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Development of Regional Joint Master Program in Maritime Environmental Protection and Management - MEP&M -

BALLAST WATER AND ITS EFFECTS ON MARINE ECOSYSTEMS

**WP3. Capacity Building through staff training and equipment purchase .
Dev 3.4.3 KNOW-HOW TRANSFER TO TEACHING STAFF RELATED TO THE
MEP&M**

**Ruth García-Llave, Maritime Navigation and Naval Architecture Dept.
(University of Cádiz)**

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Virtual meeting via Google-meet application

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Ballast Water OBJECTIVES

1. What it is and what it is used for
2. Its effects on marine ecosystems
3. International bodies in charge of its regulation and implementation
4. Regulations





Concept

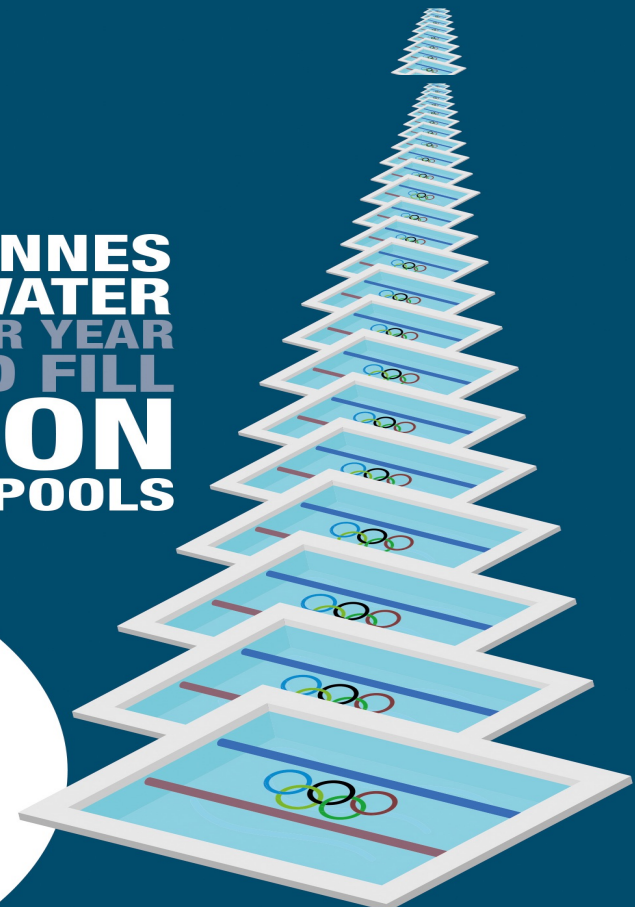


The process of
ballasting/ deballasting
of the ship is related to
the loading and
unloading operation



7000
Species transferred in ballast water every hour of everyday

10 BILLION TONNES
OF BALLAST WATER
TRANSPORTED PER YEAR
WHICH WOULD FILL
4 MILLION
OLYMPIC SIZED POOLS



1
NEW INVASION
EVERY
9
WEEKS

BALLAST
WATER IN
NUMBERS

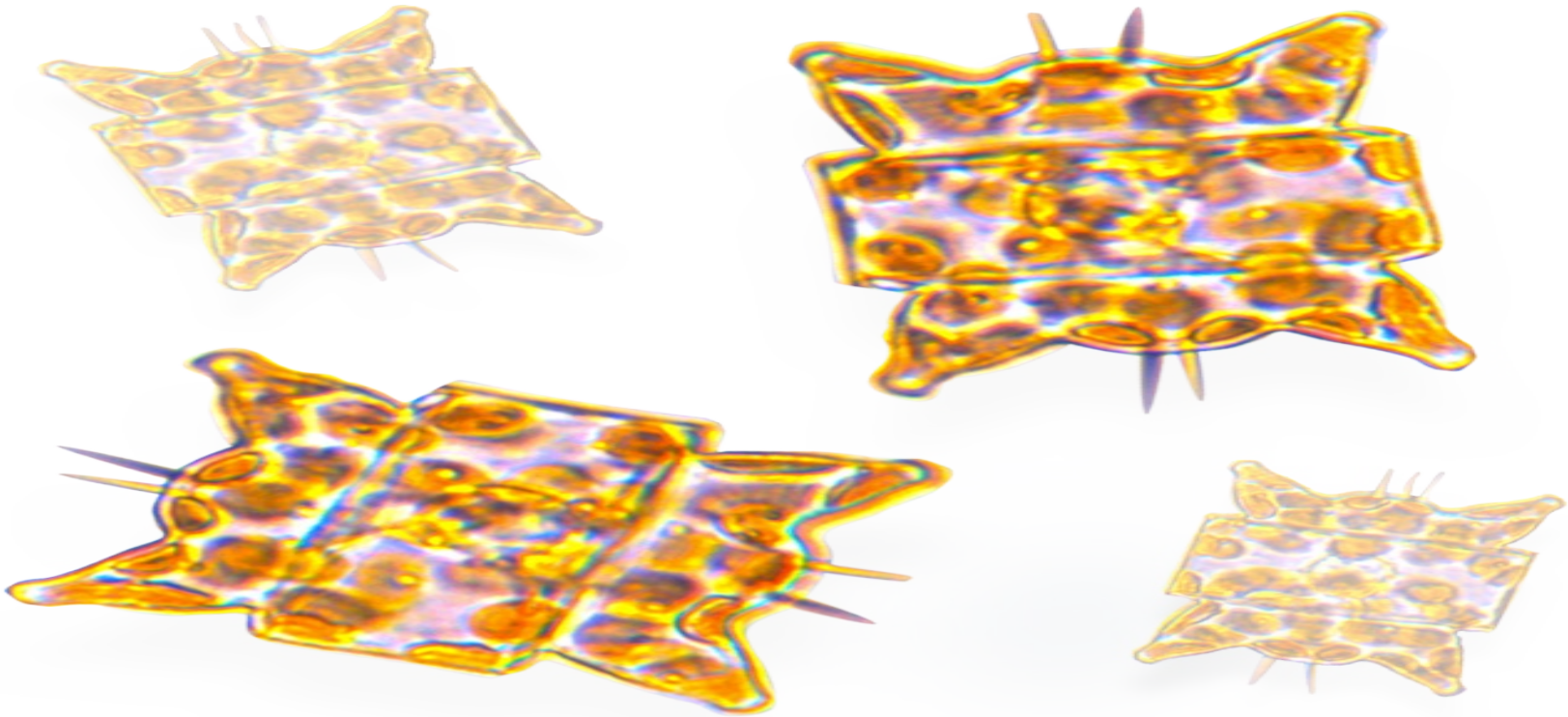
2.4 BILLION PEOPLE
LIVE WITHIN 100KM OF THE COAST

