

Overview of HNS



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Hazardous and Noxious Substances

Five categories: chemicals



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Raw Ores e.g. bauxite, rock phosphate, iron, coal	
Mineral or Organic Salts e.g. ammonium nitrate, magnesium phosphide	
Petrochemical Products e.g. phenol, ethanol, vinyl chloride, styrene	
Corrosive Substances e.g. hydrochloric acid, acetic acid, sulphuric acid	
Gases e.g. butane, chlorine, ammonia, propylene	






Hazardous and Noxious Substances

Five categories: chemicals






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Physical Hazards

	GHS 01 Explosive Unstable Materials
	GHS 02 Flammable
	GHS 03 Oxidizer
	GHS 04 Gas under pressure
	GHS 05 Corrosive Skin/eye corrosion

Health Hazards

	GHS 06 Acute toxicity Poisonous even at low concentrations
	GHS 07 Harmful/irritant Poisonous at high concentrations
	GHS 08 Health hazard

Environmental Hazards

	GHS 09 Hazardous to the aquatic environment
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What are HNS?

Facts and figures



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- **37 million chemical products used in the world**
 - 2,000 regularly transported by sea
- **Chemical trade**
 - 165 million tonnes (2009)
 - 215 million tonnes (2015)
- **Number of ships carrying HNS worldwide, examples:**
 - Container ships
 - ~ 2,600 in 2000
 - ~ 5,000 in 2014
 - LNG ships
 - ~ 100 in 1998
 - ~ 500 in 2020

What are HNS?

Definitions



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- **Any substance other than oil which can**
 - Create **hazards to human health**
 - Harm **living resources** and marine life
 - Damage **amenities**
 - Interfere with other legitimate **uses of the sea**

(Definition from OPRC-HNS Protocol, 2000)
- **Reference to substances listed in international regulations**
 - SOLAS Convention
 - MARPOL 73/78 Convention
 - and their relevant goods transport codes
 - Includes oils






Identifying HNS

Regulations



The different codes governing goods transport by ship

SOLAS Convention	IGC Code	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk	Liquefied gas		
	IBC Code	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk	Bulk liquids		MARPOL 73/79 Convention
	IMDG Code	International Maritime Dangerous Goods code	Containers and packages		
	IMSBC Code	International Maritime Solid Bulk Cargoes Code	Bulk solids		

(source: CEDRE, Transport Canada)

What are HNS?

Substances at risk



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Top 10 substances spilt

Rank	Substance
1	Iron ore
2	Sulphuric acid
3	Caustic soda
4	Fertilisers
5	Cereals
6	Ammonium nitrate
7	Phosphate
8	Coal
9	Sulphur
10	Vegetable oils

(Source: IMO)

Top 20 substances at risk*

Rank	Substance	Rank	Substance
1	sulphuric acid	11	styrene
2	hydrochloric acid	12	methanol
3	sodium hydroxide /caustic soda	13	ethylene glycol
4	phosphoric acid	14	Chlorine
5	nitric acid	15	Acetone
6	LPG/LNG	16	ammonium nitrate
7	ammonia	17	urea
8	benzene	18	toluene
9	Xylene	19	acrylonitrile
10	phenol	20	vinyl acetate

