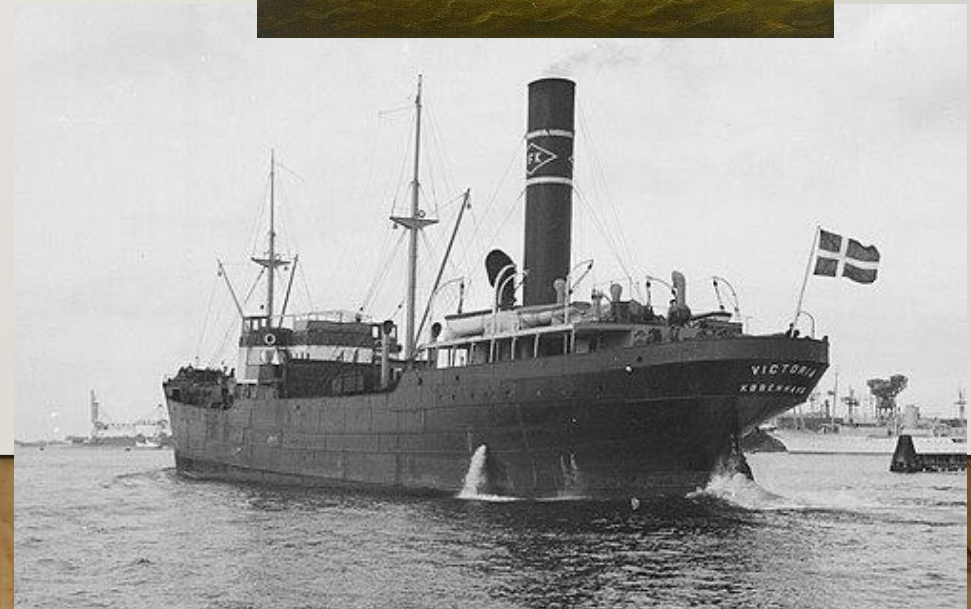
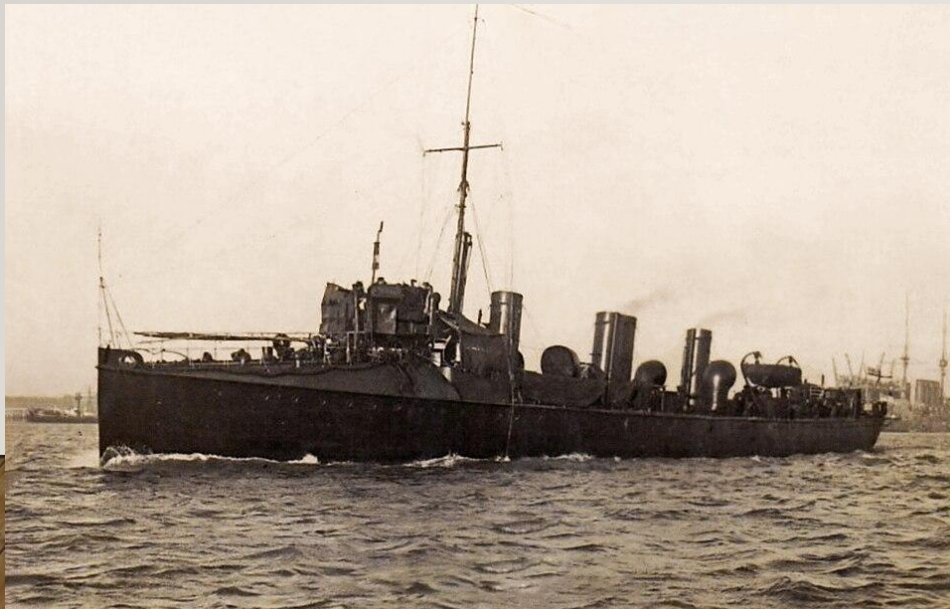