80%
OF WORLD TRADE CARRIED BY SHIPS



Odontella

Asian phytoplanktic algae in the North Sea



Osterfeld (1908)



But what are the **EFFECTS** of transferring
ballast water from one ecosystem to another?





ECOLOGICAL IMPACT on the area in question, manifested in a change in the pre-existing biota, genetic pollution and loss of marine biodiversity.





SOCIO-ECONOMIC IMPACT and shown through economic losses, as would be the case for the aquaculture or commercial fishing industry.





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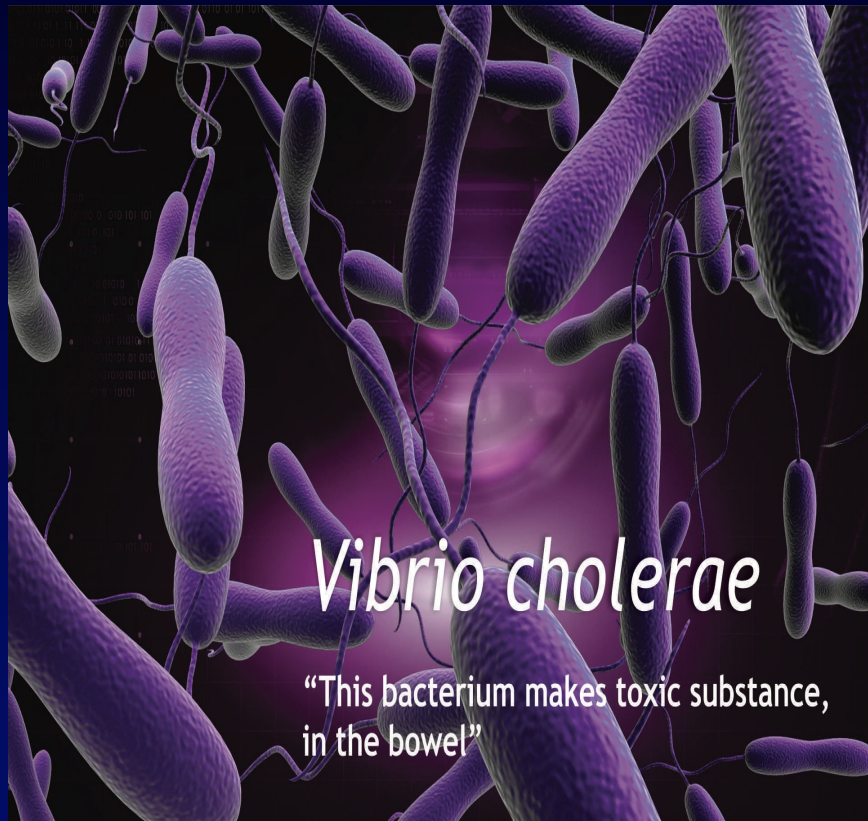