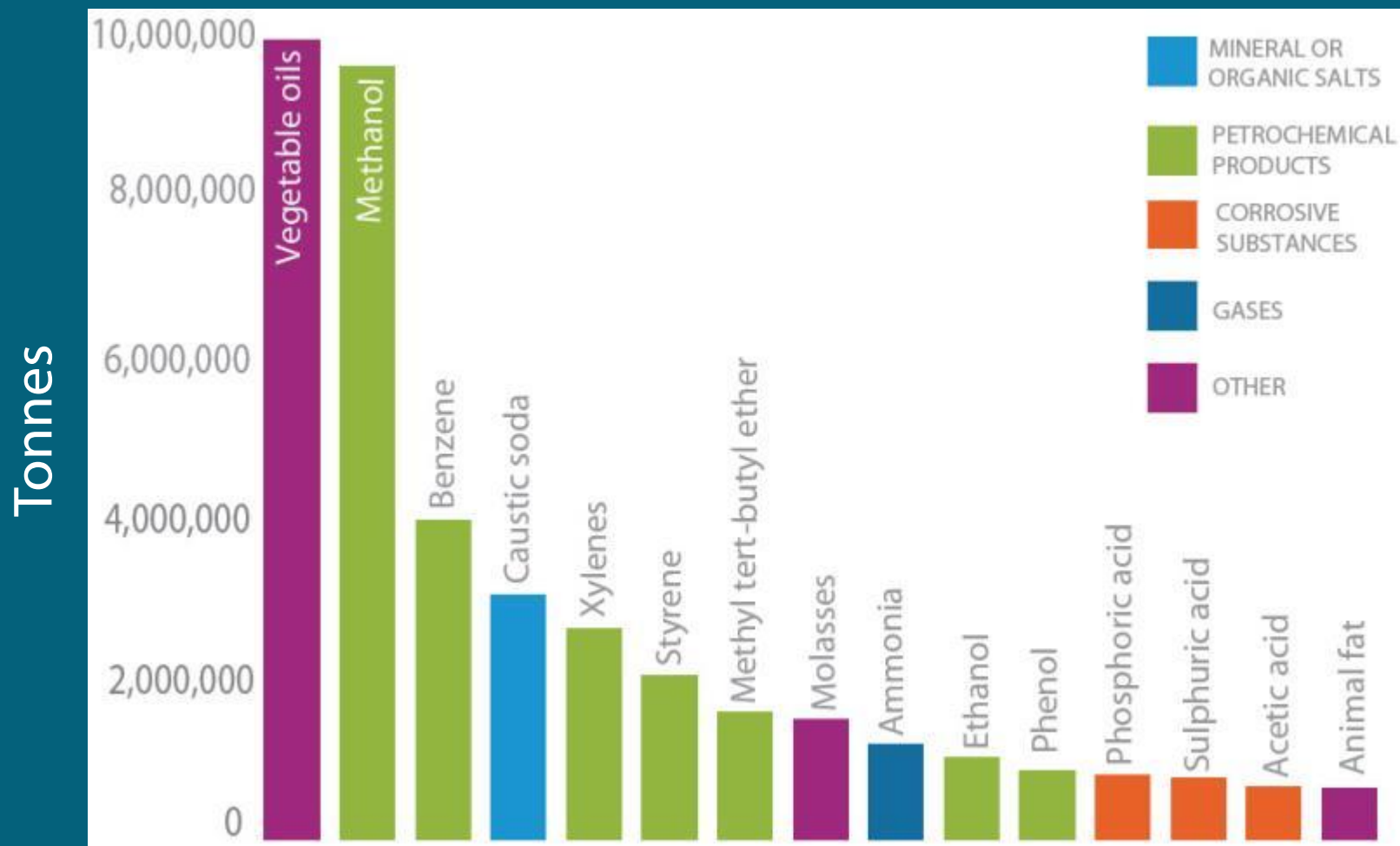
*Excluding crude oil, derivatives and vegetable oils

Transportation of HNS

15 bulk HNS most handled in European ports



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(Source: European project HASREP 2005)

