

Shipping and the environment

Regulations and consequences

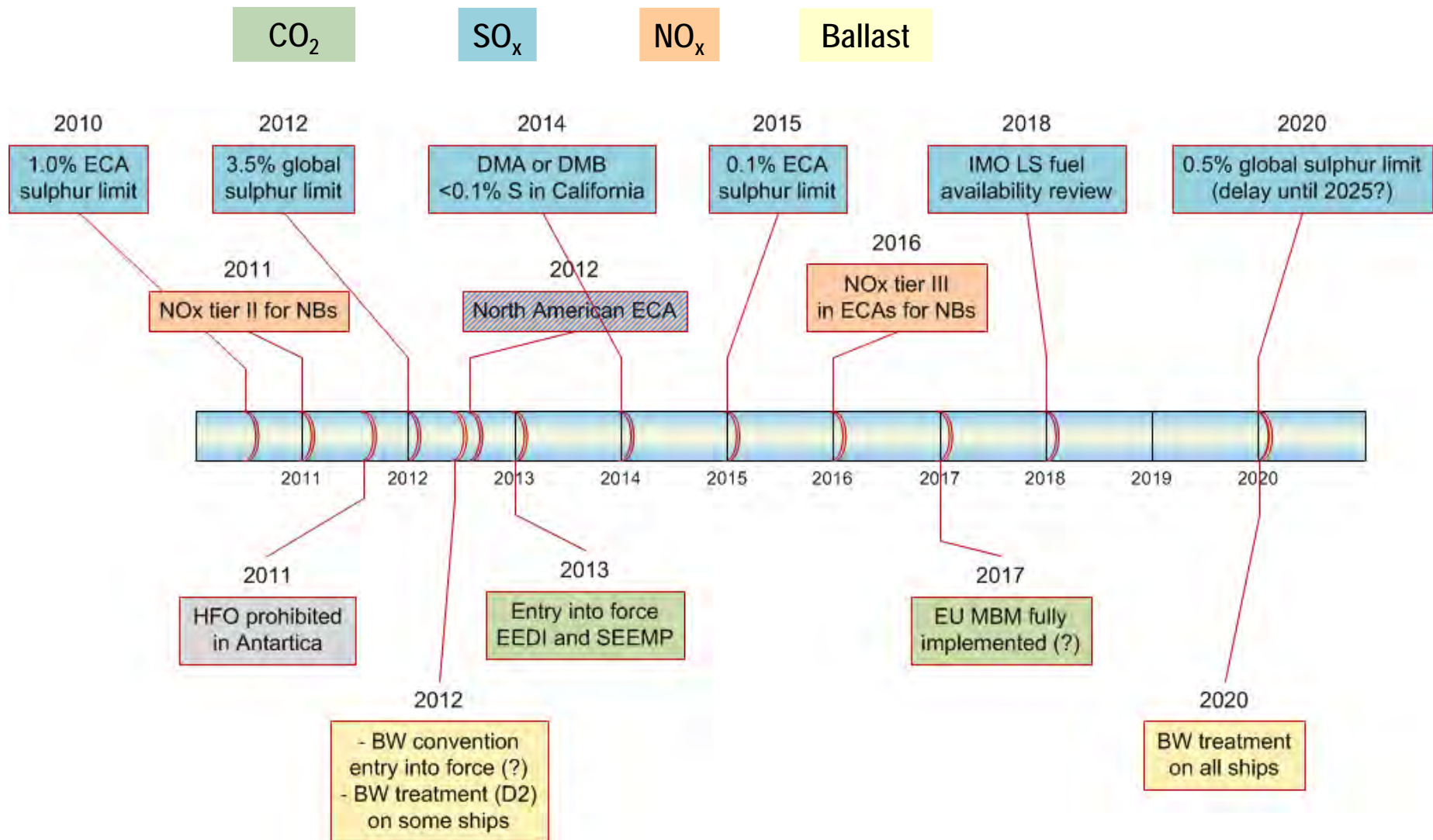
Eirik Nyhus – Director, Environment

September 2011

Stakeholders



Demanding regulatory timeline



The (fuel) cost of doing business?



Ballast water

The problem



Introduction of invasive marine species by ships' ballast water
- one of the four greatest threats to the world's oceans

Cholera

Vibrio cholerae (various strains)

Native to: Various strains with broad ranges.

Introduced to: South America, Gulf of Mexico and other areas.

Impacts: Some cholera epidemics appear to be directly associated with ballast water. One example is an epidemic that began simultaneously at three separate ports in Peru in 1991, sweeping across South America, affecting more than a million people and killing more than ten thousand by 1994. This strain had previously been reported only in Bangladesh.



North American Comb Jelly

Mnemiopsis leidyi

Native to: Eastern Seaboard of the Americas

Introduced to: Black, Azov and Caspian Seas

Impacts: Reproduces rapidly (self fertilising hermaphrodite) under favourable conditions. Feeds excessively on zooplankton. Depletes zooplankton stocks; altering food web and ecosystem function. Contributed significantly to collapse of Black and Asov Sea fisheries in 1990s, with massive economic and social impact. Now threatens similar impact in Caspian Sea.

Cladoceran Water Flea

Cercopagis pengoi

Native to: Black and Caspian Seas

Introduced to: Baltic Sea

Impacts: Reproduces to form very large populations that dominate the zooplankton community and clog fishing nets and trawls, with associated economic impacts.



Mitten Crab

Eriocheir sinensis

Native to: Northern Asia

Introduced to: Western Europe, Baltic Sea and West Coast North America

Impacts: Undergoes mass migrations for reproductive purposes. Burrows into river banks and ditches causing erosion and siltation. Preys on native fish and invertebrate species, causing local extinctions during population outbreaks. Interferes with fishing activities.