PUBLIC HEALTH IMPACT





Cases





Cases



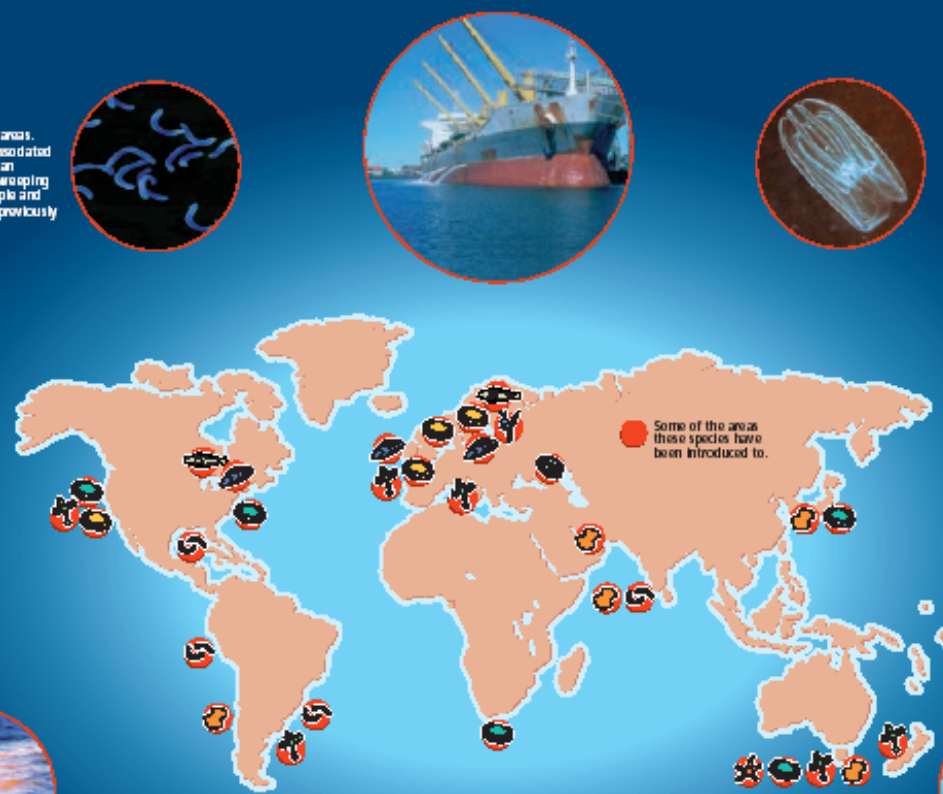


Cases



Ten of the Most Unwanted

Marine plants, animals and microbes are being carried around the world attached to the hulls of ships and in ships' ballast water. When discharged into new environments, they may become invaders and seriously disrupt the native ecology and economy. Introduced pathogens may cause diseases and death in humans.



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-fertilizing hermaphrodite) under favourable conditions. Feeds exclusively on zooplankton. Depletes zooplankton stocks altering food web and ecosystem function. Contributed significantly to collapse of Black and Azov Sea fisheries in 1990s, with massive economic and social impact. Now threatens similar impact in Caspian Sea.

Cladoceran Water Flea
Dreissena polymorpha
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.



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.

Bitten Crab
Decapoda
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 dikes causing erosion and habitat. Preys on native fish and invertebrate species, causing local extinctions during population outbreaks. Interferes with fishing activities.



Zebra Mussel
Dreissena polymorpha
Native to: Eastern Europe (Black Sea)
Introduced to: Western and Northern Europe, including Ireland and the eastern half of North America
Impacts: Feeds all available hard in mass numbers. Depletes native life. Alters habitat, ecosystem and food web. Causes severe fouling of infrastructure and vessels. Block intake pipes, sluices and irrigation. Economic costs to USA alone of US\$750 million to \$1 billion between 1989 and 2000.

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.



Asian Kelp
Ulvaria pertusata
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 fish stocks through space competition and alteration of habitat.

Round Goby
Apollonia melanostomus
Native to: Black, Azov 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
Carcinus 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.

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.

Further Information:
 Global Ballast Water Management Programme
 International Maritime Organization, London, UK
 Tel: +44 (0)20 7617 3261
 Web: <http://2gobyballast.org>





International Convention for the Prevention of Marine Pollution from Ships (MARPOL 73/78)

