2021 Mock IMO

Proposal for Handling **Grey Water** in the **Arctic** Water

TEAM Triple-Silver

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01 Background ---------- 7pg

02 Problem Analysis ---- 17pg

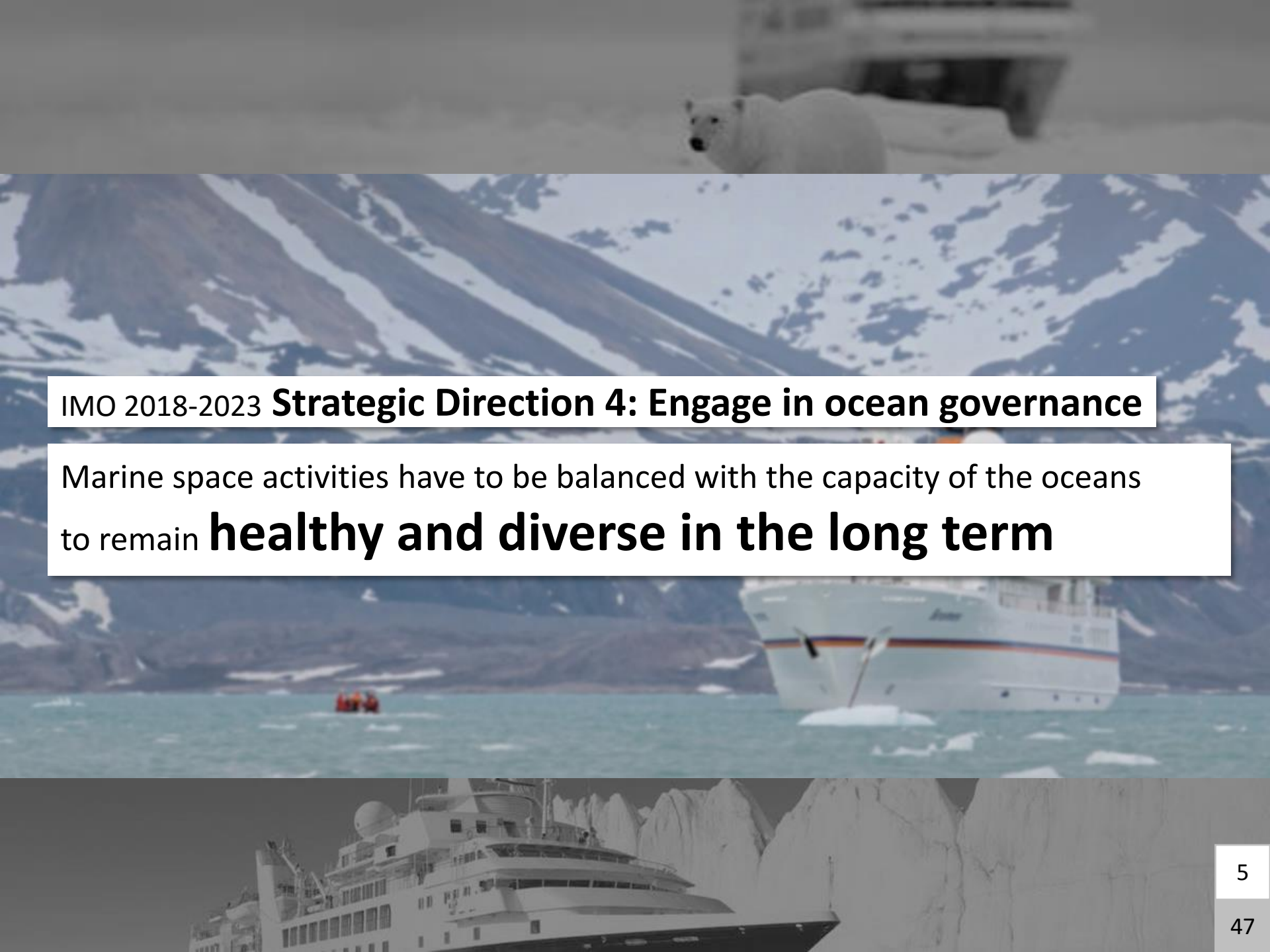
03 Proposal ---------- 24pg

04 Conclusion ---------- 42pg

INTRODUCTION

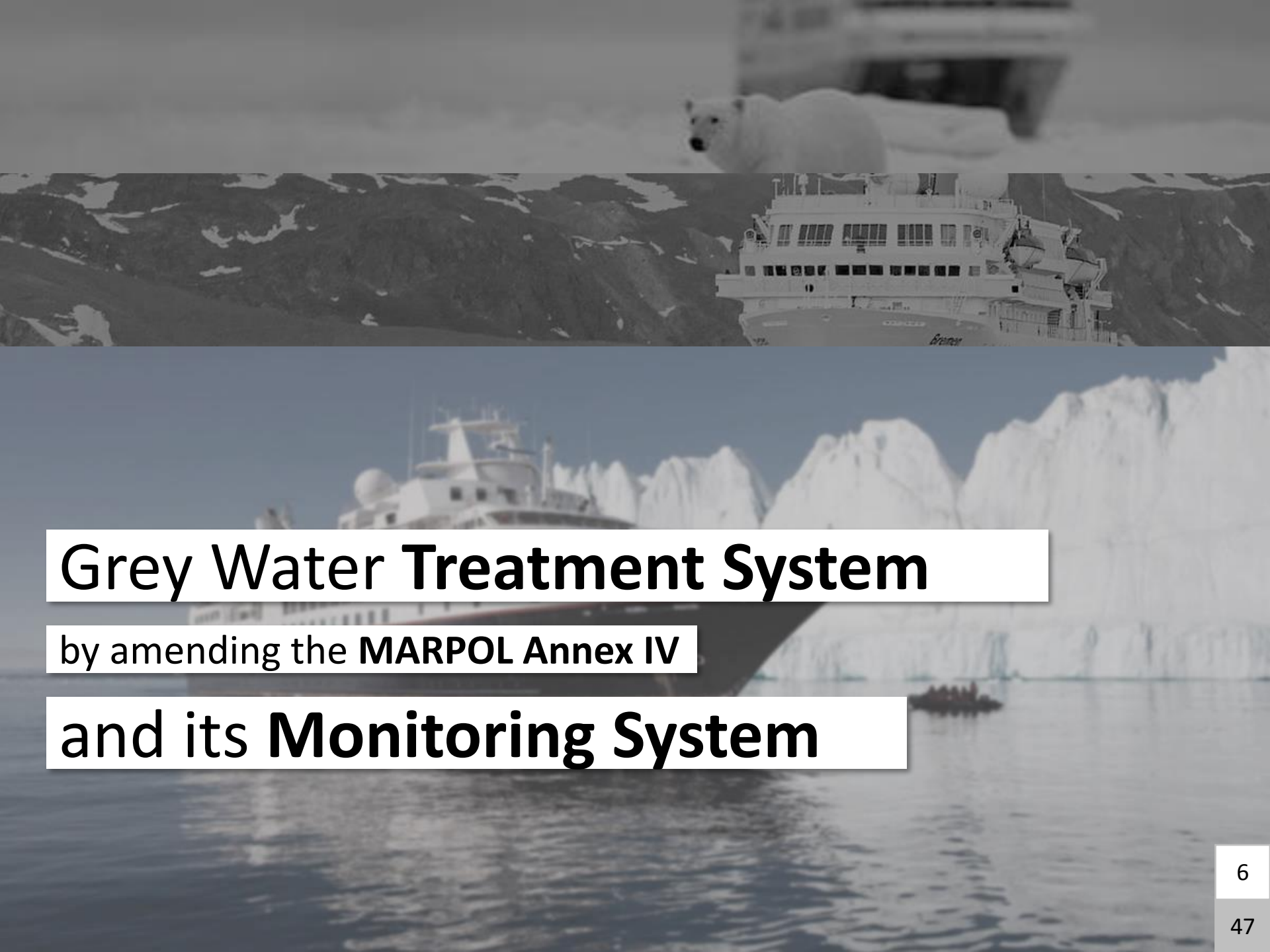
Part
00

The **Grey Water** from Ship might cause **Negative Effect on the Arctic**



IMO 2018-2023 **Strategic Direction 4: Engage in ocean governance**

Marine space activities have to be balanced with the capacity of the oceans to remain **healthy and diverse in the long term**