*VESSEL MACHINERY SYSTEMS –
FROM COAL TO NUCLEAR POWER
“EXHAUSTING ALL OPTIONS”*

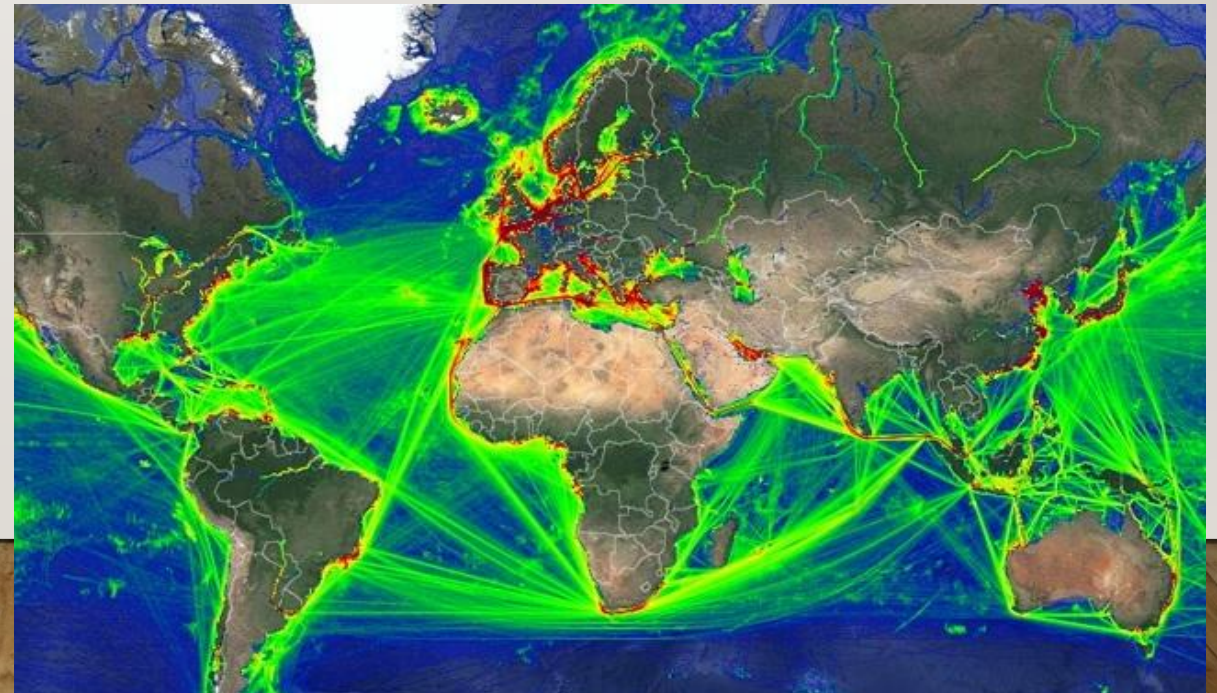
MARIA A. KAMPASI

PIRAEUS, NOVEMBER 2025

VESSEL HISTORY



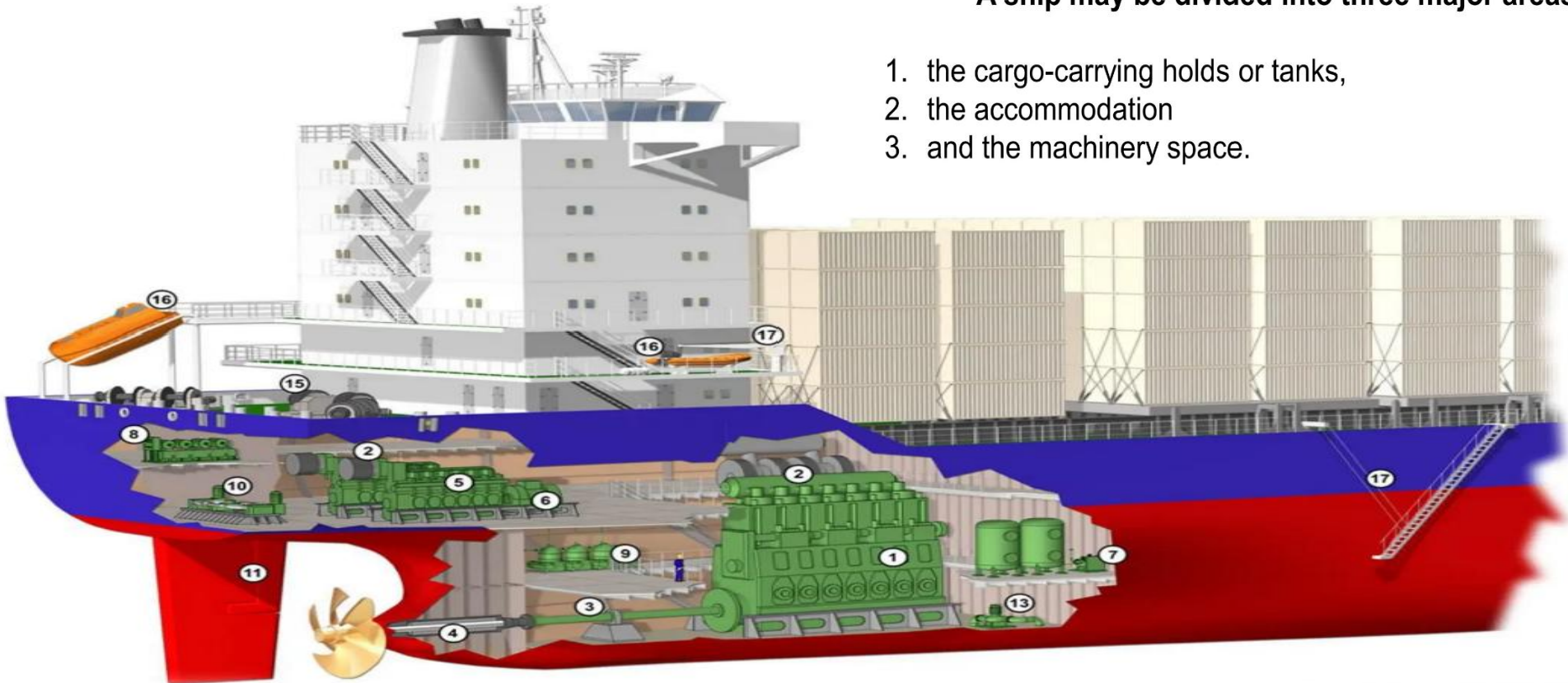
SHIPPING HISTORY



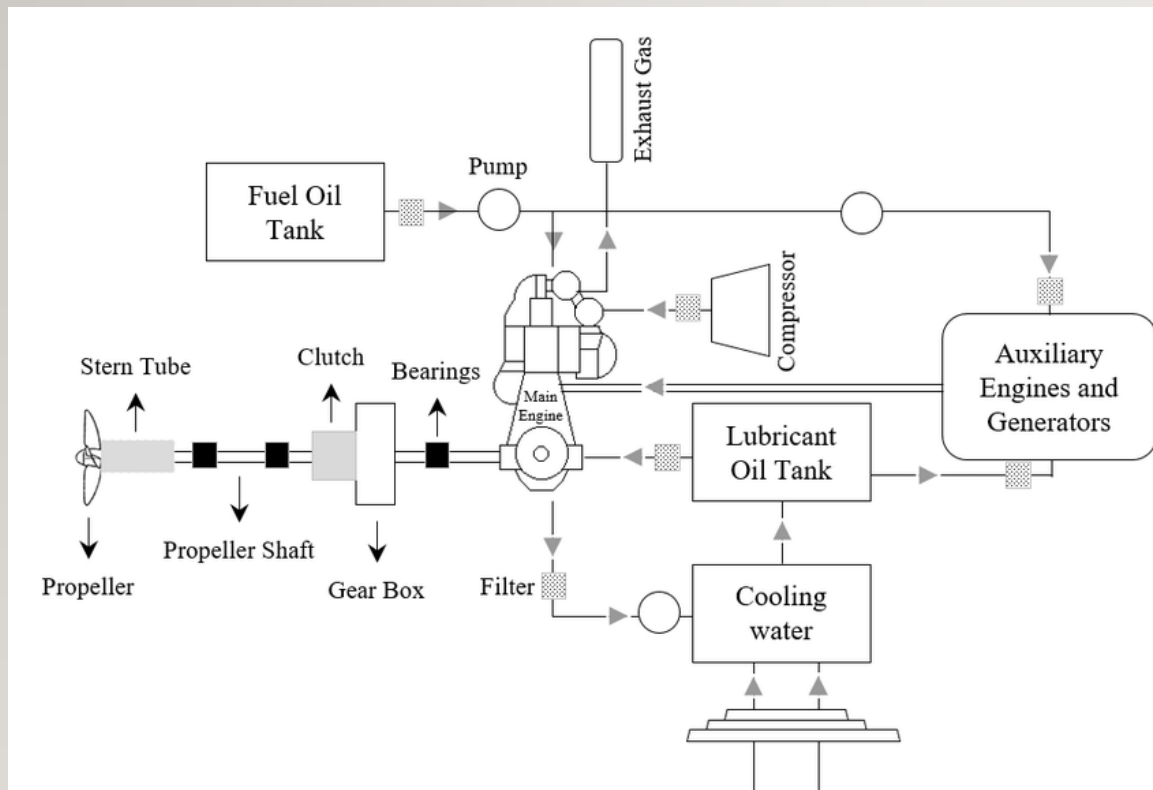
VESSEL CONSTRUCTION

A ship may be divided into three major areas:

1. the cargo-carrying holds or tanks,
2. the accommodation
3. and the machinery space.



VESSEL CONSTRUCTION



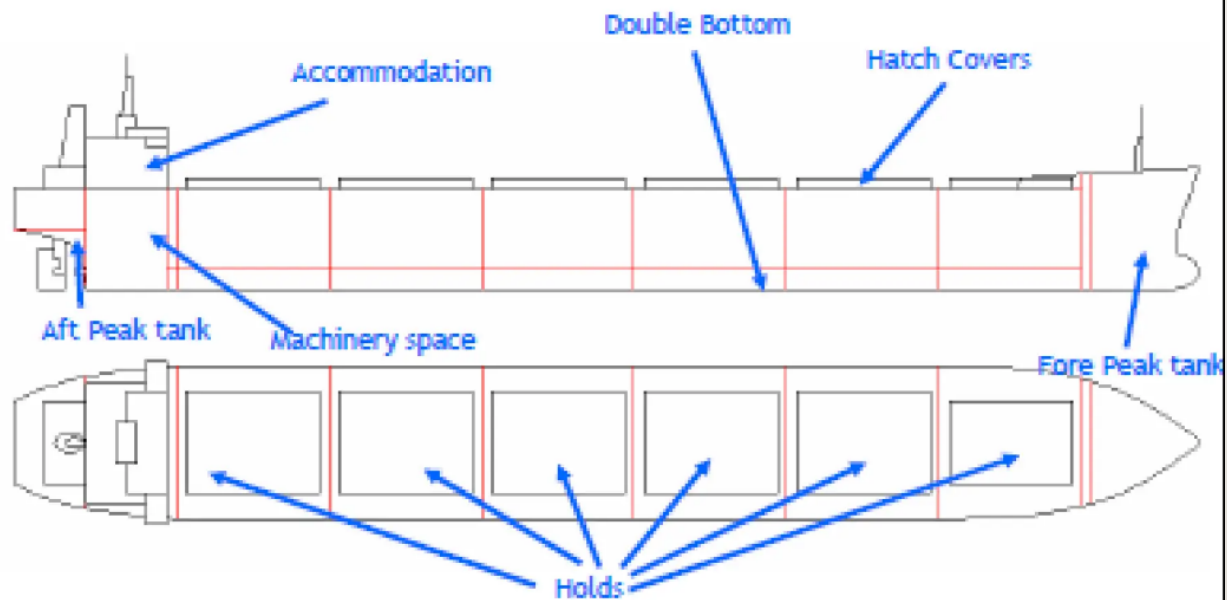
What are the Machinery required to propel and operate the ship are;

- ✓ Main engines- diesel engine, steam turbine, gas turbine, nuclear reactor
- ✓ Steering gear,
- ✓ anchoring
- ✓ ship securing / mooring
- ✓ cargo handling,
- ✓ air conditioning,
- ✓ power generation and its distribution.