Toxic Algae (Red/Brown/Green Tides)

Various species

Native to: Various species with broad ranges.

Introduced to: Several species have been transferred to new areas in ships' ballast water.

Impacts: May form Harmful Algae Blooms. Depending on the species, can cause massive kills of marine life through oxygen depletion, release of toxins and/or mucus. Can foul beaches and impact on tourism and recreation. Some species may contaminate filter-feeding shellfish and cause fisheries to be closed. Consumption of contaminated shellfish by humans may cause severe illness and death.



Round Goby

Neogobius melanostomus

Native to: Black, Asov and Caspian Seas

Introduced to: Baltic Sea and North America

Impacts: Highly adaptable and invasive. Increases in numbers and spreads quickly. Competes for food and habitat with native fishes including commercially important species, and preys on their eggs and young. Spawns multiple times per season and survives in poor water quality.



European Green Crab

Cardinus maenas

Native to: European Atlantic Coast

Introduced to: Southern Australia, South Africa, USA and Japan

Impacts: Highly adaptable and invasive. Resistant to predation due to hard shell. Competes with and displaces native crabs and becomes a dominant species in invaded areas. Consumes and depletes wide range of prey species. Alters inter-tidal rocky shore ecosystem.

North Pacific Seastar

Asterias amurensis

Native to: Northern Pacific

Introduced to: Southern Australia

Impacts: Reproduces in large numbers, reaching 'plague' proportions rapidly in invaded environments. Feeds on shellfish, including commercially valuable scallop, oyster and clam species.



Zebra Mussel

Dreissena polymorpha

Native to: Eastern Europe (Black Sea)

Introduced to: Western and northern Europe, including Ireland and Baltic Sea; eastern half of North America

Impacts: Fouls all available hard surfaces in mass numbers. Displaces native aquatic life. Alters habitat, ecosystem and food web. Causes severe fouling problems on infrastructure and vessels. Blocks water intake pipes, sluices and irrigation ditches. Economic costs to USA alone of around US\$750 million to \$1 billion between 1989 and 2000.



Asian Kelp

Undaria pinnatifida

Native to: Northern Asia

Introduced to: Southern Australia, New Zealand, West Coast of USA, Europe and Argentina

Impacts: Grows and spreads rapidly, both vegetatively and through dispersal of spores. Displaces native algae and marine life. Alters habitat, ecosystem and food web. May affect commercial shellfish stocks through space competition and alteration of habitat.



Further Information:

Global Ballast Water Management Programme

International Maritime Organization, London, UK

Fax +44 (0)20 7587 3261

Web <http://globalballast.imo.org>

Photo credits: Shy Dichtzhegsky Ballast Water - CBMP, CSIRO Marine Research, Australia; Zebra Mussel - Sergei Olenin, Chelabinsk Water Firm - Miha Bousenberg, Chelsea - Gloria Casale, Comb Jelly - Richard Harrison, Adam Karp & North Pacific Seastar - CSIRO Australia, European Green Crab - T. Harpark, Toxic Algae - S.A. Hordeman, Mitten Crab - Stephen Goldbach, Round Goby - David Jude

Concept, content and design: Slava Razymakers and Liz Gosak (design@zgusaid.plus.com)

The species presented here are for illustrative purposes only. Their introduced ranges may be greater than depicted. There are numerous other examples of serious marine bio-invasions around the world.