Grey Water **Treatment System**

by amending the **MARPOL Annex IV**

and its **Monitoring System**

BACKGROUND

Part
01

- Increasing Vessel Traffic in the Arctic
- Increasing Grey Water Generation from Ships
- Why the Arctic is Important?
- Why the Grey Water should be Regulated?

Handling Grey Water in the Arctic Water

1

Increasing
Vessel Traffic
in the Arctic

2

Increasing
Grey Water Generation
from ships

3

Why
the Arctic
is **important**?

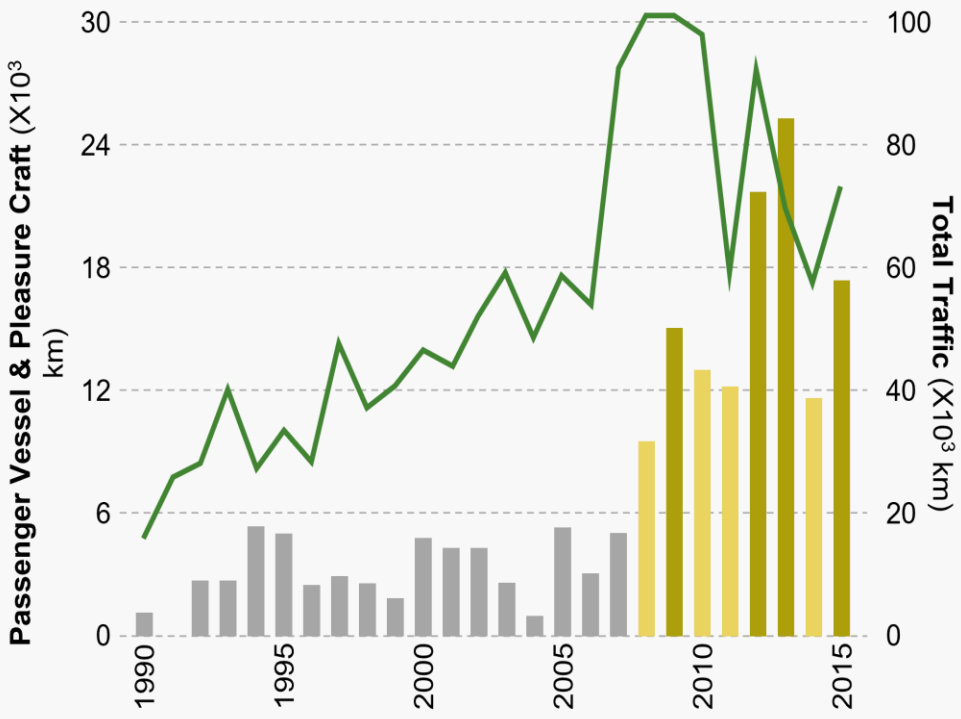
4

Why
the **Grey Water**
should be **Regulated**?