VESSEL TYPES

Bulk Carriers

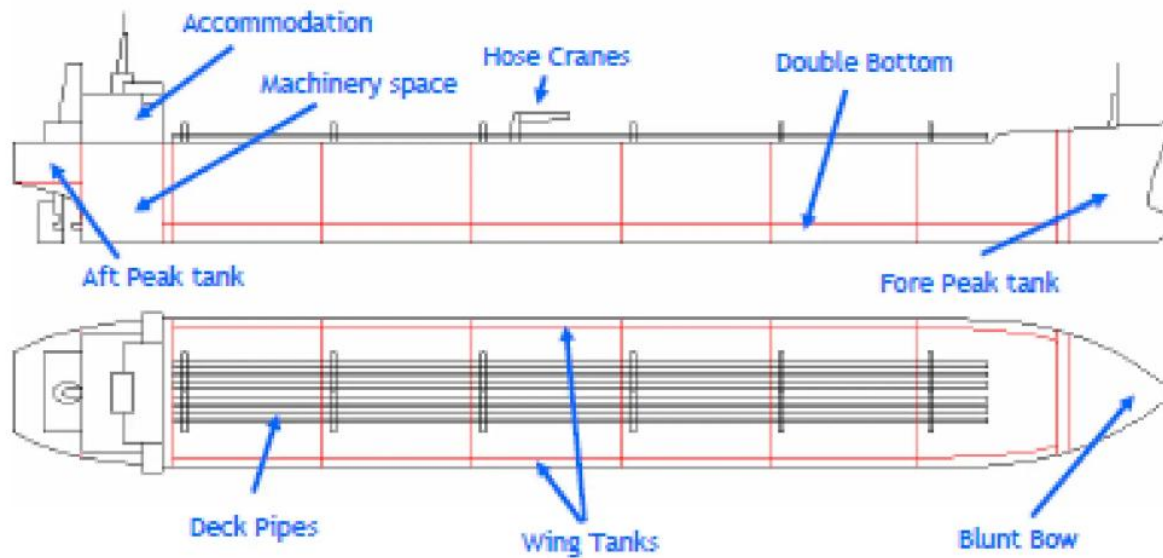


Bulk Carriers



VESSEL TYPES

Oil Tankers

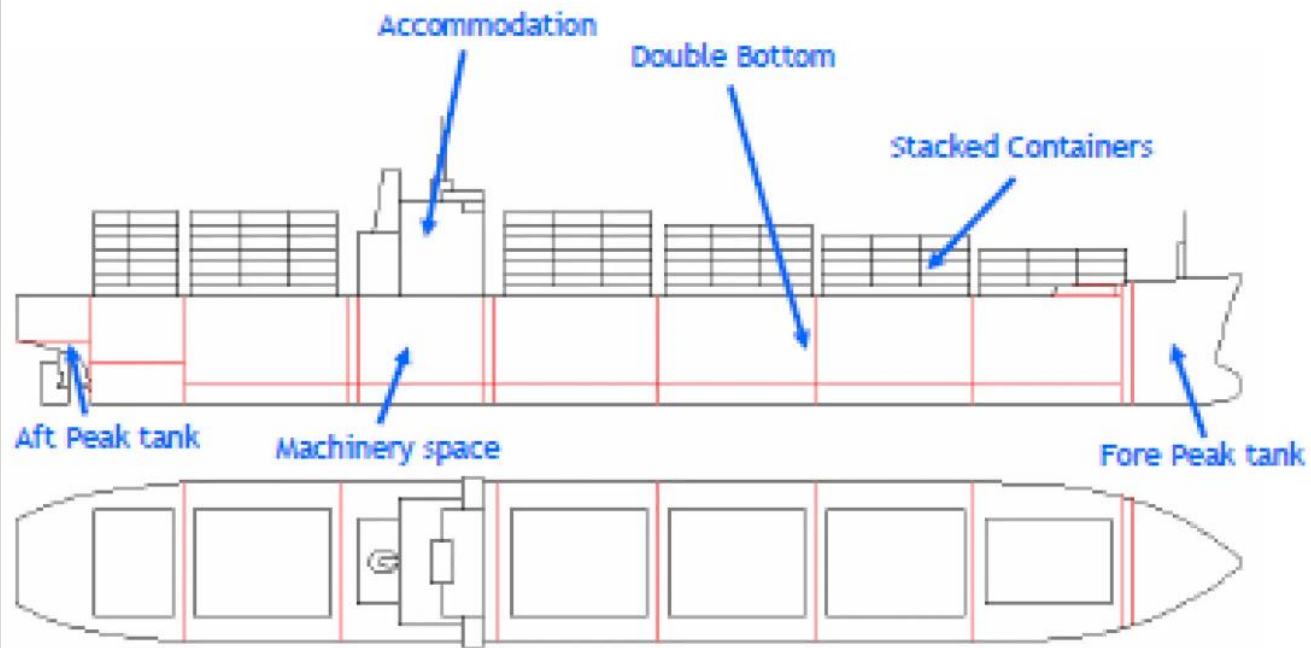


Oil Tankers



VESSEL TYPES

Container Vessels

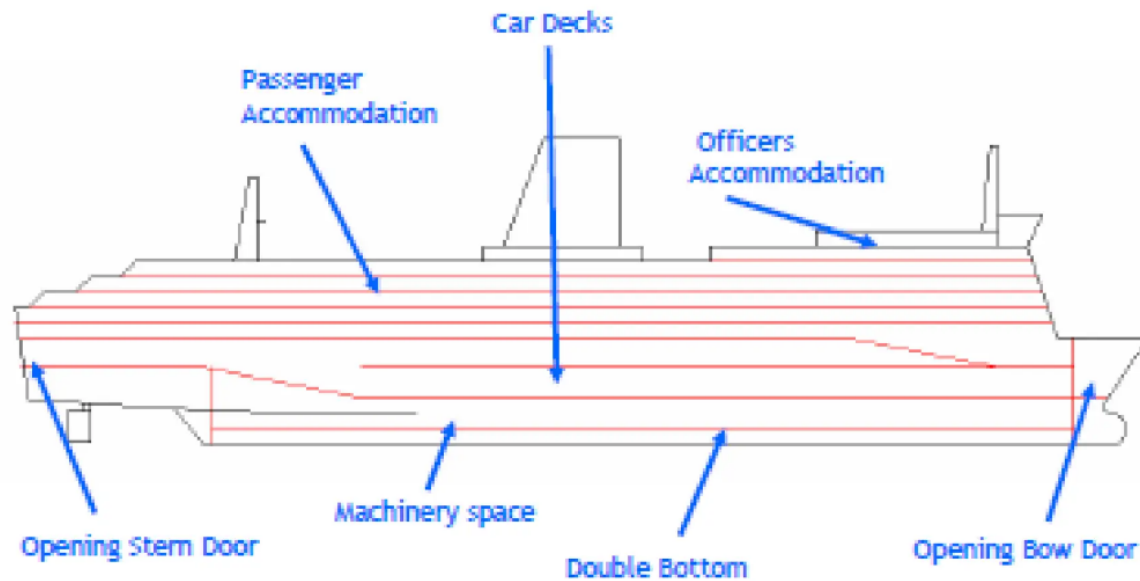


Container Vessel



VESSEL TYPES

Ro-Ro Vessels

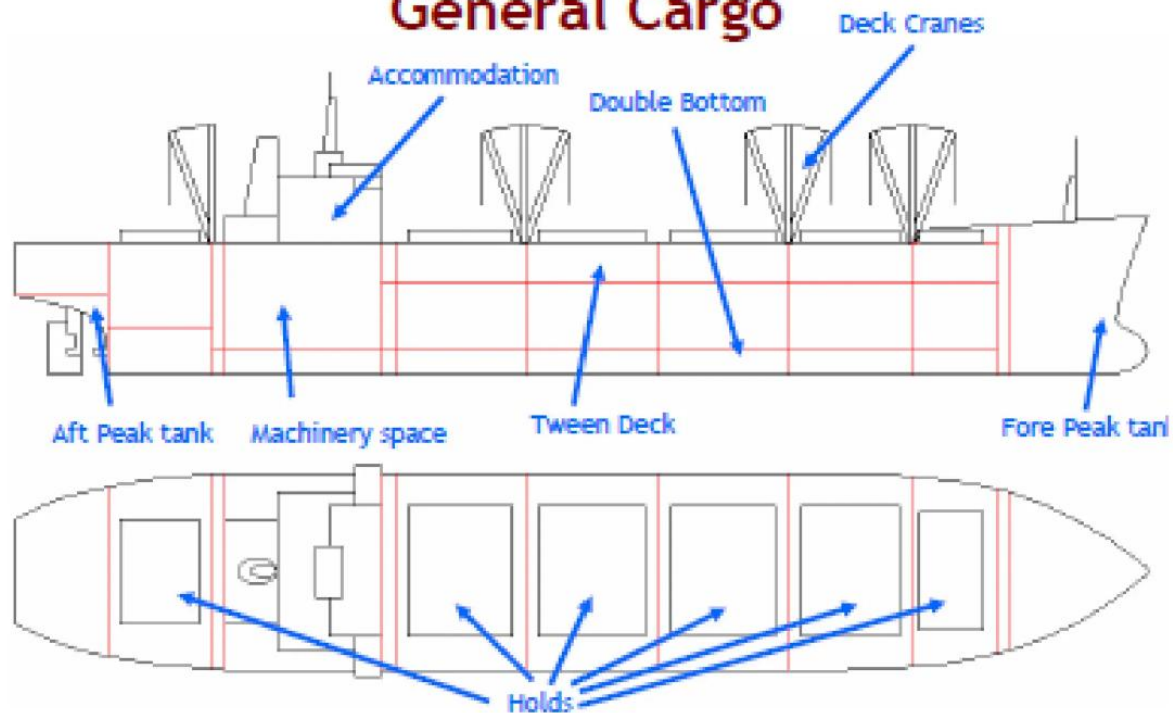


Ro-Ro Vessels

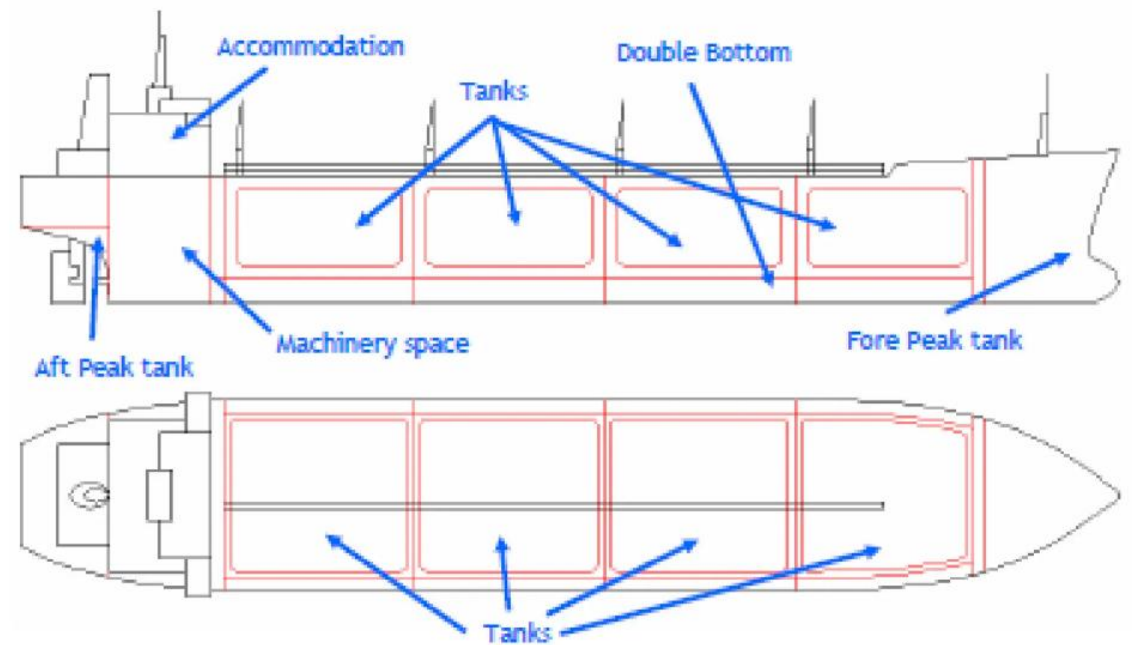


VESSEL TYPES

General Cargo



Gas Carrier



REGULATORY AFFAIRS



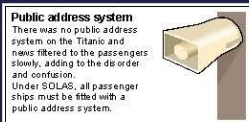
REGULATORY AFFAIRS

Surviving disaster – The Titanic and SOLAS

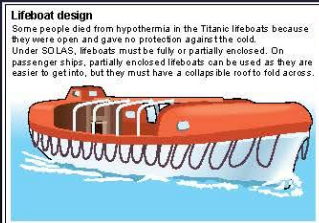
In 1914, two years after the Titanic disaster of 1912, in which 1,503 people lost their lives, maritime nations gathered in London adopted the International Convention for the Safety of Life at Sea (SOLAS Convention), taking into account lessons learned from the Titanic. The 1914 version was superseded by SOLAS 1929, SOLAS 1948, SOLAS 1960 (the first adopted under the auspices of the International Maritime Organization) and SOLAS 1974. SOLAS 1974 is still in force today, but it has been amended and updated many times. The regulations relating to life saving appliances and arrangements, contained in chapter III of SOLAS, a new version of which entered into force on 1 July 1998, are intended to ensure that in the event of a catastrophe at sea, passengers and crew have the greatest chances of survival. Improved design and equipment, better fire protection, satellite communications, rescue planes and helicopters and trained personnel also contribute to improved safety at sea.



Ice patrol
In the first SOLAS 1914, after the Titanic disaster, ice patrols in the north Atlantic were set up and continue to be a SOLAS requirement.



Public address system
There was no public address system on the Titanic and news filtered to the passengers slowly, adding to the disorder and confusion. Under SOLAS, all passenger ships must be fitted with a public address system.



Lifeboat design
Some people died from hypothermia in the Titanic lifeboats because they were open and gave no protection against the cold. Under SOLAS, lifeboats must be fully or partially enclosed. On passenger ships, partially enclosed lifeboats can be used as they are easier to get into, but they must have a collapsible roof to fold across.

Speed of navigation around ice
The Commission into the Titanic ruled the loss was due to collision with an iceberg brought about by excessive speed at which she was being navigated. Under SOLAS, when ice is reported on or near her course the master of every ship at night is bound to proceed at a moderate speed or alter course.