Methods of Carrying HNS at Sea



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HNS – Bulk

- Dry bulk carriers
- Oil, bulk, ore carriers or combination carriers



Methods of Carrying HNS at Sea

HNS – Packages

- Container ships
- General cargo vessels
- RO-RO and ferries



Methods of Carrying HNS at Sea

HNS – Liquid

- Chemical tankers
- Product tankers
- Gas carrier



HNS Shipping Routes



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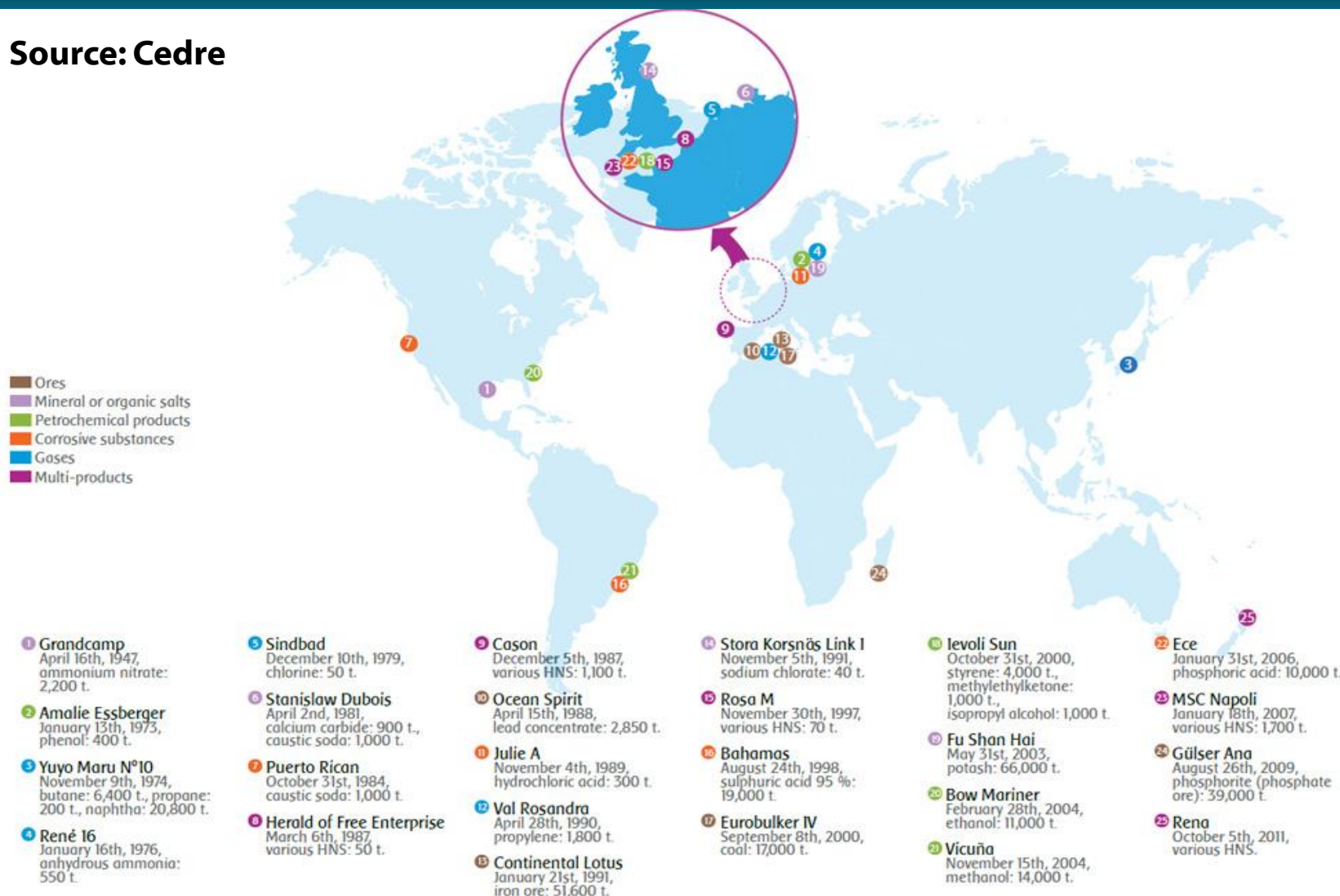
HNS Spills

Reported HNS incidents



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Source: Cedre



HNS Spills

Reported HNS incidents



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- 192 incidents dealt with by the International Group of P&I Clubs (2002 – 2010)
 - Could have fallen under the HNS Convention
 - Cost: SDR 185 million
- 235 maritime incidents reported by Member States and compiled by IMO (2006 – 2011)

Impacts of HNS incidents

Human health impact

- Acute effects
- Chronic effects

Environmental impact

- Lethal effects
- Sub-lethal effects
- Secondary effects
- General impact on biodiversity