1-1 Increasing Vessel Traffic in the Arctic

Increasing Vessel Traffic in the Arctic ISR from 1990

Distance Traveled within ISR



Source: "Tourist vessel traffic in important whale areas in the western Canadian Arctic : Risks and possible management solutions". Marine Policy. November 2018

Technology development
& Decrease of Sea Ice

Vessel Traffic in the Arctic ↑

- Tripled than 1980s
- STRONG INCREASE in Passenger Vessel & Pleasure Craft (2008 ~ 2015)

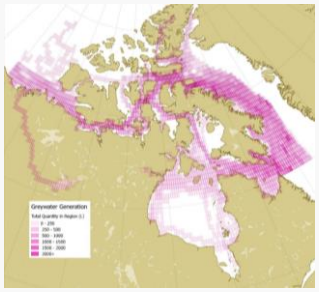
Passenger / Cruise Ships

- The large number of people onboard
- Long sailing period (24~28days)

1-2 Increasing Grey Water Generation from Ships

Increasing Grey Water Generation and Discharge from ships in the Arctic

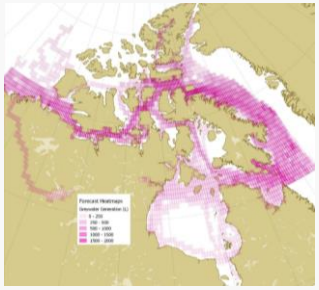
Forecast Generation Density of Grey Water



2016

13,460,855 L

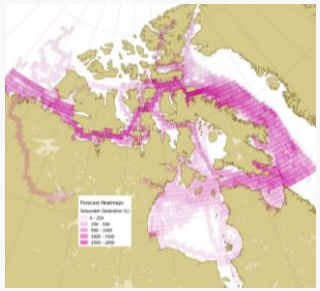
45% increase



2025

20,778,026 L

104% increase



2035

27,422,155 L

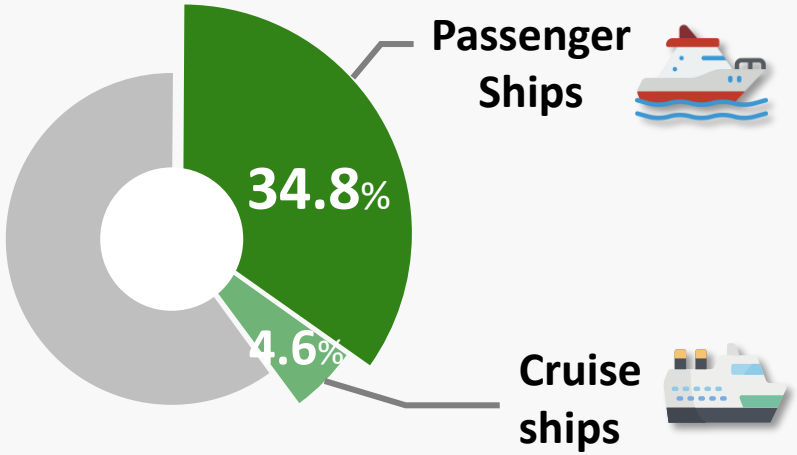
Source: "Canadian arctic greywater report: estimates, forecasts, and treatment technologies". Vard Marine Inc. 2018.

Increasing Generation Density of **Total Grey Water** in Arctic

1-2 Increasing Grey Water Generation from Ships

Increasing Grey Water Generation and Discharge from ships in the Arctic

Greywater Generated in the Canadian Arctic in 2016



Proposition of greywater in shipborne wastewater

90% shipborne wastewater

Source: "Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues". CRS. 2008

Increasing Generation Density of Total Grey Water in Arctic

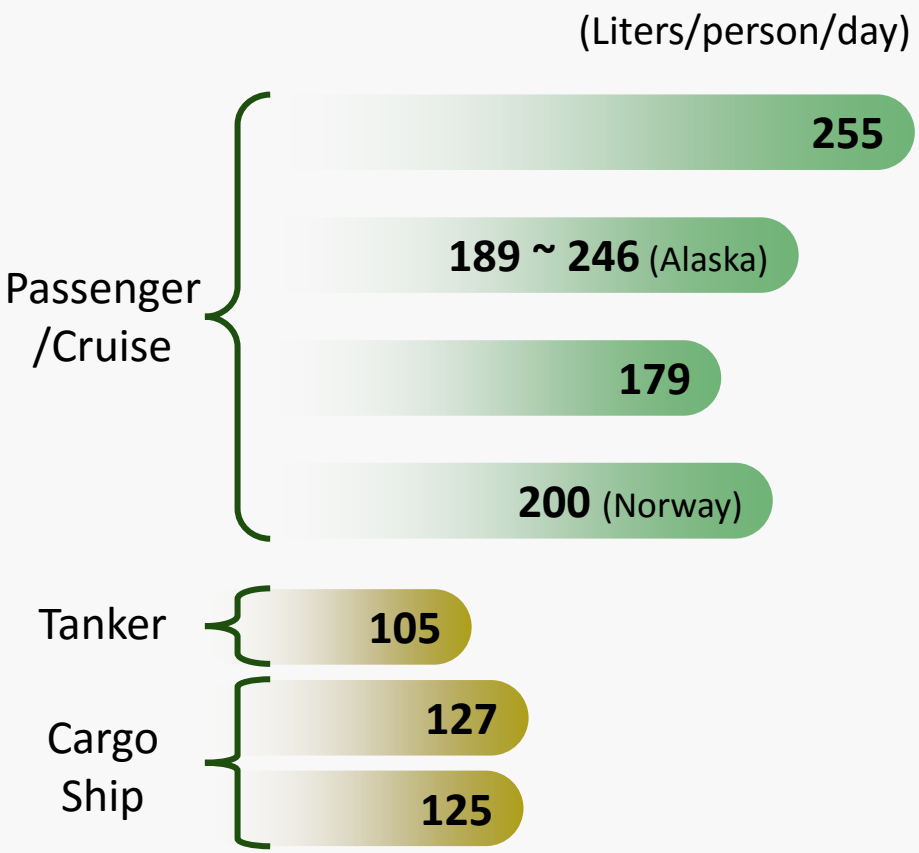
About **40%** of Shipborne Grey Water was from **Passenger/Cruise ships**

90% of wastewater from **Cruise** is Grey Water

1-2 Increasing Grey Water Generation from Ships

Increasing Grey Water Generation and Discharge from ships in the Arctic

Passenger / Cruise ship grey water production



Source: "Graywater Discharges from Vessels". U.S. EPA. 2011.

