/water and especially seawater, to produce hydrogen and heat. Hydrogen is a flammable gas that can form an explosive mixture in combination with air in concentrations above 4% by volume.</p>		

OH hazard = oxygen depletion

# Safety measures for DRI (D)

- **Proper preparation of the cargo – aging, etc.**
- **Load in dry conditions**
- **Cargo Technician on board throughout voyage**
- **Regular monitoring of cargo temperature and hydrogen content in hold atmosphere [max. permitted 1% by volume = 25% LEL]**
- **Continuous mechanical ventilation of holds**
- **No potential ignition sources**
- **Avoid contact with water at all times**
- **Informed vessel master/crew**
- **Carry out risk assessments**

# IIMA's goal for DRI Fines

- Of paramount importance and at the top of our agenda is **SAFE CARRIAGE OF DRI FINES**.
- Second on our agenda is to protect the **REPUTATION OF THE DIRECT REDUCTION INDUSTRY AND ITS VALUE CHAIN** - another serious maritime incident would do immense damage.
- At the practical level, our goal is to achieve a **NEW SCHEDULE** for DRI Fines - **DRI (D)** - to the IMSBC Code.
- A new schedule is needed:
  - to provide **A MANDATORY, UNIVERSAL CODE** to be followed by member states and industry globally, reflecting existing best practice measures
  - to eliminate the need for exemptions and equivalent measures
  - to eliminate risks arising from mis-declaration of cargoes, inadvertent or otherwise, and thereby improve safety of ships, crews, port facilities and their workers.
- A parallel goal is to **PROMOTE BEST PRACTICE** for DRI Fines along its global value chain through relevant guidance and communication.



INTERNATIONAL  
FOUNDATION FOR  
AIDS TO NAVIGATION



- IIMA has NGO consultative status at the IMO
- IIMA has engaged with a group of stakeholders who have a decisive influence on regulators at the IMO - P&I Clubs and maritime organisations.
- IIMA is fully engaged with key IMO member states.
- We are being assisted by a recognised independent firm of consulting scientists and engineers, Burgoynes, with significant experience of DRI.



# Key takeaways for DRI Fines

- **Safe carriage of DRI Fines must be at the top of all concerned agendas.**
- **A separate, representative schedule for DRI (D) is needed.**
- **There is a risk of reputational damage to the direct reduction industry through non-observance of regulations and proper procedures for designation, shipping and handling of DRI Fines.**
- **This message must reach your commercial and logistics organisations which must ensure that handling of your fines is compliant along the value chain.**
- **IIMA is a resource that is available to the industry.**

# MHB corrosivity to metals hazard (CR)

- **From January 1<sup>st</sup> 2017 it became mandatory for shippers to declare MHB hazards, including corrosive substances.**
- **IMSBC Code mandates a modified C-1 test for corrosivity testing**
  - UN manual of tests and criteria [recommendations on transport of dangerous goods]
- **C-1 is a test for liquids and some non-corrosive solid cargoes have failed the test – e.g. iron ore, coal, bauxite, mineral sands...**
- **The mining industry (through ICOMM\*) has a programme to find a solution to this “storm in a teacup” – IIMA is involved.**
  - \*International Council on Mining & Metals
- **Interpretation of this regulation varies across jurisdictions.**