Global Ballast Water Management Programme

GEF

undp

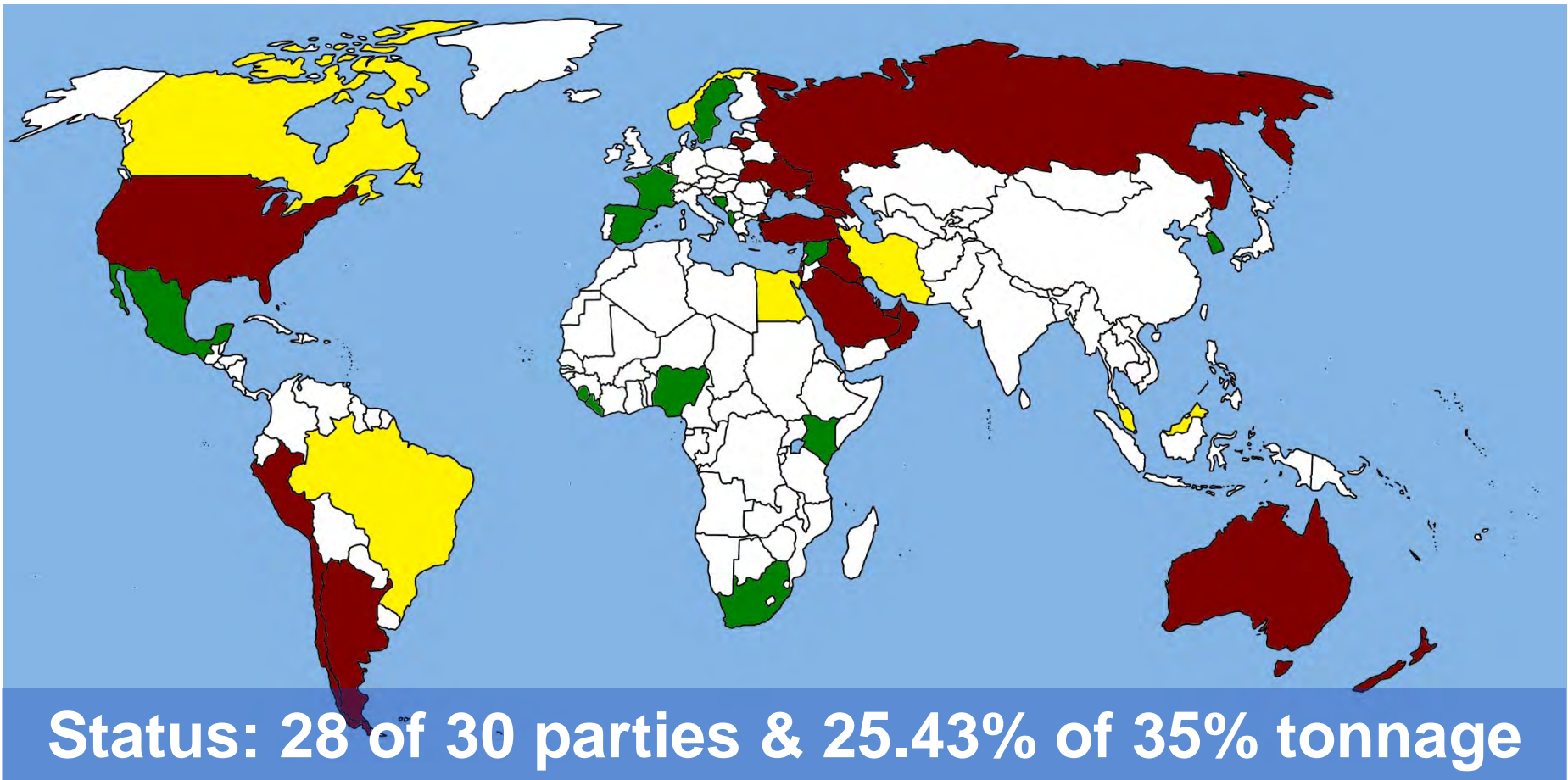
IMO

The International Response

- **The Ballast Water Management Convention**
 - The Ballast Water Convention was adopted in 2004
- **Mandatory compliance for all ships and offshore structures**
 - All ships to be fitted with treatment system before the end of 2020 regardless of age and size



Ratification status; who goes next?



Party

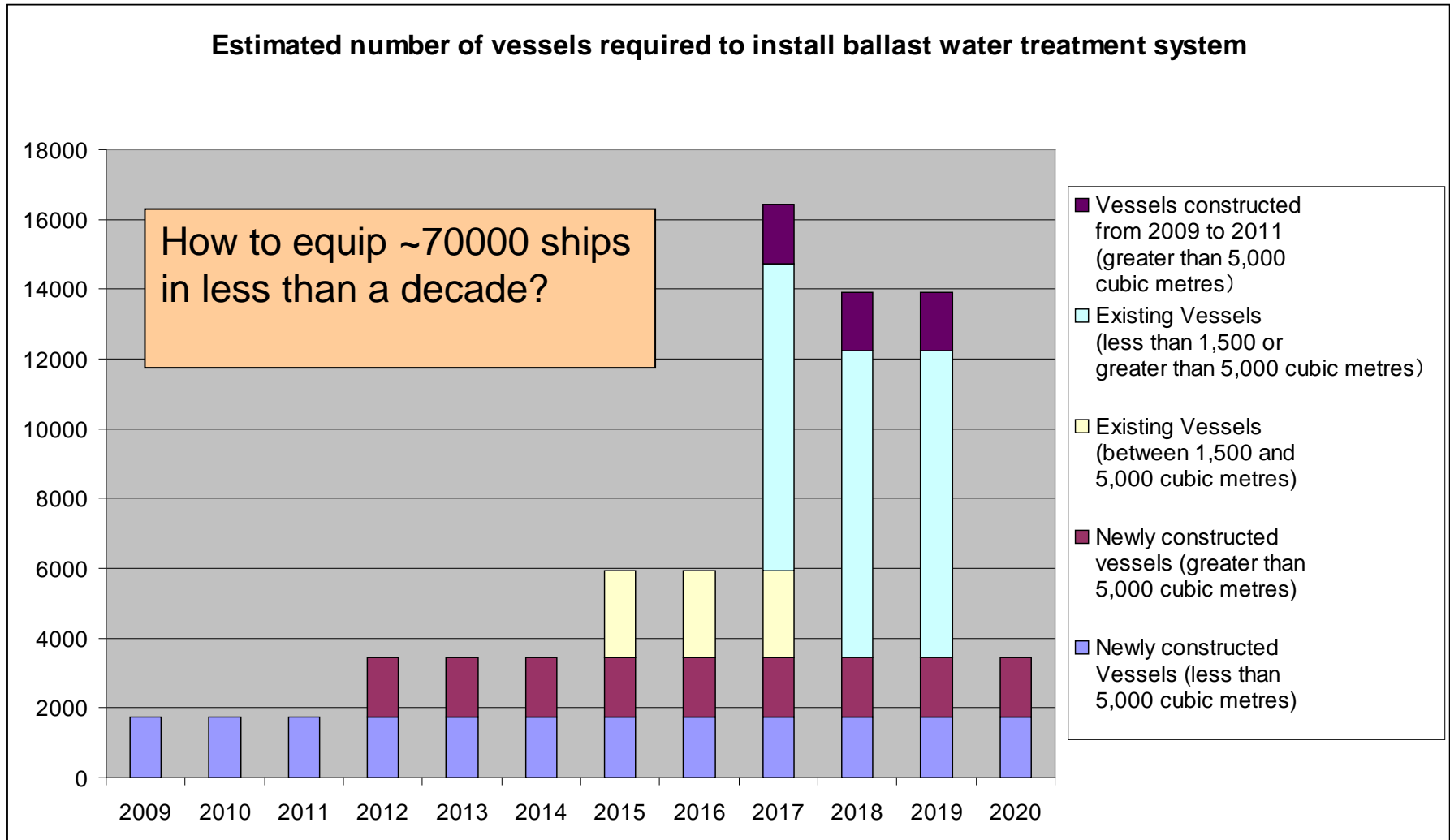


Local requirements



Party & local requirements

Treatment systems – looming bottlenecks?