Increasing Generation Density of Total Grey Water in Arctic

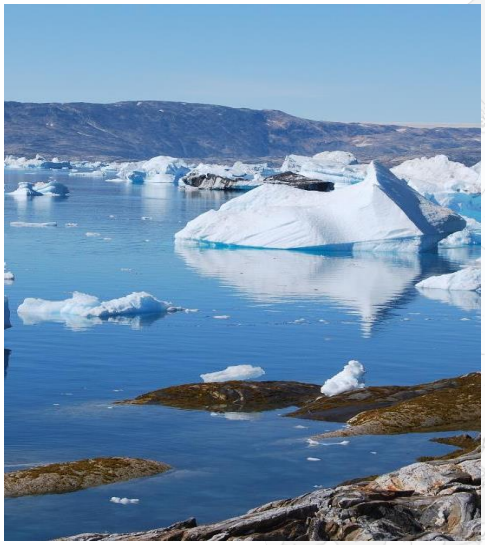
About 40% of Shipborne Grey Water was from Passenger/Cruise ships

90% of wastewater from Cruise is Grey Water

Passenger/Cruise ships generate much **more amount** of Grey Water per ship **than other types**

1-3 Why the Arctic is Important?

Specificity of the Arctic environment and Grey Water Regulation



Critical than Open Ocean

Disturb food chains

Illnesses to Indigenous people

1-4 Why the Grey Water should be Regulated?

The Danger of Grey Water and the Exist Regulations

Untreated Grey Water Compared with Domestic Sewage

Grey Water > **Domestic Water**

	Fecal [illegible]iform FCU/1[illegible]ml	TSS mg/L	BO[illegible] m[illegible]	[illegible]	Phosphorus mg/L
Raw domestic sewag[illegible] water	10,000 ~100,0[illegible]	120 ~360	1[illegible] ~4[illegible]		4 ~ 8
Galley grey water	804[illegible]1	3,951	9,0[illegible]	7,0[illegible]	65
Accommodations grey water	1,1[illegible],760	108	177	435	2
Laundry grey water	185	46	90	262	7
Food pulper waste water	110,562	16,481	30,490	26,413	186
Small cruise ship					5
Large ship grey w[illegible]	2,[illegible]22	[illegible]	[illegible]	2,[illegible]13	9

Biochemical Oxygen , Suspended Solids, etc

Source: Ed White. "Grey Water from Passenger Vessels in Alaska 2000-2019". Ocean Conservancy. 2021

1-4 Why the Grey Water should be Regulated?

The Danger of Grey Water and the Exist Regulations

CONSTITUENTS

Microplastics

Nutrients

Detergent Residue

Soap Residue

Bacteria

Pathogens

Suspended Solids

Pesticides

Phosphates

…

Environmental Problems

Shellfish Contamination

Harmful Algal Blooms(HABs)

Hypoxic Water Generation

Marine Dead Zones

…

1-4 Why the Grey Water should be Regulated?

The Danger of Grey Water and the Exist Regulations

Canada

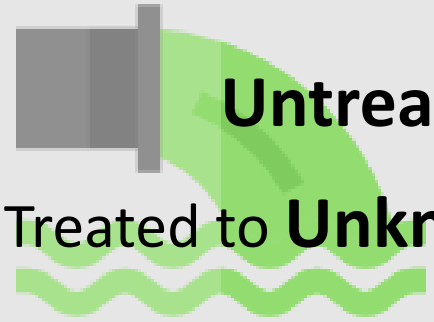
- Operators should **process** grey water and **discharge before entering** a zero-discharge region

Arctic Waters Pollution Prevention Act

USA

- Alaska ;
  - **Treatment requirements** for black & grey water
  - **Monitoring & Inspections**
  - Requirements for Emission & Impacts

USC Title XIV - Certain Alaskan Cruise Ship Operations



Untreated or

Treated to **Unknown Standards**

PROBLEM ANALYSIS

Part
02

- The Relevant Committee and Convention
- Definitions of Grey Water in IMO
- MARPOL Annex IV
- Polar Code
- What is the Problem?

2-1 The Relevant Committee and Convention

MEPC, MARPOL and Polar Code

- The Committee addresses **environmental issues** to control and protect ship-source oil, chemical carried in bulk, sewage, and garbage.
- The Committee covers issues related with MARPOL and other matters - ballast water management, anti-fouling systems, ship recycling, etc

- The Convention covers **prevention** of pollution of the **marine environment by ships** from operational or accidental causes.
- The Convention currently includes **six technical Annexes** and Special Areas with strict controls on operational discharges.

- The Code is applied to all ships operating in polar waters - harsh and challenging.
- The Code imposes additional demands beyond the existing SOLAS and MAROL requirements and other IMO instruments on the ships, systems and operation.