Ballast Water Management Convention

and the Guidelines
for its Implementation
2009 EDITION

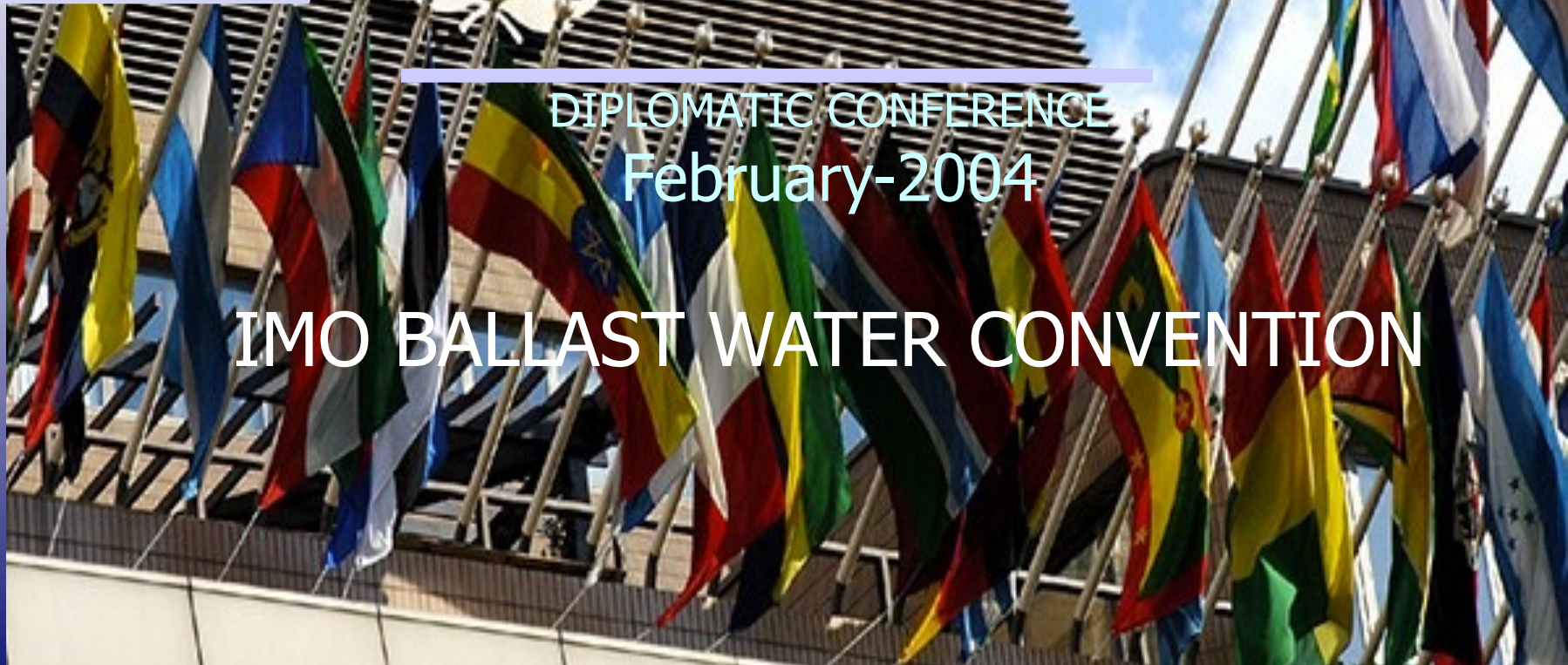


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DIPLOMATIC CONFERENCE
February-2004

IMO BALLAST WATER CONVENTION





REGULATORY FRAMEWORK

United Nations Convention on the Law of the Sea
1982, Montego Bay (Jamaica)

Articles 196, 197 and 235





REGULATORY FRAMEWORK

"to *prevent, reduce and control* pollution of the marine environment (...) or the *intentional or accidental introduction* into a particular part of the marine environment of *alien or new species* which may cause significant and harmful changes to the marine environment".

Art. 196 UNCLOS





BALLAST WATER MEMORANDUM

STRUCTURE

22 articles

Annex: Rules A-1 to E-5

Appendix I *"International BWM Certificate"*

Appendix II *"Ballast Water Record Book"*

14 Directives





BALLAST WATER MEMORANDUM

BALLAST WATER MANAGEMENT

*Mechanical, physical, chemical or biological processes, whether used alone or in combination, designed to **remove or neutralise** aquatic organisms and pathogens in ballast water and sediments, or to prevent their **uptake or discharge***





HARMFUL AQUATIC ORGANISMS AND PATHOGENS

*Whose introduction into the **sea** or **freshwater** courses may cause **RISKS** to the environment, human health, property or resources, **impair** biological biodiversity or **interfere with** other legitimate uses of the area.*





SCOPE OF APPLICATION

- ✓ *Ships entitled to fly the flag of a Party*
- ✓ *Operate under the authority of a Party*





BALLAST WATER MEMORANDUM

SCOPE OF APPLICATION NON SUBJECTS

- ✓ *Designed or constructed so as **not to carry** ballast water*
- ✓ *Operate only in waters under the jurisdiction of a State (**cabotage shipping**)*
- ✓ *Warships, auxiliary and state service ships*
- ✓ *Permanent ballast water in sealed tanks*





BALLAST WATER MEMORANDUM

SEDIMENT RECEPTION FACILITIES (*art.5*)



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BALLAST WATER MEMORANDUM

INSPECTIONS

(art. 9)

- *Verify that a valid certificate is on board,*
- *Inspect the ballast water record book*
- *Ballast water sampling*

Adoption of measures to prevent ballast water discharge: Detention





BALLAST WATER MEMORANDUM

RULES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS (ANNEX)

Section A: General provisions

Section B: Management and control requirements for vessels

Section C: Special requirements for certain areas

Section D: Ballast water management standards

Section E: Requirements for inspections and certificates

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BALLAST WATER MANAGEMENT PLAN BALLAST WATER RECORD BOOK

BWM/CONF/36
ANEXO
Página 36

APÉNDICE II

MODELO DE LIBRO REGISTRO DEL AGUA DE LASTRE

CONVENIO INTERNACIONAL PARA EL CONTROL Y LA GESTIÓN DEL AGUA DE LASTRE Y LOS SEDIMENTOS DE LOS BUQUES

Periodo: de a

Nombre del buque

Número IMO

Arqueo bruto

Pabellón

Capacidad total de agua de lastre (en metros cúbicos)