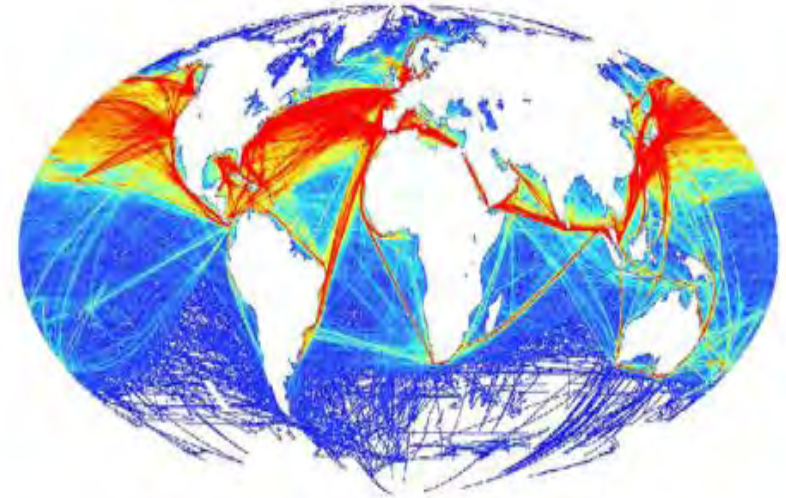
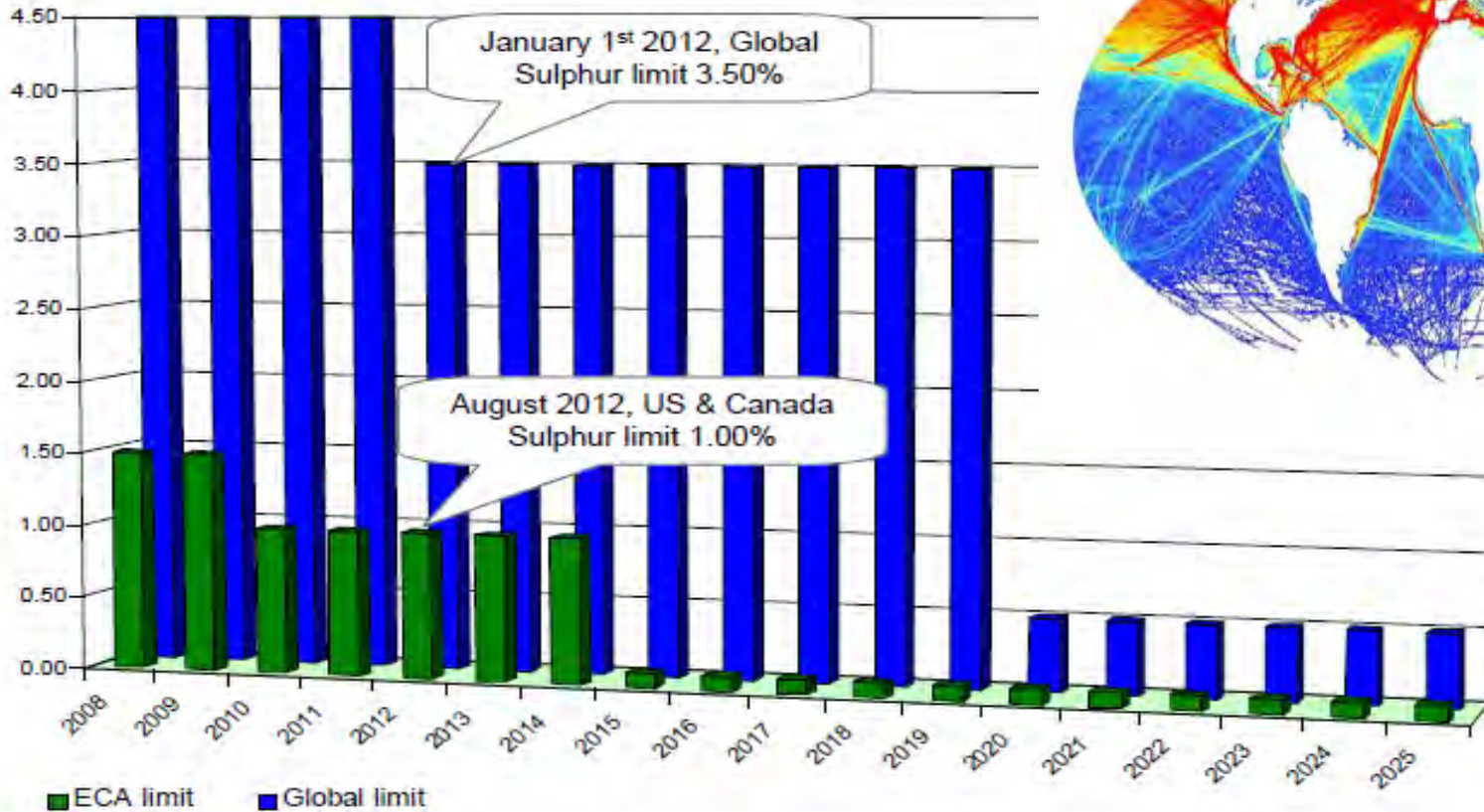