2-2 Definitions of Grey Water in IMO

Definitions of Grey Water in MEPC.227 and MEPC.295

MEPC.227(64)

2012 Guidelines on Implementation of Effluent Standards and Performance Test for Sewage Treatment Plants

2.7. *Grey water* – is **drainage from dishwater, galley sink, shower, laundry, bath and washbasin drains** and **does not include** drainage from toilets, urinals, hospitals, and animal spaces, **as defined in regulation 1.3 of MARPOL Annex IV** and does not include drainage from cargo spaces.

MEPC.295(71)

2017 Guidelines for the Implementation of MARPOL Annex V

1.6.3 … *Grey water* is **not considered garbage** in the context of **MARPOL Annex V.**

2-3 MARPOL Annex IV

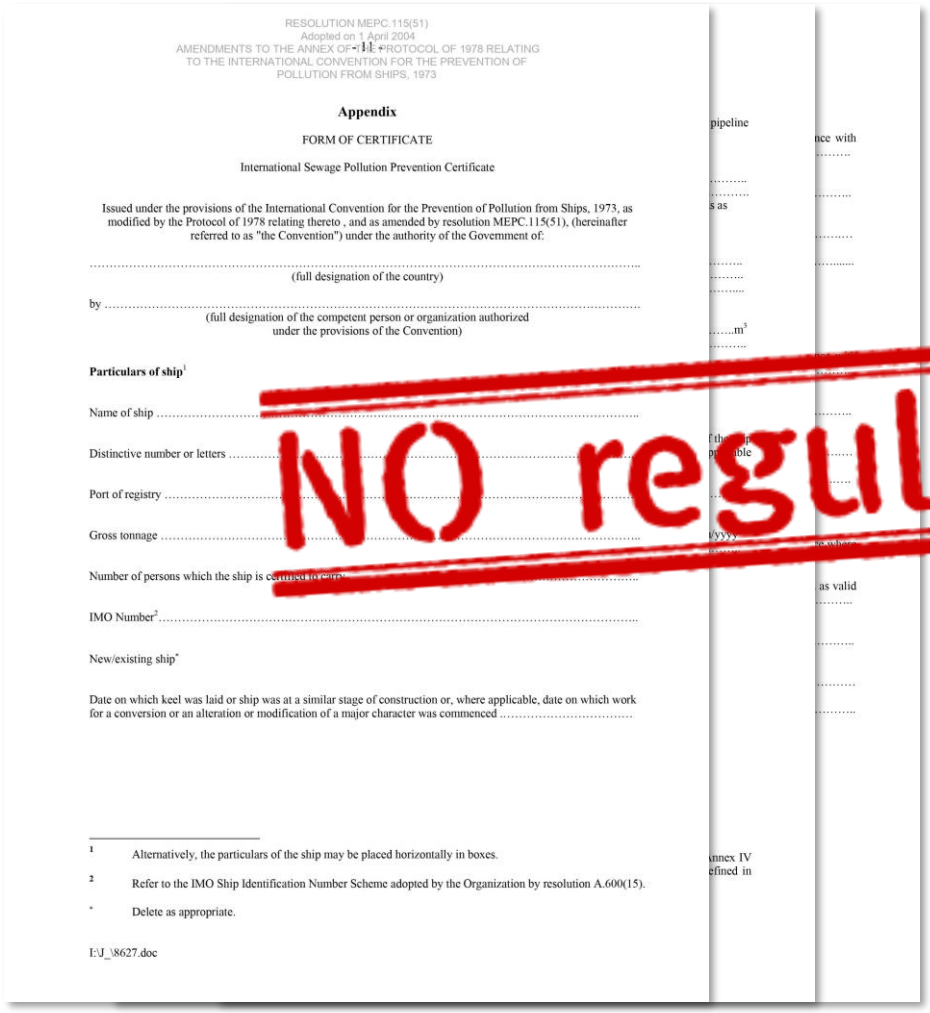
Prevention of Pollution by Sewage from Ships

Regulation 1 Definition

MARPOL Annex IV	Guidelines for the Implementation of Annex V
Sewage	**Grey Water**
drainage and other wastes from any form of **toilets and urinals**	drainage from **dishwater, galley sink, shower, laundry, bath and washbasin drains**
drainage from **medical premises** via wash basins	
drainage from spaces containing **living animals**	**NOT INCLUDE** reg 1.3 of Annex IV
other waste waters when **mixed** with the drainages defined above	**NOT INCLUDE** drainage from **cargo spaces**

2-3 MARPOL Annex IV

Prevention of Pollution by Sewage from Ships



RESOLUTION MEPC.115(51)
Adopted on 1 April 2004
AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1978 RELATING TO THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973

Appendix

FORM OF CERTIFICATE

International Sewage Pollution Prevention Certificate

Issued under the provisions of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto , and as amended by resolution MEPC.115(51), (hereinafter referred to as "the Convention") under the authority of the Government of:

.....
(full designation of the country)

by .....
(full designation of the competent person or organization authorized under the provisions of the Convention)

Particulars of ship[1]

Name of ship .....

Distinctive number or letters .....

Port of registry .....

Gross tonnage .....

Number of persons which the ship is certified to carry .....

IMO Number[2] .....

New/existing ship*

Date on which keel was laid or ship was at a similar stage of construction or, where applicable, date on which work for a conversion or an alteration or modification of a major character was commenced .....

1 Alternatively, the particulars of the ship may be placed horizontally in boxes.

2 Refer to the IMO Ship Identification Number Scheme adopted by the Organization by resolution A.600(15).

* Delete as appropriate.