Economic impact

- Commercial
- Non-commercial

HNS incidents



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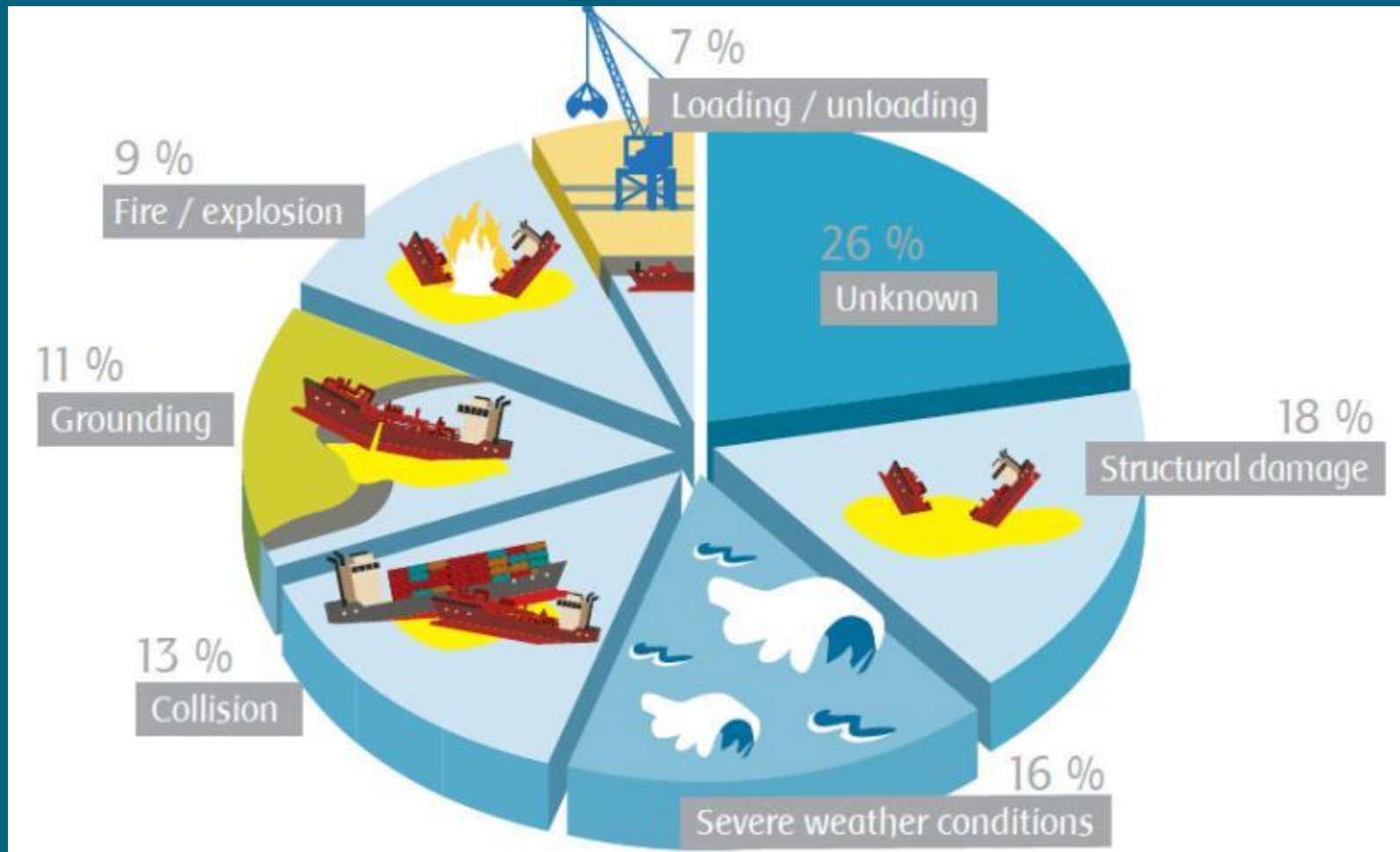
Name of Ship	Place	Substances	Aftermath
Cargo Ship Mont-Blanc	Halifax, Canada 1917	Explosive and flammable substances	1,500 people killed
Gas Carrier Yuyo Maru	Tokyo Bay, Japan, 1974	Flammable substances	32 crew members killed
Cargo Ship Cason	Ria De Arousa, Spain, 1987	Flammable, toxic and corrosive substances	23 crew members killed
Chemical Tanker, Ena 2	Hamburg, Germany, 2004	Corrosive Substances	11 people affected
Container Ship MSC Napoli	Western English Channel, 2007	Flammable, toxic, corrosive and explosive substances	1,700 tonnes of hazardous substances airlifted
Ferry Princess of the Stars	Sibuyan, Philippines, 2008	Flammable, toxic and corrosive substances	700 people killed, fishing ban issued
Container Ship Rena	Bay of Plenty, New Zealand, 2011	Flammable, toxic and corrosive substances	Bunker fuel pollution