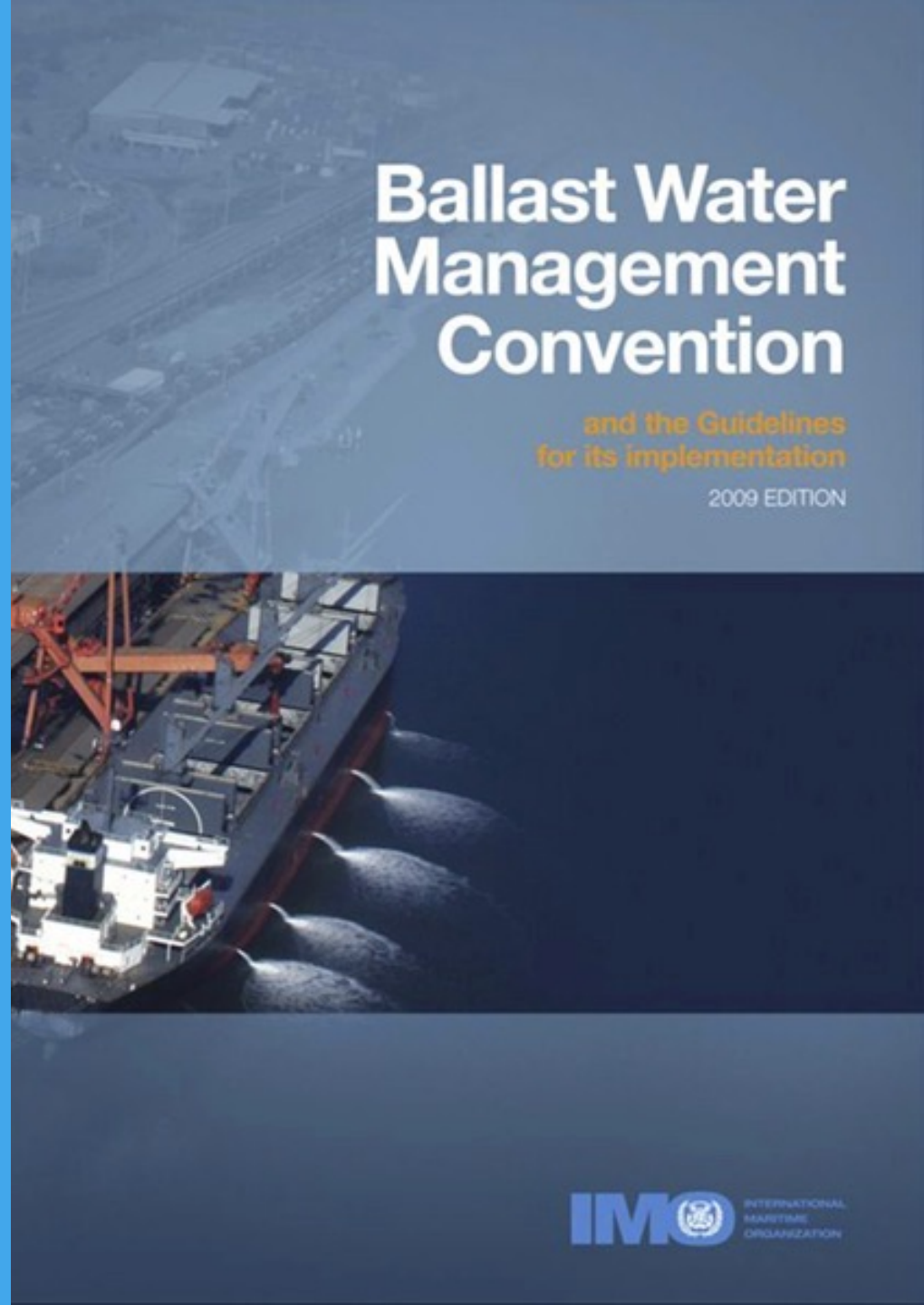
El buque dispone de un plan de gestión del agua de lastre

Diagrama del buque con indicación de la situación de los tanques de lastre:



Ballast Water Management Systems *(G-8, G-9 and G-10)*

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Ballast Water Management Convention

and the Guidelines
for its implementation

2009 EDITION





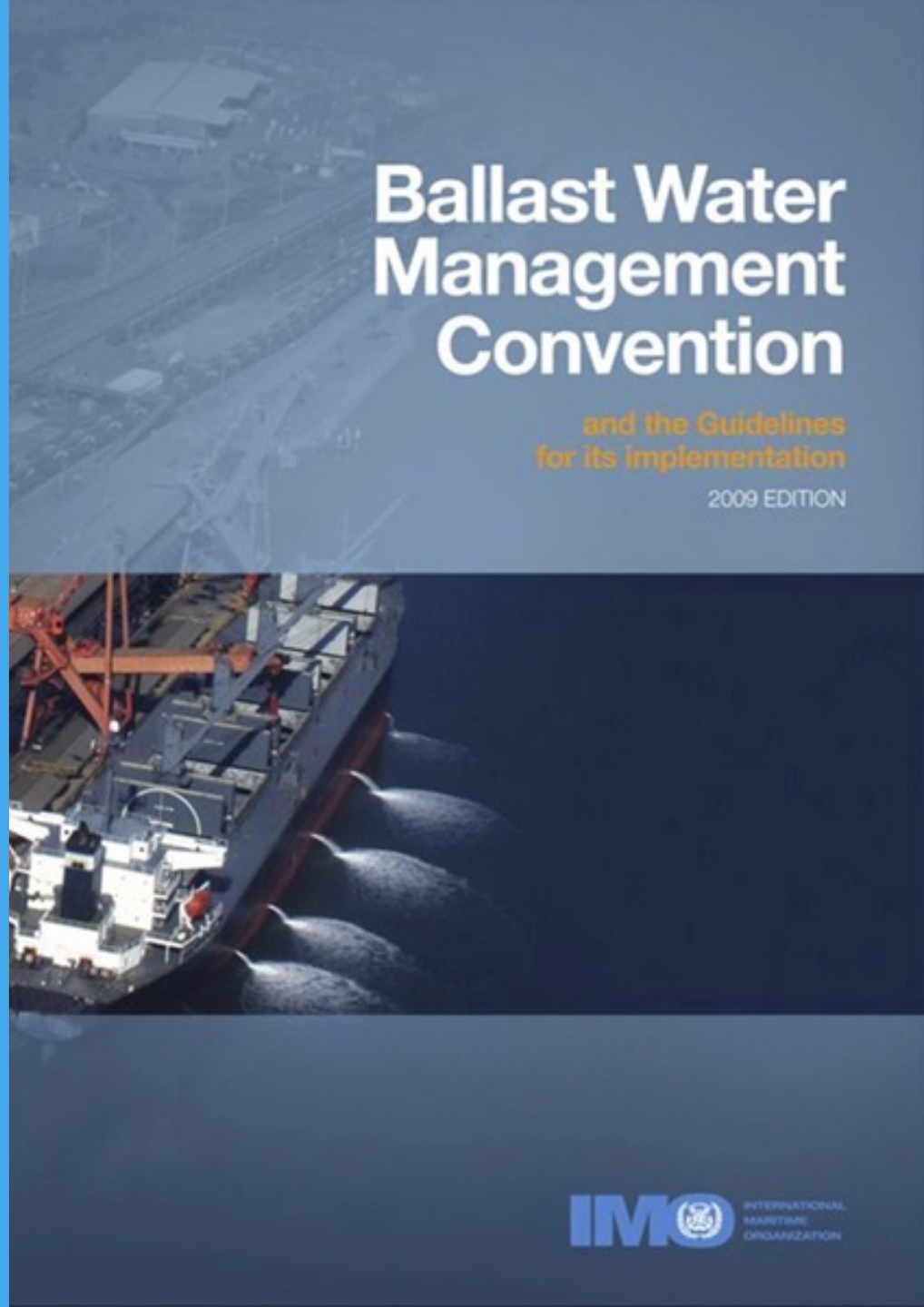
Ballast Water Performance Standard:

95% volumetric switching efficiency

Less than 10 organisms (50 microns) viable per metre³

(Regulation D-1 and D-2)

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Ballast Water Management Convention

and the Guidelines
for its implementation

2009 EDITION





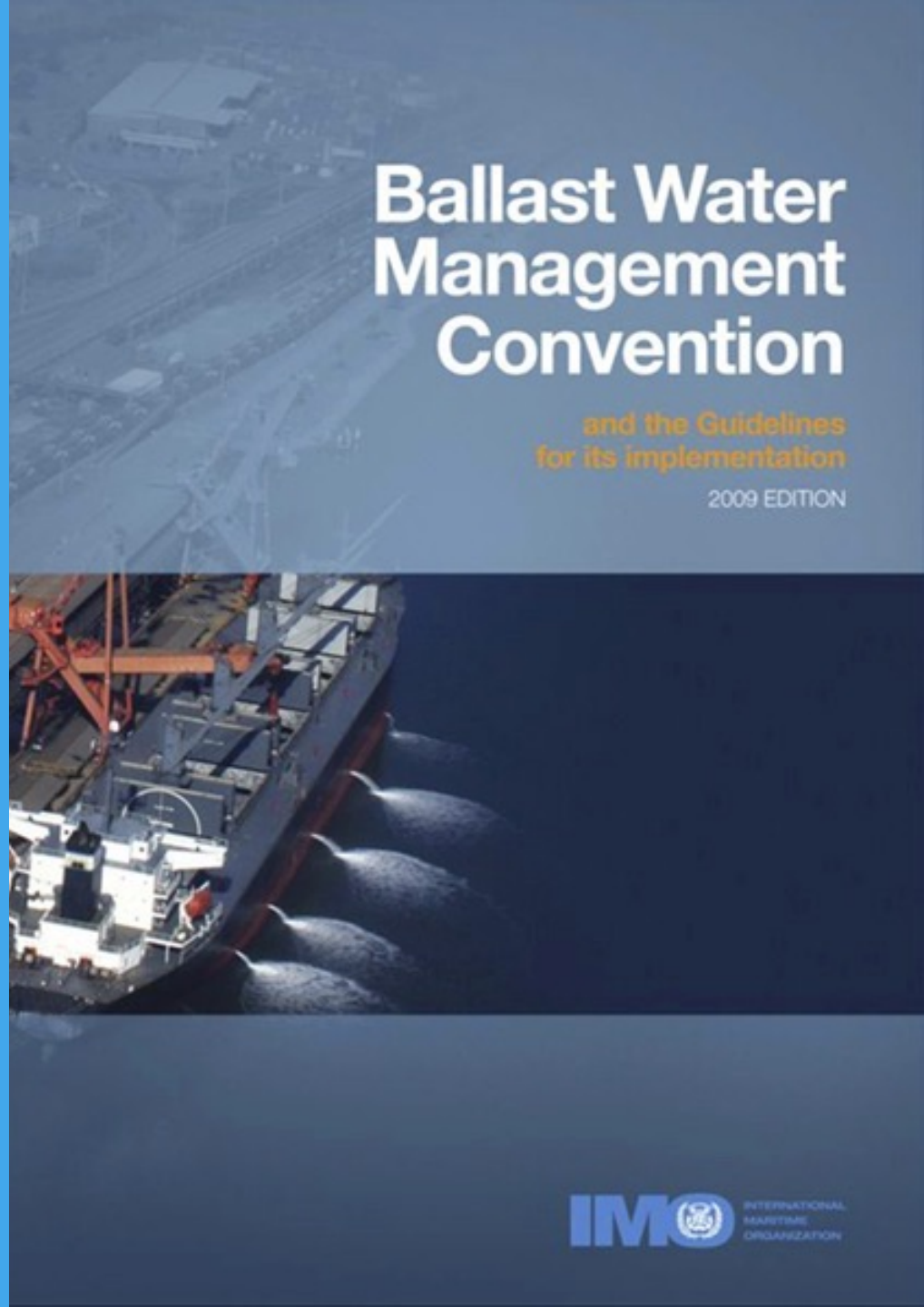
**Ballast Water Exchange:
200 metres/200 miles 200
metres/50 miles**