I:\J_\8627.doc

NO regulations

Regulation 9 Sewage Systems

Criteria for
Sewage Treatment System
or Holding Tanks

Regulation 11 Discharge of Sewage

Condition for discharge sewage
into the sea

Regulation 12 Reception Facilities

Provisions of facilities
at port and terminals

▲ Appendix | **International Sewage Pollution Prevention Certificate**

Chapter 4 Prevention of Pollution by Sewage from Ships

4.2.1 Discharges of sewage within polar waters are prohibited except when performed in accordance with MARPOL Annex IV and the following requirements:

Comminuted, Disinfected Sewage

over 3 nautical miles

NO regulations

over 12 nautical miles

ice-shelf or fast ice as far as from areas of ice concentration **exceeding 1/10**

2-5 What is the Problem?

Problems Regarding Handling Grey Water in Arctic Water

MEPC 63/23

2.36 Having considered document MEPC 63/2/18 (Norway) seeking clarification of application of the BWM Convention to grey water and sewage stored in ballast tanks, the Committee agreed, after extensive discussions, that handling of grey water and sewage water on board ships should be regulated under MARPOL Annex IV and invited Parties to propose relevant amendments to that Annex for consideration at a future session of the Committee.

- Vessel grey water **NOT REGULATED** internationally
- Already be **COGNIZANT** of necessity by IMO

GREY WATER REGULATION

PROPOSALS

Part
03

- Proposal for Handling Vessel Grey Water
- Treatment Sector : On-Board Treatment System
- Treatment Sector : Reception Facility
- Treatment Sector : Gradual Application
- Monitoring Sector : Monitoring system

3-1 Proposal for Handling Vessel Grey Water

Definition of Grey Water

MARPOL Annex IV : Regulations for the Prevention of Pollution by Sewage from Ships

Regulation 1 Definitions

INSERT new paragraph 9

9 "Grey Water" means:

.1 drainage from dishwater, shower, laundry, bath and washbasin drains;

.2 drainage from shop sinks and deck drains in non-engine rooms, and whirlpools; or

.3 refrigerator and air conditioner condensate, and inter alia.

3-1 Proposal for Handling Vessel Grey Water

Treatment and Monitoring Sector

Measurements

Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

Phase 1 Research & Prepare for regulation

STEP 03 Analyze &Predict

STEP 02 Measure & Monitor

STEP 01 Investigation

3-2 Treatment Sector : On-Board Treatment System

Discharge or Reuse Treated Grey Water On Board

Measurements

Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

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STEP 03 Analyze &Predict

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STEP 01 Investigation

3-2 Treatment Sector : On-Board Treatment System

Discharge or Reuse Treated Grey Water On Board

Regulation 9 Sewage Systems

REPLACE word "sewage" with "sewage and grey water"

1 Every ship which, in accordance with regulation 2, is required to comply with the provisions of this Annex shall be equipped with one of the following sewage systems:

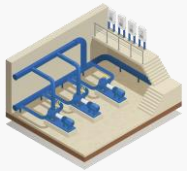
.1 a sewage treatment plant which shall be of a type approved by the Administration, taking into account the standards and test methods developed by the Organization*, or

⋮

3-2 Treatment Sector : On-Board Treatment System

Discharge or Reuse Treated Grey Water On Board

1 Discharge After Treatment

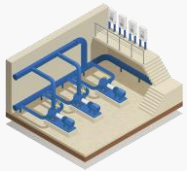


Comminute & Disinfect

Discharge

- Pollutant Level ↓
- Secure Indigenous People's Food Security

2 Reuse After Treatment



Comminute & Disinfect

Reuse on-board

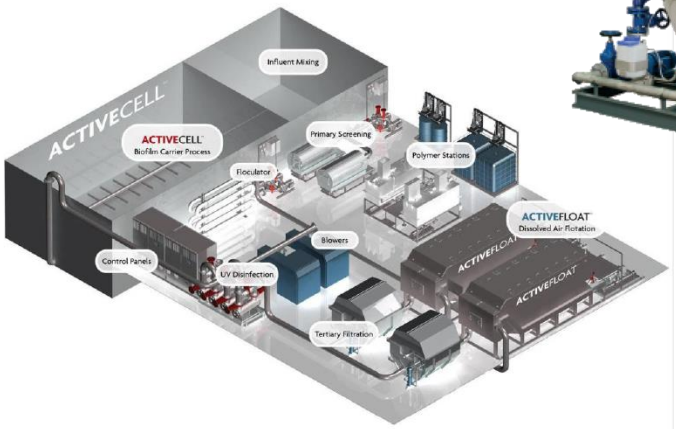
Energy Saving & Water Pollution↓

3-2 Treatment Sector : On-Board Treatment System

Discharge or Reuse Treated Grey Water On Board

AWTS Advanced Water Treatment System

MBR Membrane Bioreactor



LESSEN

- Bacteria
- Microplastic
- Chemical Substances

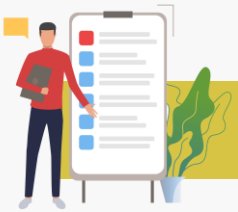
SOLVE

- Mixed Volume Increase
- Solids & Nutritional load
- Laundry Chemicals, etc

3-3 Treatment Sector : Reception Facility

Port/Terminal Provision of Reception Facility

Measurements



Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

Phase 1 Research & Prepare for regulation

STEP 03 Analyze &Predict

STEP 02 Measure & Monitor

STEP 01 Investigation

3-3 Treatment Sector : Reception Facility

Port/Terminal Provision of Reception Facility

Regulation 12 Reception Facilities

INSERT new paragraph 3

3 The Government of each Party to the Convention, which has ports and terminals under its jurisdiction in the Arctic, undertakes to ensure that:

.1 the facilities for the reception of grey water are provided in ports and terminals which are used by passenger ships operating in the Arctic;

.2 the facilities are adequate to meet the needs of those passenger ships operating in the Arctic; and

.3 the facilities are operated so as not to cause undue delay to those passenger ships operating in the Arctic.