Training of crew in lifeboat drill
The crew of the Titanic lacked training in loading and lowering the lifeboats and few knew which boat they were assigned to. Lifeboats were not fitted to capacity because senior officers did not know the boats had been tested and were strong enough. Under SOLAS, every crew member must participate in regular practice drills and have easy access to training manuals.



Immersion suits
The sea temperature when the Titanic sank was below freezing point and many people died in the water from hypothermia. Under SOLAS, a specific number of immersion suits must be carried on both passenger and cargo ships, mainly for the crews of rescue boats.

Distress alert
The Titanic used a radio which had a limited range of 200 nautical miles. Ships can now communicate globally via satellites.



Marconi radio wires

Helicopters and rescue planes
Unavailable in 1912, helicopters and rescue planes are now used to locate, search for and rescue survivors.

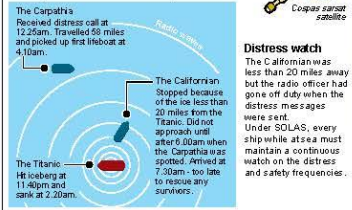


Lifeboat drill
No lifeboat drill was held on the Titanic. Under SOLAS chapter III an 'abandon ship' and fire drill must take place weekly on all passenger ships.

Evacuation chutes
Passengers on the Titanic jumped from windows and doorways into the lifeboats as they were lowered, often injuring themselves or other passengers. New emergency evacuation chutes are both safer and quicker.



Location
The land station at Cape Race, Newfoundland and ships other than the Carpathia and the Californian heard the Titanic distress call but the answers were cracking and the Titanic's position was misinterpreted. With EPRBS and global positioning systems, the position of a ship in distress can be automatically sent.



Distress watch
The Californian was less than 20 miles away but the radio officer had gone off duty when the distress messages were sent. Under SOLAS, every ship while at sea must maintain a continuous watch on the distress and safety frequencies.



SOLAS CHAPTERS

CHAPTER I General Provision

- Covers survey requirements, certification, and inspection for compliance.



CHAPTER II-1 Construction - Subdivision and Stability, Machinery and Electrical Installation

- Deals with ship design, stability, and essential machinery.



CHAPTER II-2 Fire Protection, Fire Detection, and Fire Extinction

- Outlines fire safety requirements including fire suppression system and prevention.



CHAPTER III Life-Saving Appliances and Arrangements

- Details lifeboat, life craft, life jacket, and their arrangement maintenance.