**Do not create diversions
or delays**

**Does not affect safety or
stability conditions**

(Regulation B-4)

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CRITERIA FOR THE DESIGNATION OF AREA FOR THE EXCHANGE OF BALLAST WATER

(Regulation B-4 and G-14)





Regulation B-4

1. Identification:

Legal aspects, important resources and protected areas navigational constraints

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Regulation B-4

2. Evaluation

*Oceanographic, Physico-chemical, Biological
Environmental and Economic factors*

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Regulation B-4

3. Designation

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BALLAST WATER MEMORANDUM



Complying with the Ballast Water Management Convention

Stopping the spread of invasive aquatic species



D1 standard requiring ships to exchange ballast water in open seas, away from coastal areas. Few organisms survive.

D2 standard specifying the maximum amount of viable organisms allowed to be discharged, including specified indicator microbes harmful to human health. Usually involves installing ballast water management system.

BACKGROUND INFO

- All new ships must conform to the D2 standard.
- Until the date when they have to meet the D2 standard, existing ships should exchange ballast water mid-ocean, to meet the D1 standard.
- Over time, all ships will have to meet the D2 standard.
- 'Renewal survey' refers to the IOPPC renewal survey under MARPOL Annex I

All ships must have:

- ballast water management plan
- ballast water record book
- International Ballast Water Management Certificate

New ships built on or after 8 September 2017 must meet the D2 standard.

Existing ships built prior to 8 September 2017 must meet the D1 standard until their D2 compliance date.

Existing ships with renewal survey between 8 September 2017 and 8 September 2019

Case 1: if previous renewal survey was between 8 September 2014 and 8 September 2017 – must comply with D2 by this renewal survey.

Case 2: if previous renewal survey was before 8 September 2014 – then compliance with D2 must be by the next renewal survey.

Existing ships with renewal survey after 8 September 2019 must meet D2 standard by this renewal survey.

All ships must meet D2 standard by 8 September 2024.

2019 ✓

2017 ✓

2024 ✓

D2 STANDARD
D1 STANDARD





BALLAST WATER MEMORANDUM

LASTE'S WATER TREATMENT SYSTEMS AND TECHNOLOGY

PH adjustment, coagulation, UV and ozone filtration

Heat treatment

Oxygen deprivation

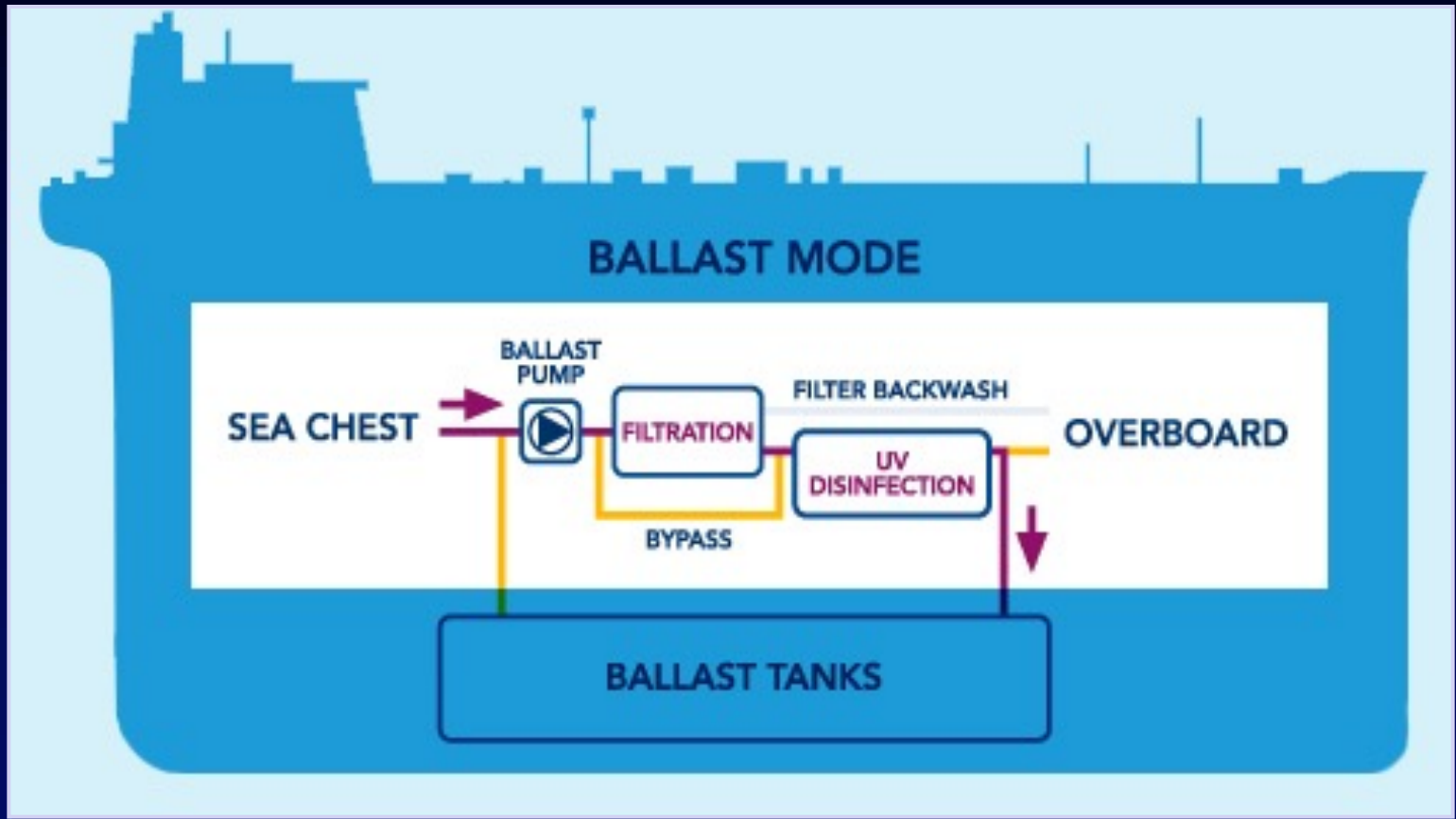
Mechanical separation and U.V. treatment