3-3 Treatment Sector : Reception Facility

Port/Terminal Provision of Reception Facility

Object and Goal

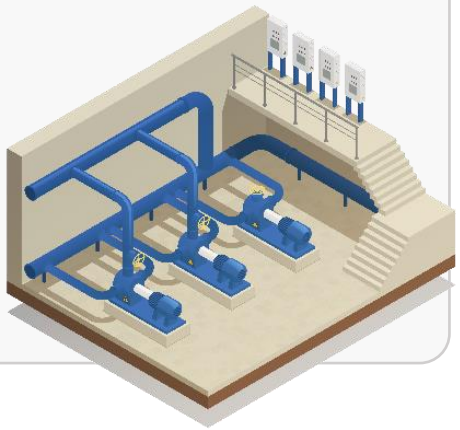
- For ships **not equipped certificated treatment system**
  ex) small ships, old cruises
- For **proper and systematic** grey water treatment process
- To **reduce illegal grey water discharges**

3-3 Treatment Sector : Reception Facility

Port/Terminal Provision of Reception Facility

Example of Reception Facilities

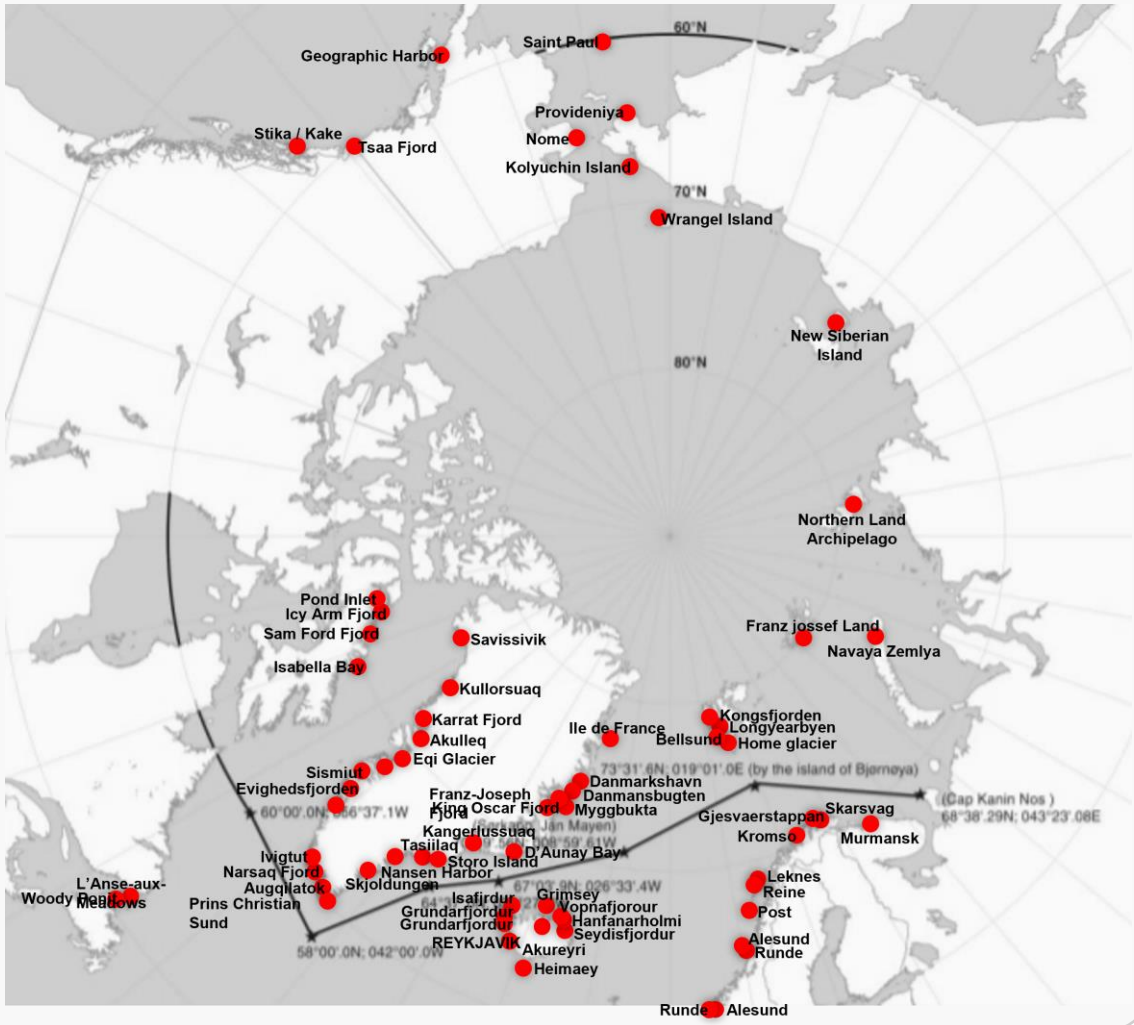
- **Tank trucks / Mobile** reception facilities for ships which cannot use land facilities
- Narrow the **interval of the discharge points**
- Supplement **existing sewage facilities**



3-3 Treatment Sector : Reception Facility

Port/Terminal Provision of Reception Facility

Example of Ports & Anchorages in the Arctic



Extent of Arctic waters & **Major ports** of cruise (Crystal Cruise, Ponant)