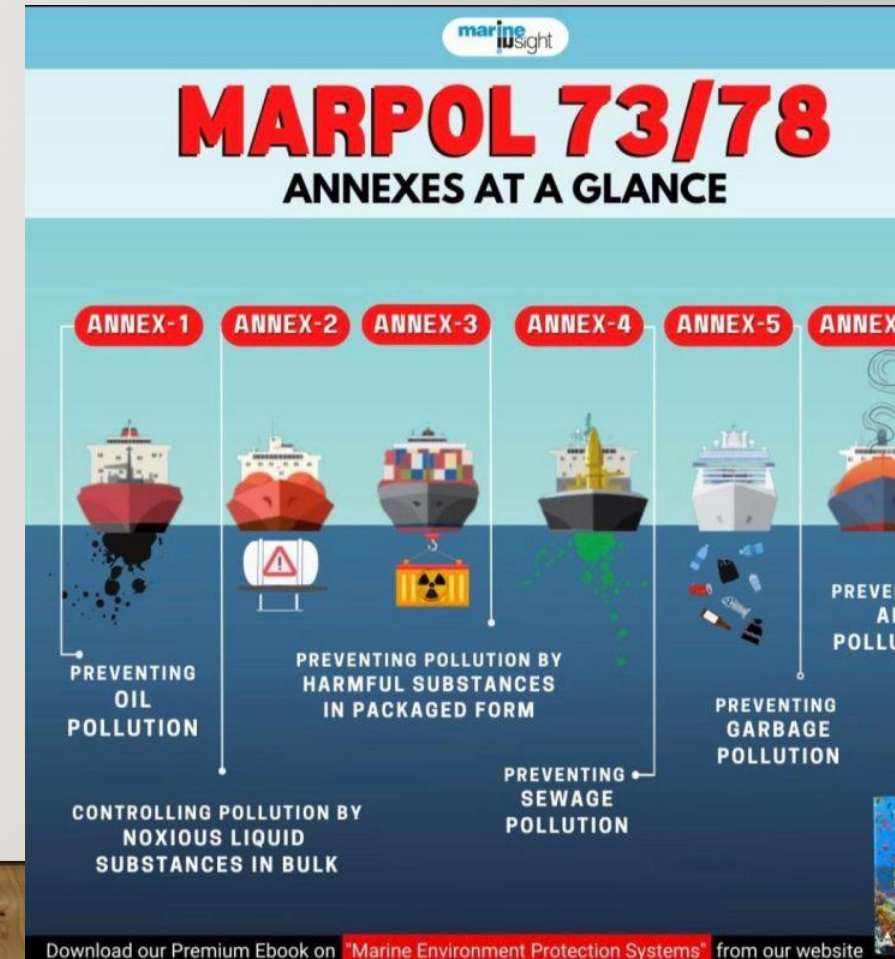
www.imo.org

www.solasconvention.org

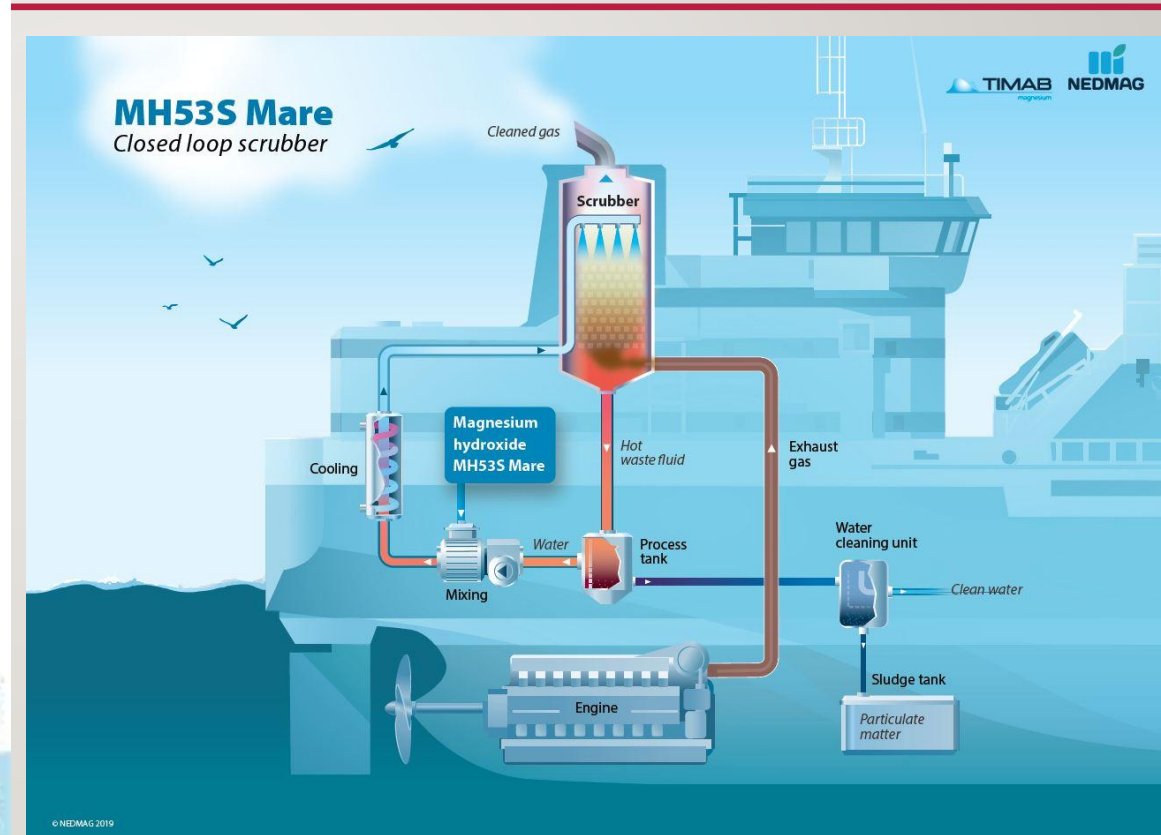
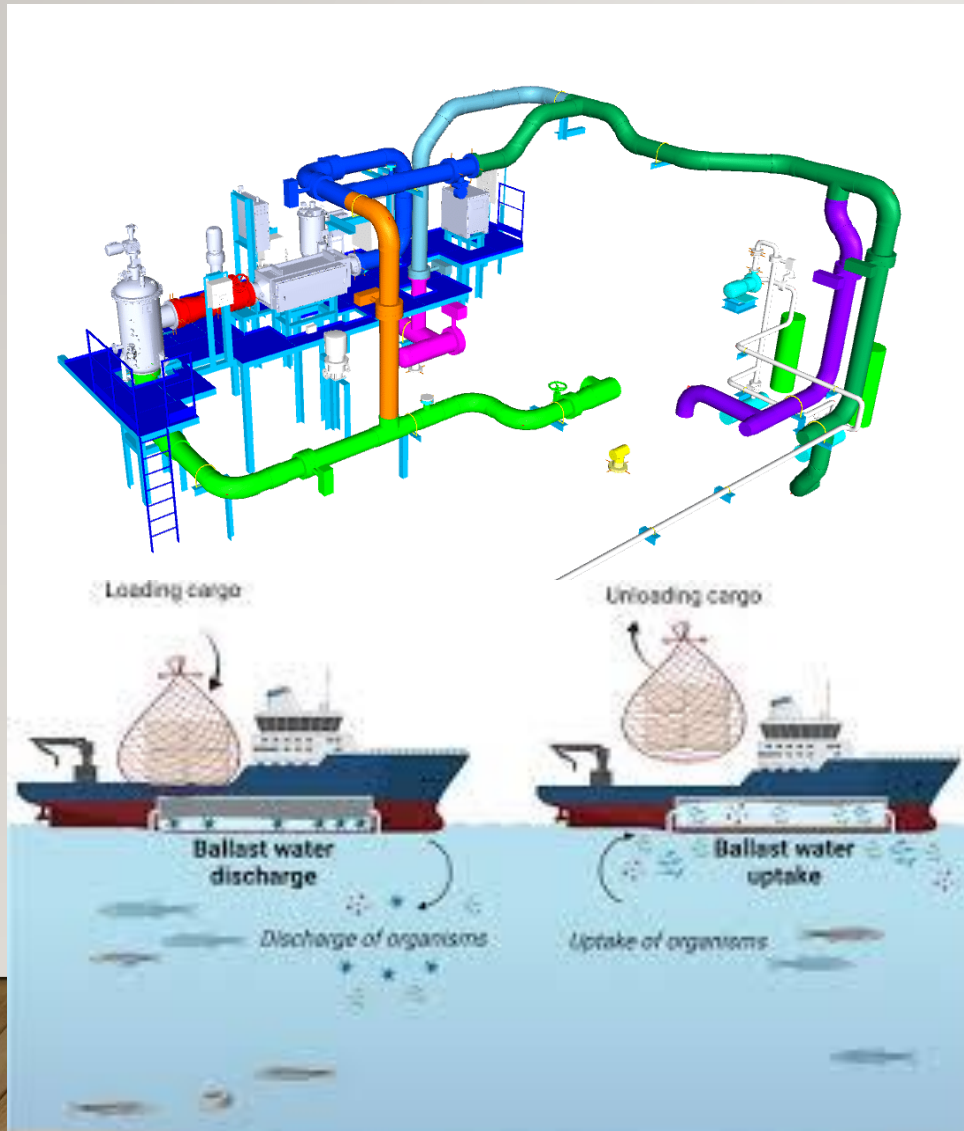


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REGULATORY AFFAIRS



NEW SHIPPING REGULATIONS IN FORCE



EXPLORING ENERGY SOLUTIONS

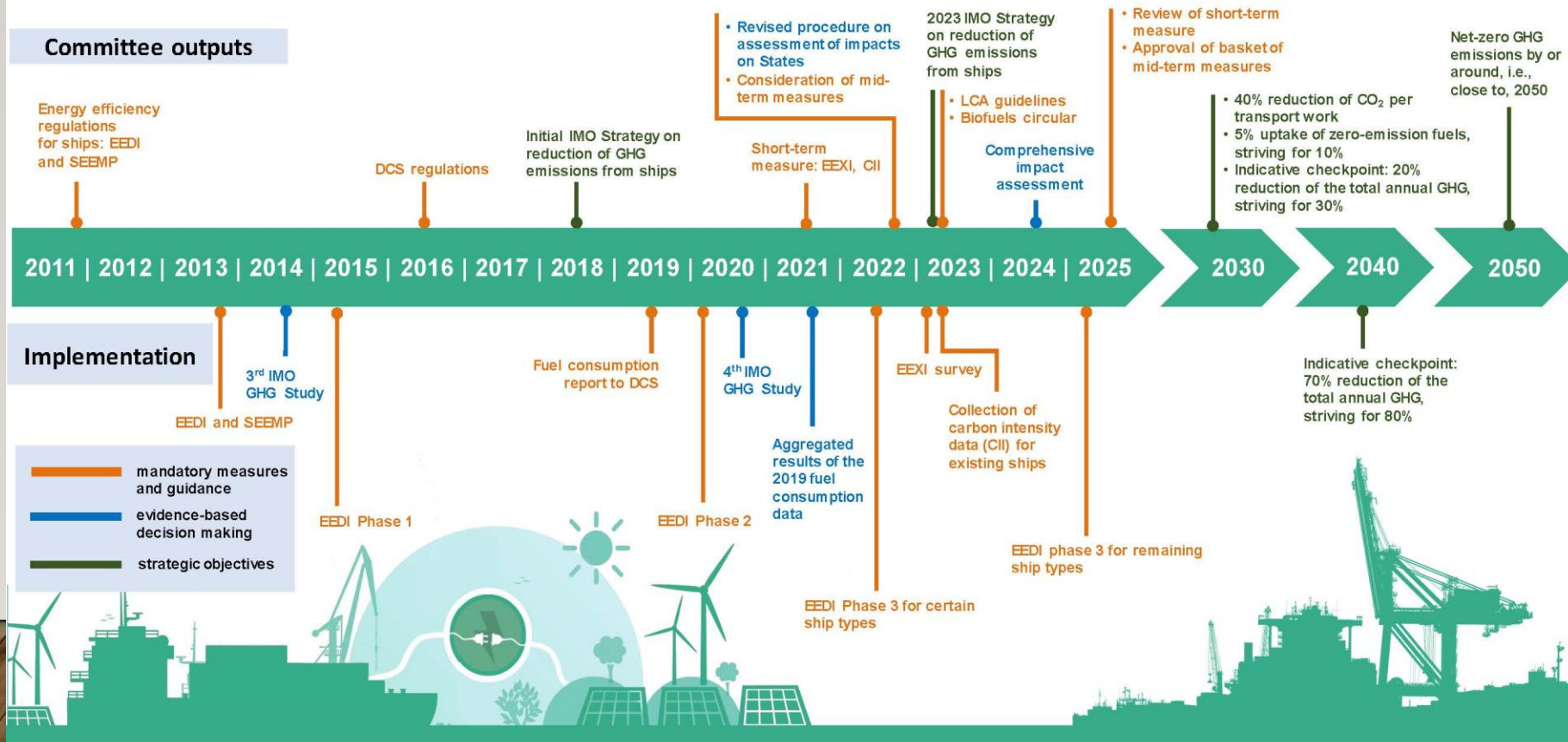
- **LNG** (more mature alternative option so far vs “dynamic fuel”)
- **Ammonia** (zero carbon vs toxicity)
- **Methanol** (already shipped globally as commodity, still high risk)
- **Hydrogen** (zero carbon, fuel cells vs cryogenic storage, diffusivity)
- **Biofuels** (renewable sources, suitable for existing equipment so no vessel redesign vs still generating in acceptable FO characteristics (fail in testing) is challenging)
- Additional – Intermediate stage: I strongly believe in using **electrical propulsion (electrical main engines) by providing electricity through oil (fuel treated) fired auxiliary engines.**