Air emissions

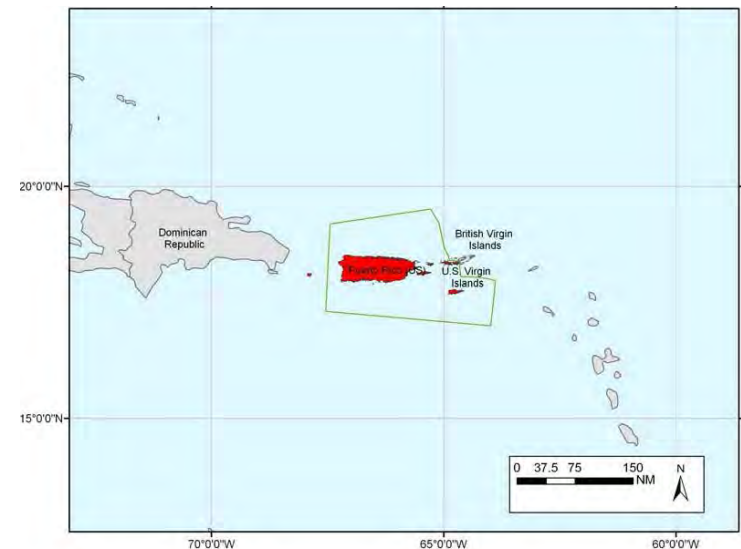
SO_x, NO_x, and particles

Stricter sulphur regulations

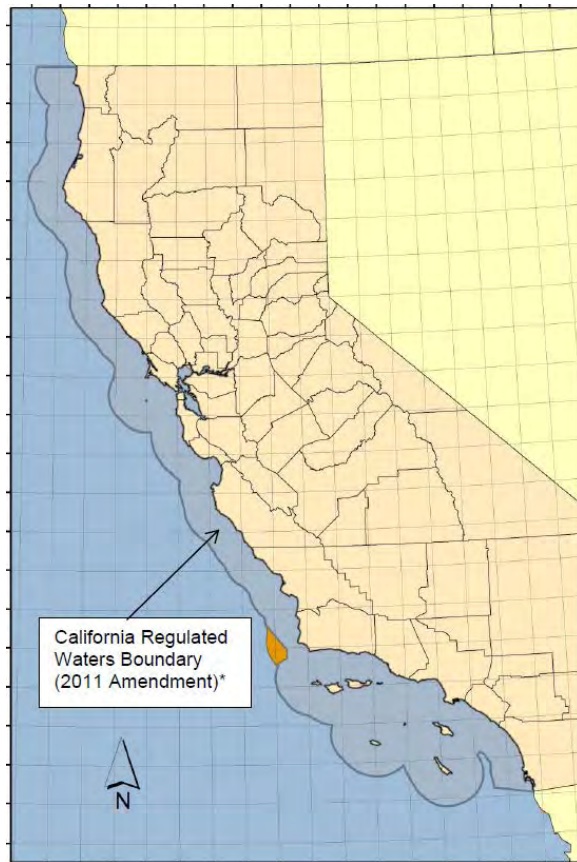
Trade patterns show global impact



Emission Control Areas – huge implications



Revised California Regulations (effective end 2011)



Requirements

Fuel Requirement	Effective Date	Percent Sulfur Content Limit
Phase I	July 1, 2009 ¹	Marine gas oil (DMA) at or below 1.5% sulfur; or Marine diesel oil (DMB) at or below 0.5% sulfur
	August 1, 2012 ²	Marine gas oil (DMA) at or below 1.0% sulfur; or Marine diesel oil (DMB) at or below 0.5% sulfur
Phase II	January 1, 2014 ³	Marine gas oil (DMA) or marine diesel oil (DMB) at or below 0.1% sulfur

¹ No change from the existing requirements.

² Marine gas oil sulfur limit reduced from 1.5% to 1%. No change in marine diesel oil limit.

³ Implementation delayed from 2012 to 2014.