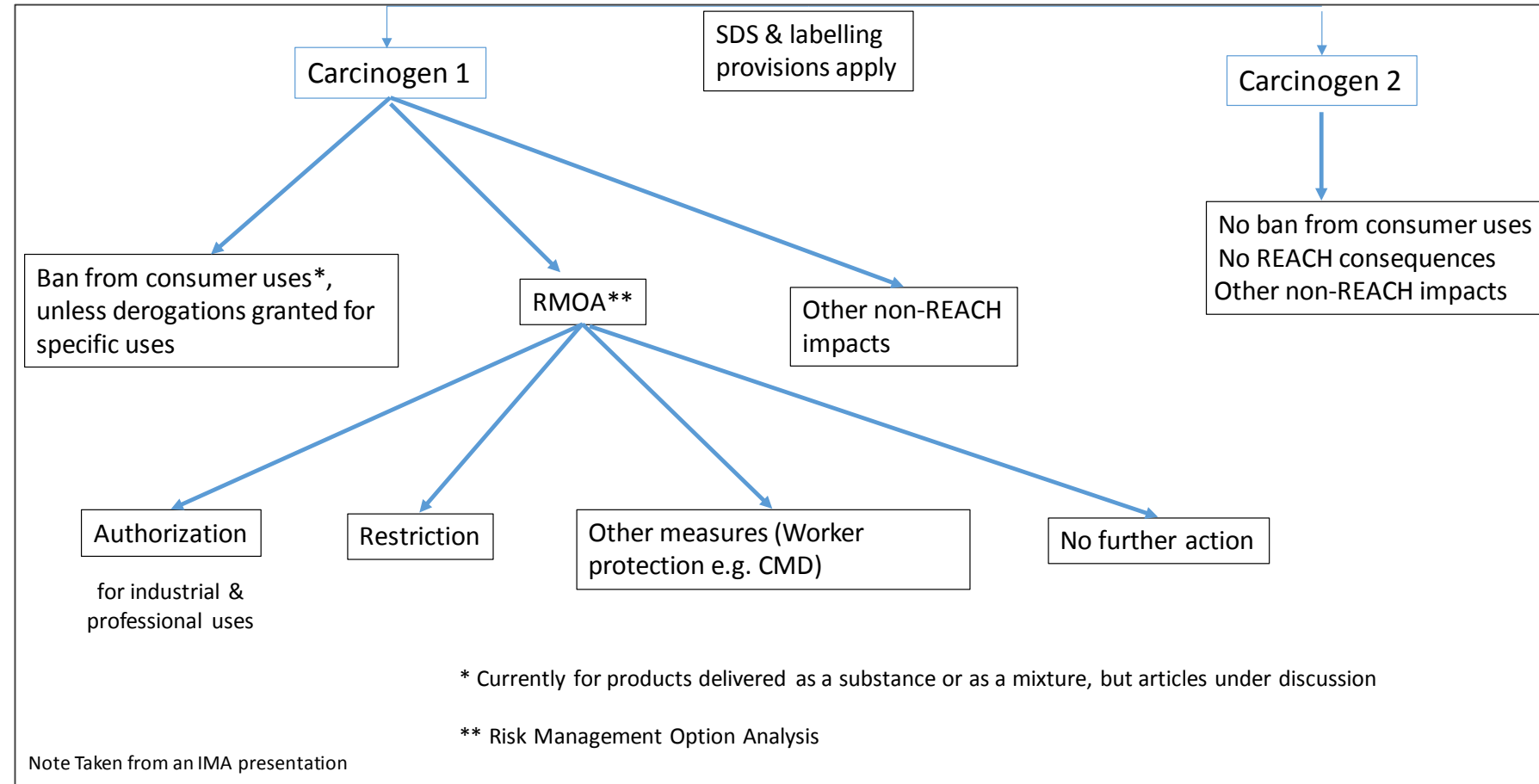
# Threats from chemical regulation

- **Possible classification of crystalline silica (in one form or another) as carcinogen in EU, already considered as such by NTP and IARC in some but not all occupational settings).**
  - Possible impact on iron ore containing  $\geq 0.1\%$  crystalline silica?
- **Proposed classification of  $\text{TiO}_2$  as category 1B carcinogen in EU.**
  - Possible impact on iron ore containing  $\geq 0.1\%$   $\text{TiO}_2$ ?
  - Iron oxide (and aluminium oxide) quoted in CLH proposal to have same effect as  $\text{TiO}_2$ .
- **Iron and iron oxide are on the radar of NTP and IARC**
- **Iron oxide has been proposed as a possible carcinogen by MAK**

NTP = National Toxicological Program (USA) IARC = International Agency for Research on Cancer  
MAK = DFG Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (Germany)

# Key Downstream Consequences of Harmonised Classification as a Carcinogen

- Category 1A Substances known to have carcinogenic potential for humans. The classification in this category is largely based on human evidence, human studies that establish a causal relationship between human exposure to a substance and the development of cancer.
- Category 1B Substances presumed to have carcinogenic potential for humans. The classification in this category is largely based on animal evidence, animal experiments for which there is sufficient evidence to demonstrate animal carcinogenicity.
- Second category: category 2 Suspected human carcinogens. The placing of a substance in category 2 is done on the basis of evidence obtained from human and/or animal studies, but which is not sufficiently convincing to place the substance in category 1A or 1B.





**KEEP  
CALM  
AND  
melt with  
OBM's!**

## Contact Information

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