NEW SHIPPING REGULATIONS

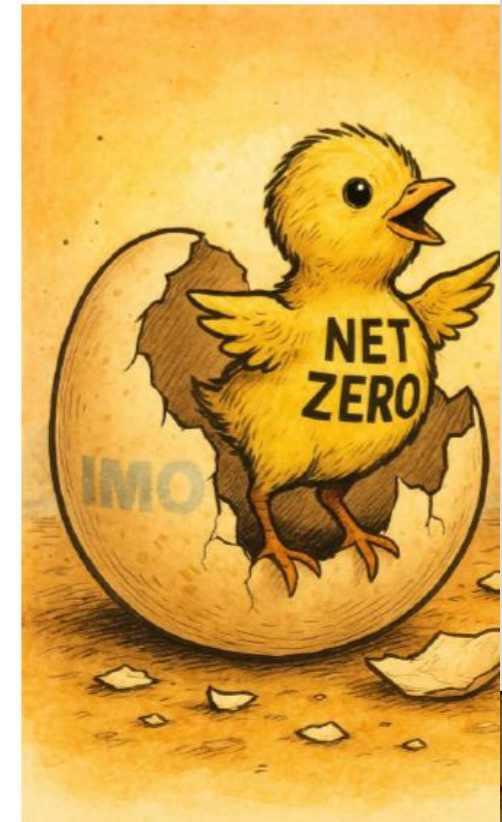
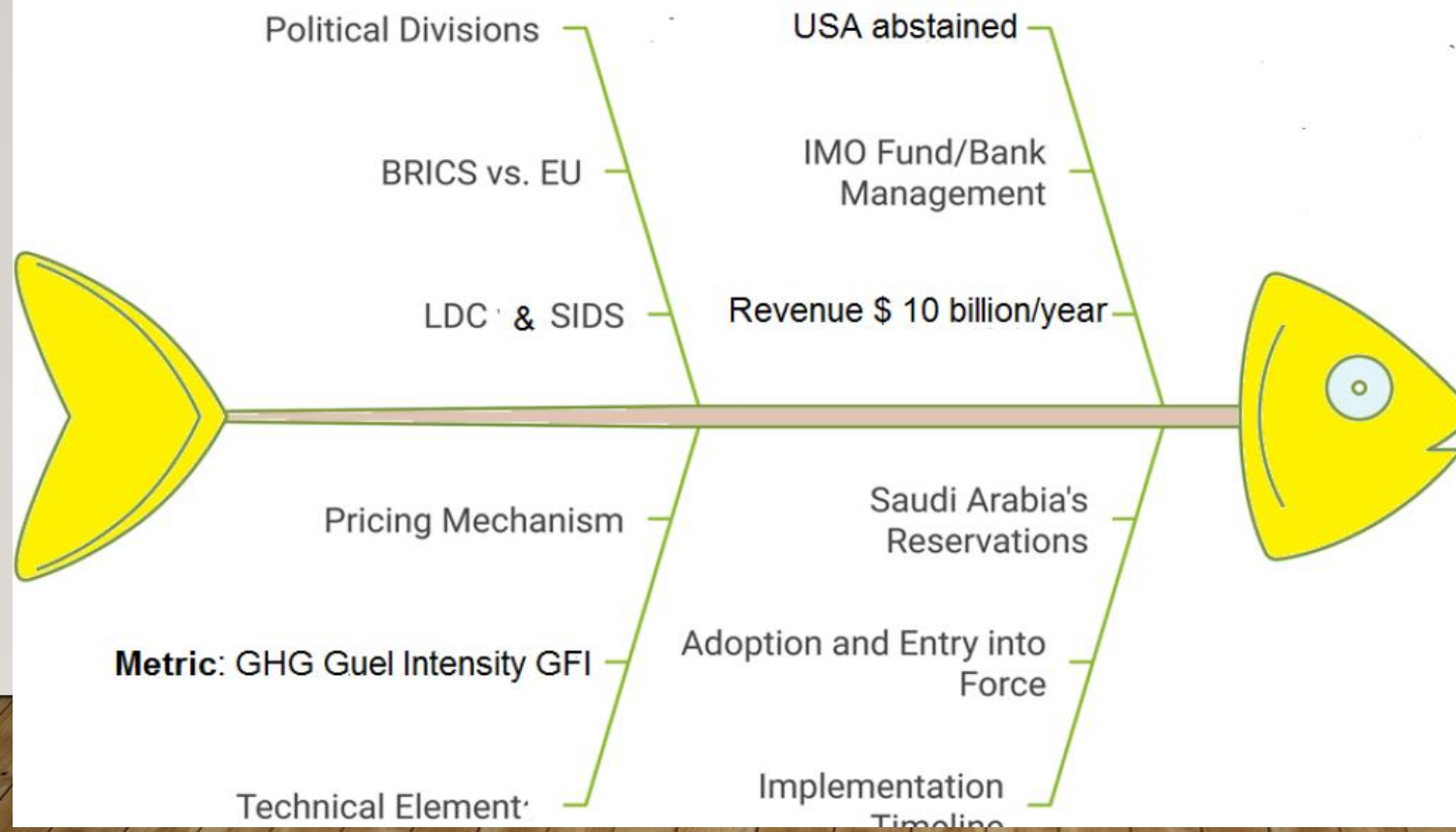
Addressing climate change