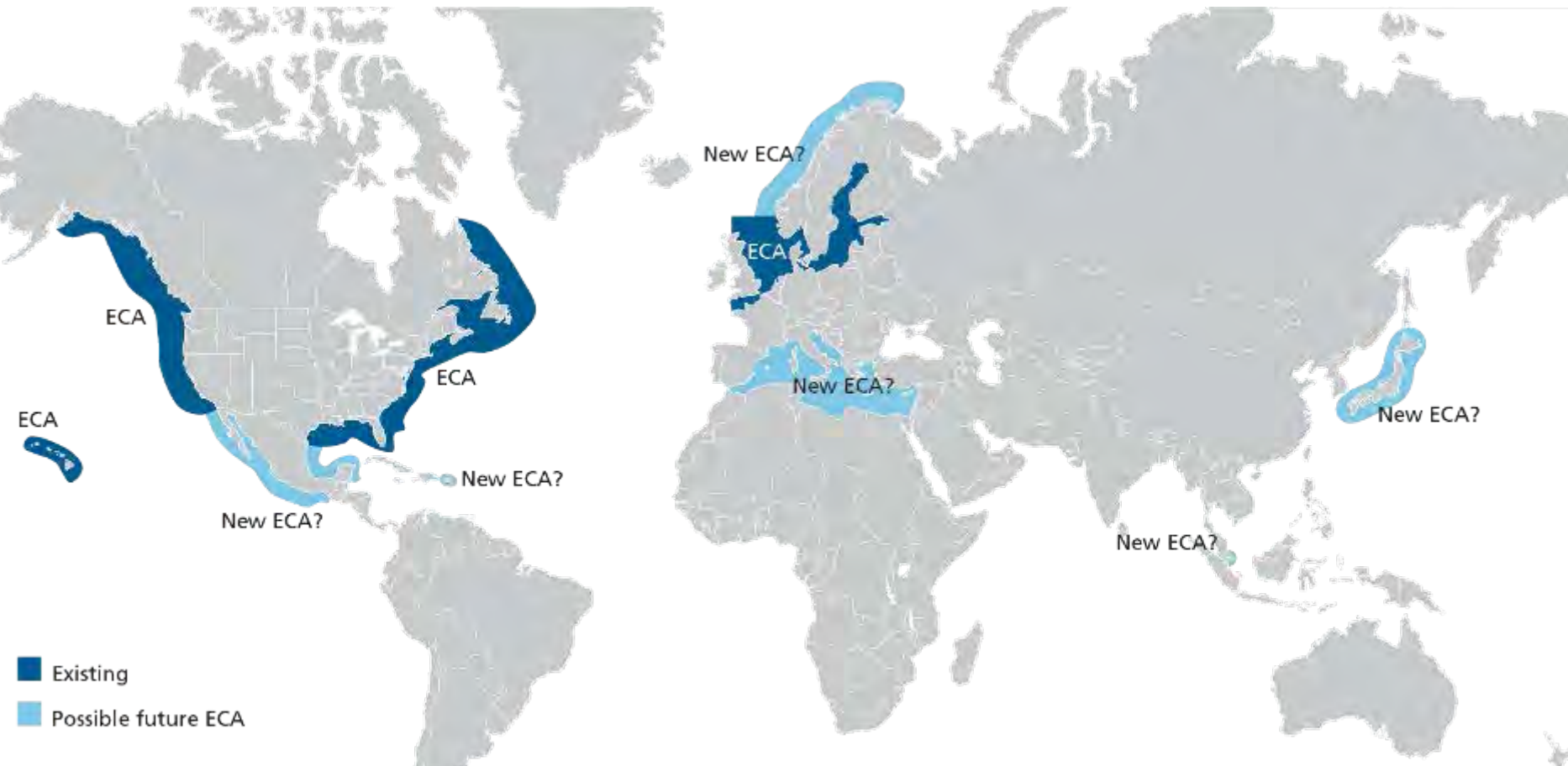
Noncompliance fee schedule

California Port Visits	Amended Per-Port Visit Fee*	Fee Prior to Amendments
1st Port Visited	\$45,500	\$45,500
2nd Port Visited	\$45,500	\$91,000
3rd Port Visited	\$91,000	\$136,500
4th Port Visited	\$136,500	\$182,000
5 th or more Visits	\$182,000	\$227,500

* Fee halved for vessels that purchase and use compliant fuel during port visit.

CARB regulation will be superseded by MARPOL Annex VI in 2015

Future ECAs? Potential impact??



What is the right compliance strategy?

Basically 3 options on the table

1 LNG as fuel



2 Scrubbers for exhaust gas cleaning



3 Low sulphur fuel



*...or fleet redeployment,
i.e. give up trading in ECAs...*

Not all issues are equally important – but the decision space is complex, and cost implications significant

- There is a lot of money at stake
 - Major investments or increased operating costs
 - Vessel second-hand value
 - Non-compliance consequences
- Different strategies have different capital needs
- Different trading patterns requires different solutions
 - Time in ECA
- Fleet characteristics/age profiles will impact decisions & solutions
 - Is selling or scrapping a viable option?
 - Repositioning?
- Contractual framework
 - Who pays for the fuel?
 - Increased fuel cost – less chance of charter?
- Fleet flexibility
 - It costs, is it worth it?
- Technology risk
 - Who wants to go first? Using what?

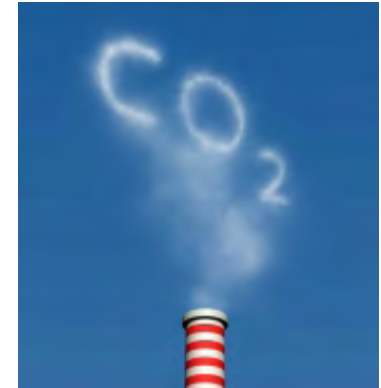


Air emissions

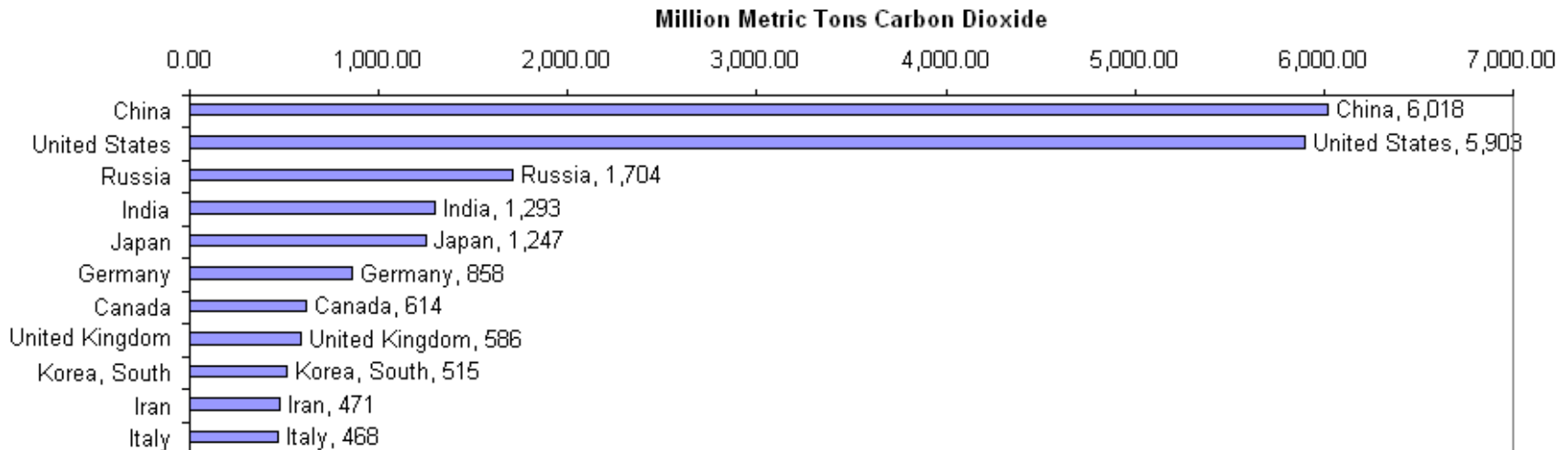
CO₂

Shipping CO₂ emissions – why the world cares

- Shipping burns approx. **335 million tonnes fuel** per year... while transporting 85% of the worlds goods
- The associated emission of CO₂ is around **1 billion tonnes of CO₂** per year