Causes of ship-source accidents

Worldwide statistics involving HNS (1917 – 2010)



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Source: Cedre

Cason incident

Spain, 5 December 1987



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HNS cargo

- 1,100 tonnes of packaged chemicals in 5,000 barrels, cans, containers and bags, 23 different types
- All IMDG code groups except 1 (explosives), 5 (oxidising substances) and 7 (radioactive materials)

Grounded in bad weather following fire in cargo holds

- 23 crew lost
- Further fire caused by drums of sodium after contact with seawater
- 15 000 people evacuated
- Fishing and harvesting ban



Cason incident

Spain, 5 December 1987



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Costs and damages

- LLMC 1976 applicable at time of the incident
- Large part of the costs borne by Spanish Government



Cason incident

Cargo manifest



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SUBSTANCE	QUANTITY (tonnes)	IMDG Class	UN Number
n-Butanol	228	3.3	1120
Xylenes	254	3.3	1307
Cyclohexanone	8.6	3.3	1916
Formaldehyde	86	3.3	1198
Sodium metal	126	4.3	1428
Aniline oil	110	6.1	1547
Diphenylmethe 4.4 Diisocyanate	0.7	6.1	2489
Ortho cresol	110	6.1	2076
Bunker fuel	750	X	1270
Phosphoric acid	50	8.0	1805

Anna Broere incident

North Sea, 27 May 1988



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Chemical carrier collided with container ship

- Collision occurred 52 miles from land, vessel sank

HNS cargo on board

- Acrylonitrile (547 tonnes), Dissolver/Evaporator
- Dodecylbenzene (500 tonnes), Floater

Response operations

- Air and sea exclusion zone established
- Acrylonitrile main priority
- Salvage operation to recover vessel
 - lift vessel and Cut vessel in two then lift

Vicuña

Brazil, 15 November 2004



Chemical tanker carrying

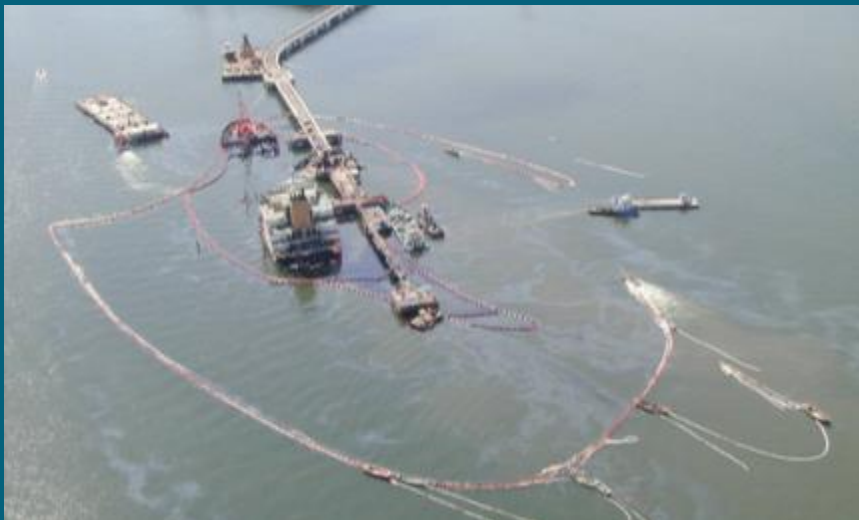
- Methanol (4,000 tonnes)
- Bunker fuel (400 tonnes of IFO 180)

Explosion occurred on-board during cargo offloading at terminal

- 4 crew members died
- Total loss of the ship
- Damage to terminal
- Methanol caused the explosion but no further damage to the environment
- Bunker spill caused extensive environment damage

Costs involved

- P&I Club paid ~US\$50 million (wreck removal, clean-up)
- Fines in excess of US\$30 million





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www.hnsconvention.org