Over a decade of regulatory action to cut GHG emissions from shipping

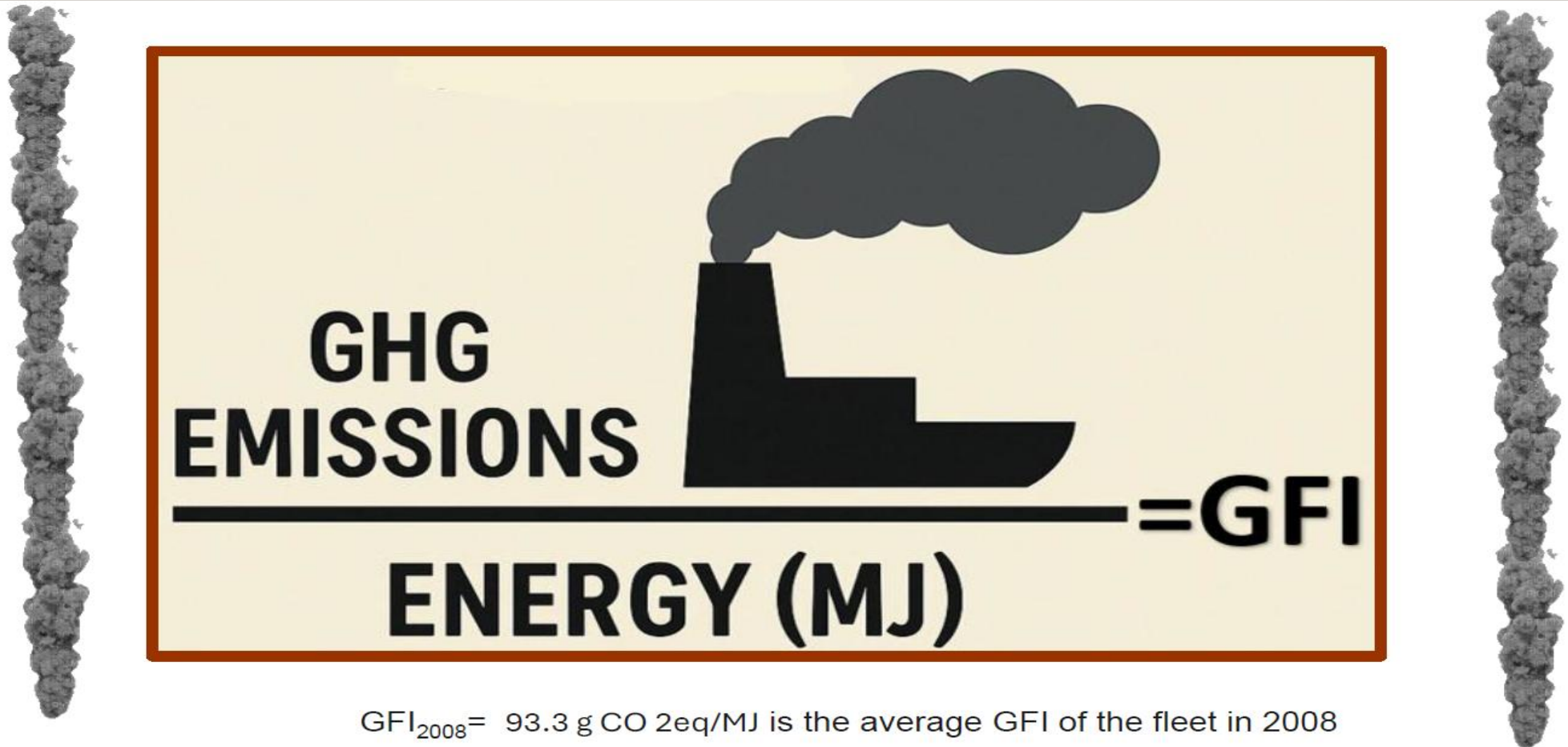


2050 NET ZERO FRAMEWORK

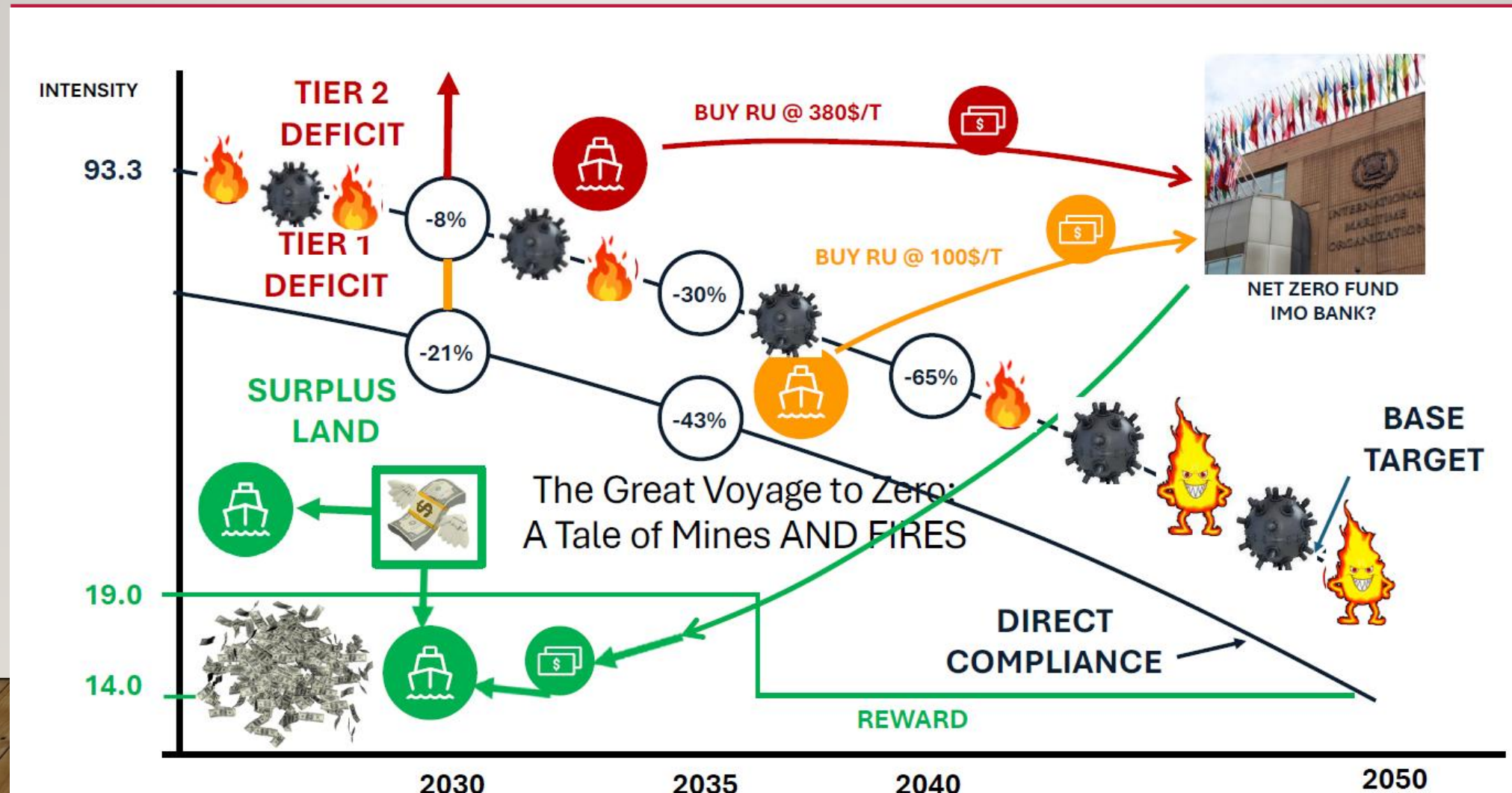
The birth of Zero-Net-Framework - NZF



GHG FUEL INTENSITY (GFI)



THE GREAT VOYAGE TO ZERO-A TALE OF MINES AND FIRES



THE IMO HOUSE DIVIDED



KEY GUIDELINES UNDER DEVELOPMENT

- Well-to-Wake GHG emissions calculation methodology
- Fuel classification & certification rules
- Monitoring, reporting & verification of onboard fuel use
- Biofuel sustainability criteria + default factors
- Certification of electro-fuels/hydrogen-derived fuels
- Drop-in blending equivalency + dual-fuel treatment
- Compliance framework: corrections, penalties, derogations
- Governance & administration of revenue collection & USE (!)
- Enforcement, dispute and non-compliance treatment
- Incentives/rebates for very low-GHG fuels
- Ship GHG Management / Transition Plan requirements
- Transparency & GHG intensity labeling for ships/fuels



KEY OVERALL TAKEAWAYS

- The adjournment represents both a pause and apolitical reset
- Deep geopolitical divisions over climate policy and global taxation.
- U.S. influence, combined played a key role
- Can the IMO rebuild trust and consensus by 2026?
- Delay jeopardizes technical timelines & industry confidence
- Delay hurts IMO's image as a credible global regulator
- The shipping industry remains in limbo, awaiting regulatory certainty critical for long-term investment decisions.
- The European Emissions Trading System (ETS) was openly criticized
- Demands for the repeal/modification of ETS as a precondition for adopting NZF
- UAE proposal to avoid regulatory patchworks (regional or national)

THANK YOU