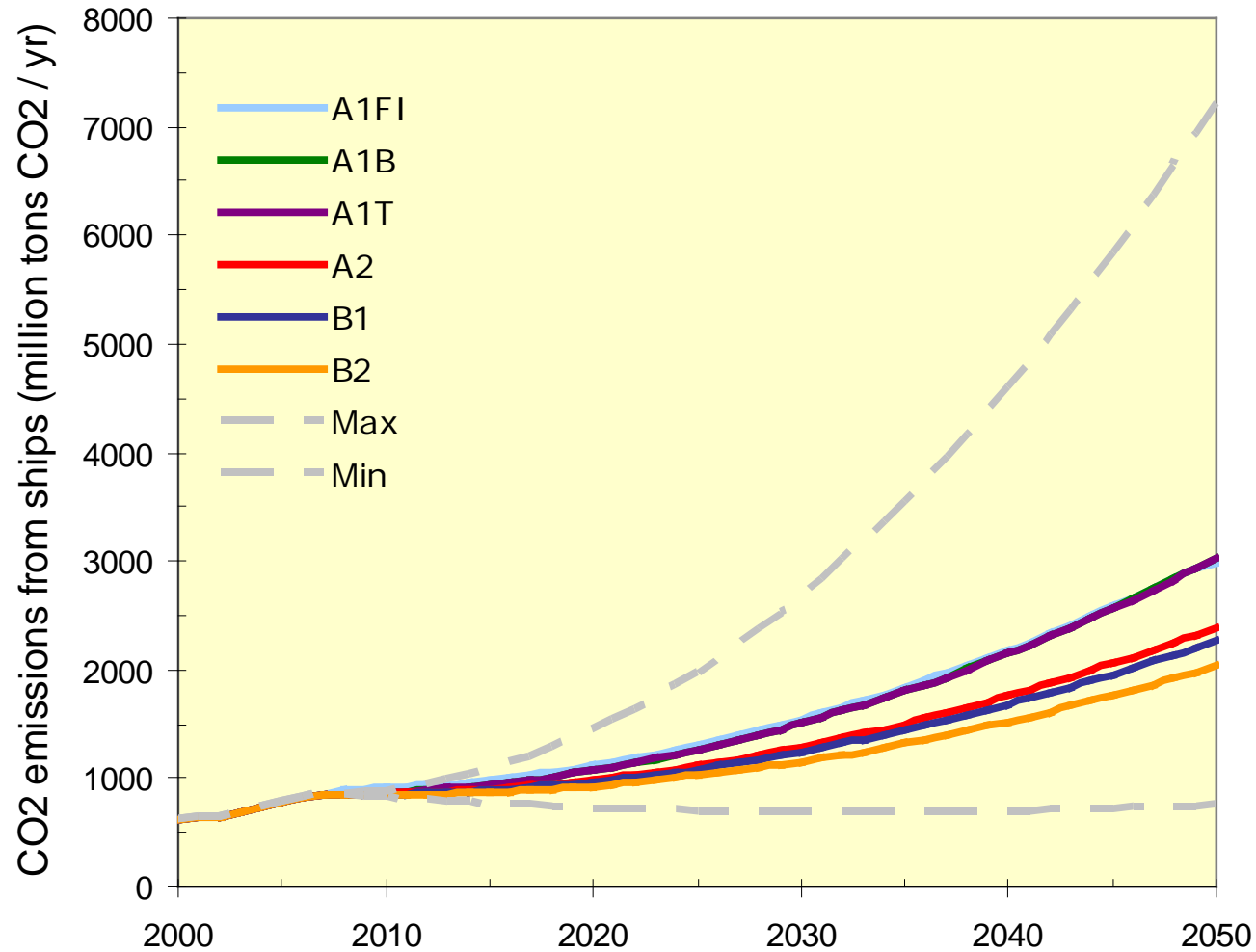


2006 CO2 Emissions



Future outlook

- Economic growth **drives increased trade** and transportation
- BAU improvements in fleet efficiency expected to be **more than offset by growth**
- Emission **doubling or trebling by 2050** likely consequence
- **Unacceptable** to policymakers



Source; Second IMO GHG Study 2009; MEPC59/INF.10

Political bodies shape global efforts to reduce shipping GHG



- **UNFCCC**. Arena for international climate negotiations. Considers shipping key source of climate change mitigation and adaptation **funding**

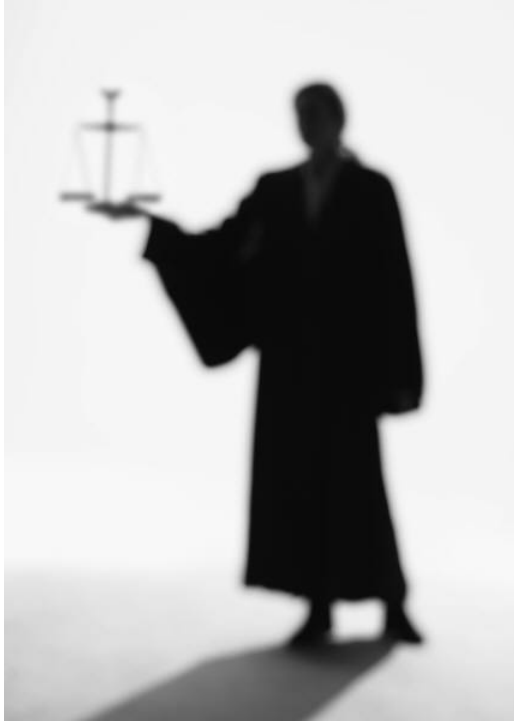


- **IMO**. Working to reach **industry wide, global agreements** reducing the amount of CO2 emissions from international shipping.