Filtration and U.V. treatment





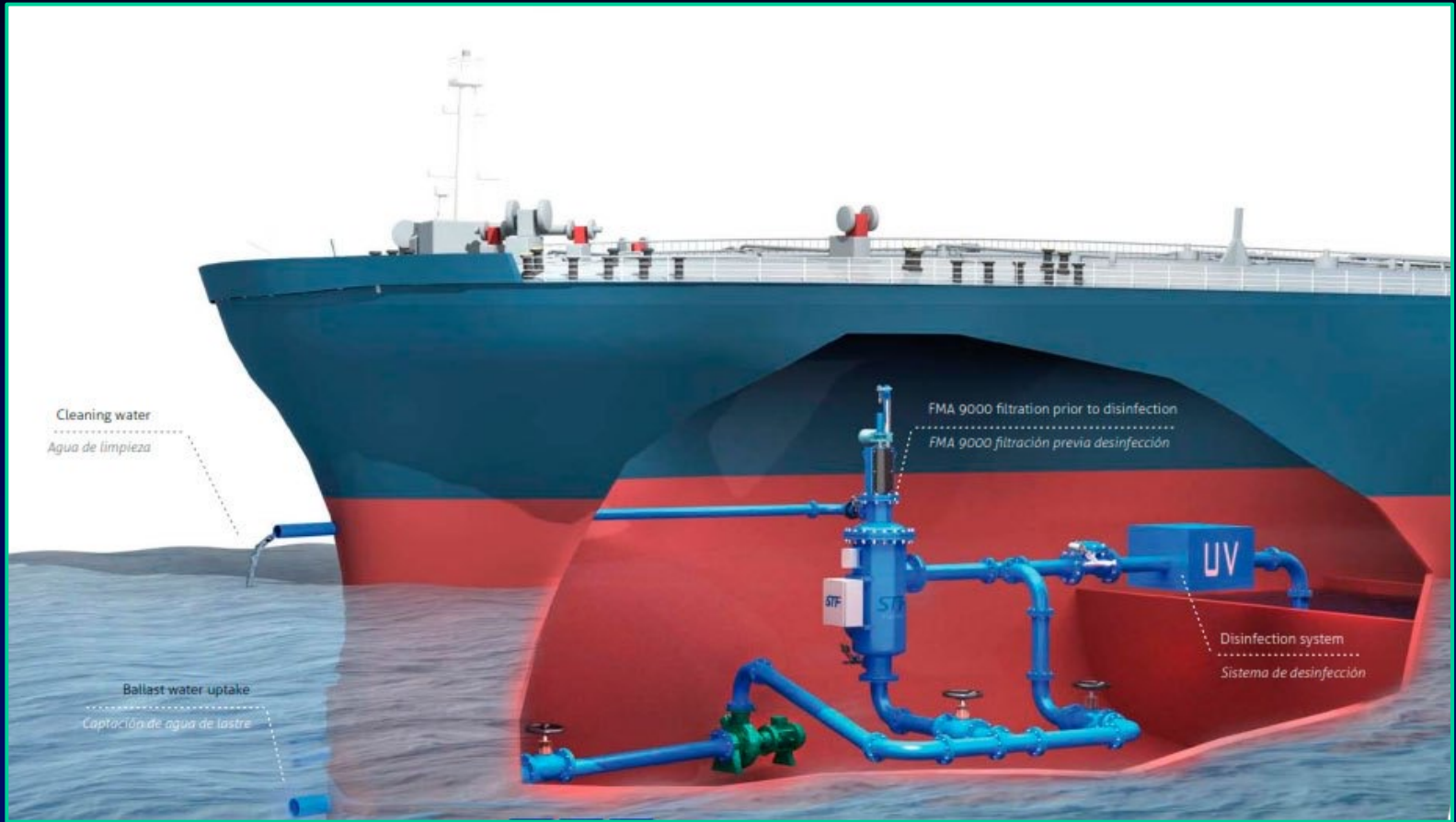
BALLASTWATER MEMORANDUM





BALLASTWATER MEMORANDUM

<https://youtu.be/cVUg-3Me5Zo>



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BALLASTWATER MEMORANDUM



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THANK YOU! Thank you Faleminderit Hvala.

Ruth García-Llave
ruth.garcia@uca.es