- **EU**. Proposes to cut shipping CO2 by **40% by 2050** when compared with 2005 levels. Working on regional regulations.

Regulatory options for shipping



- **Technical / operational measures**
 - EEDI
 - SEEMP
 - EEOI
- **Market Based Measures (MBM)**
 - cap and trade system
 - levy system
 - other approaches (several on the table)

Speed limits seeing renewed interest



Regulations aside, what can shipping actually do?

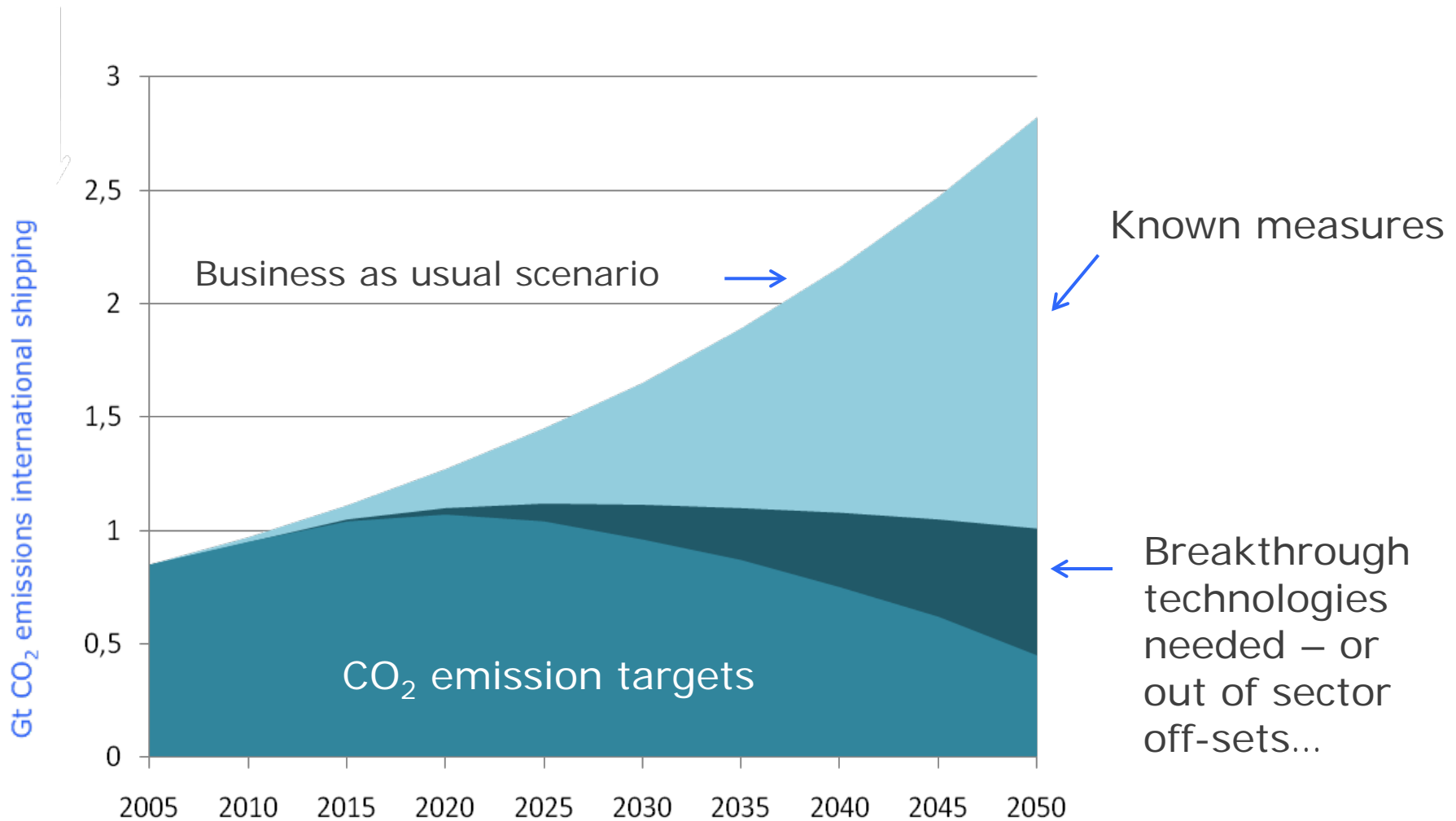
- **More efficient operations**, e.g. weather routing, control of energy consumers onboard, speed optimising and trim
- The introduction of **more efficient technology** – both for ships in operation and for newbuildings
- **Fuel shift** from residual fuel oils, marine gasoil and diesel oil to use of natural gas; possibly other green fuels
- **Improved infrastructure**, including port turn-around times, port capacity / -logistics and size of ships
- **Improved cooperation** between players including owners/charterers, contractual issues, port integration

It's not just technology, it's also about people and their organisations



CO₂ reduction – What does it all add up to?

What is the maximum reduction achievable?



Key words for the decade



COMPLEXITY

UNCERTAINTY

REAL BUSINESS RISK