3-4 Treatment Sector : Gradual Implement

3 Phases to Apply Grey Water Treatment Regulations

Measurements

Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

Phase 1 Research & Prepare for regulation

STEP 03 Analyze &Predict

STEP 02 Measure & Monitor

STEP 01 Investigation

3-4 Treatment Sector : Gradual Implement

3 Phases to Apply Grey Water Treatment Regulations

Apply to ALL VESSELS

Phase 3

Apply **Arctic** **All Type** Ships

Phase 2

Apply **Arctic** **Passenger** Ships

Phase 1

- Before the amended regulations take effect
- Estimate grey water generation/discharge in the Arctic
- Prepare Reception Facilities and Treatment Systems

3-5 Monitoring Sector : Monitoring system

Discharge-Pollution-Impact Monitoring System

Measurements

Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

Phase 1 Research & Prepare for regulation

STEP 01 Investigation

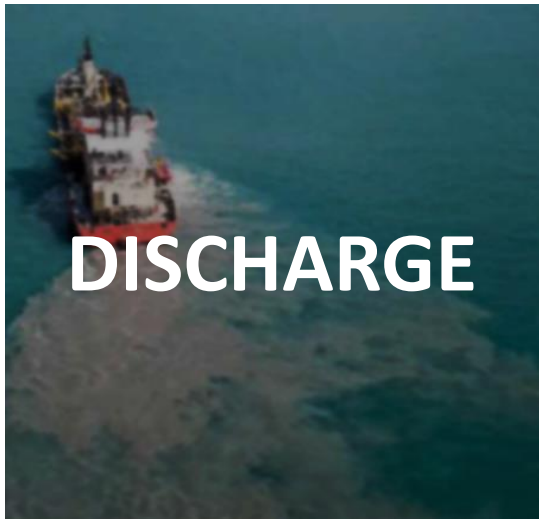
STEP 02 Measure & Monitor

STEP 03 Analyze &Predict

3-5 Monitoring Sector : Monitoring system

Discharge-Pollution-Impact Monitoring System

The object for implementation of Monitoring System



- **Source** of Pollutant
- **Amount** of Pollutant

- Pollutant **concentration**
- Pollutant **diffusion**

Analyze, Predict effects

- Local Societies
- Ecosystems

3-5 Monitoring Sector : Monitoring system

Discharge-Pollution-Impact Monitoring System

Gradual steps for implementation of
Discharge – Pollution – Impact Monitoring System

STEP 01
Investigation

- Investigate pollutants
- Determine target ships & Investigate emissions
- Estimate data & Assess the risks

STEP 02
Measure & Monitor

- Monitor in Port & Region
- Measure water pollutant concentration in the sea

STEP 03
Analyze &Predict

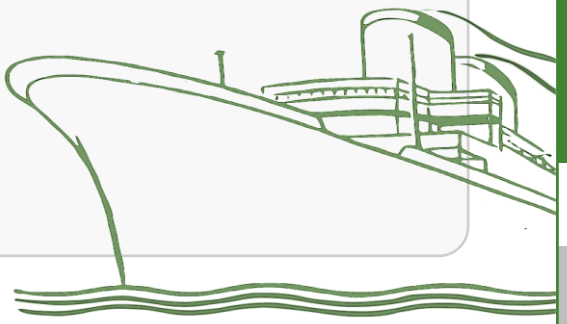
- Analyze & predict
  - Impacts on the Arctic from various angles
- Utilize already equipped system – AIS, etc

3-5 Monitoring Sector : Monitoring system

Discharge-Pollution-Impact Monitoring System

Expected Effects

- **Systematic Management at Port/Terminal**
  for Grey Water Discharge from the Ship
- **Assessment of Continuity & Effectiveness**
  of this regulation
- **Internationally Standardized Method**
  for measurement & prediction
  of grey water production/discharge
- **Baseline Data** for various researches



CONCLUSION

Part
04

4-1 Main Points of Proposals

Proposal for Handling Grey Water in the Arctic Water

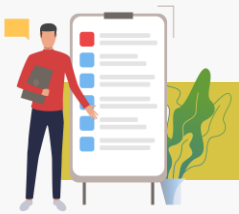
Background

- Increasing **Vessel Traffic** in the Arctic
- Increasing **Grey Water Generation** from ships
- Specificity of **the Arctic**
- Risk of **Grey Water**

Problem

- NO **International/Mandatory** Regulations for grey water
- Already be **Cognizant** of **Necessity** for Regulation by IMO

Measurements



Treatment

- On-board Treatment System
- Reception Facilities

Monitoring

Discharge-Pollution-Impact Monitoring System

Implements

Phase 3 Apply Arctic All Type Ships

Phase 2 Apply Arctic Passenger Ships

Phase 1 Research & Prepare for regulation

STEP 03 Analyze &Predict

STEP 02 Measure & Monitor

STEP 01 Investigation

1

PREVENTIVE & SUSTAINABLE management

2

TRIGGERS for
PREEMPTIVE regulations / international discussions

SAFE and CLEAN SEA !

2021 Mock IMO

THANK YOU

TEAM Triple-Silver

References

- William D.Halliday, Pierre-Louis Tetu, Jackie Dawson, Stephen J.Insley, and R.Casey Hilliard. “Tourist vessel traffic in important whale areas in the western Canadian Arctic: Risks and possible management solutions”. Marine Policy. November 2018.
- “Canadian arctic greywater report: estimates, forecasts, and treatment technologies”. Vard Marine Inc. 2018.
- Me issa Parks, Austin Ahmasuk, Barry Compagnoni, Andrew Norris, and Roger Rufe. “Quantifying and mitigating three major vessel waste streams in the northern Bering Sea”. Marine Policy. August 2019.
- “Graywater Discharges from Vessels”. U.S. EPA. 2011.
- “Projections for ship-generated waste traveling through the Canadian Arctic”. Vard Marine Inc. June 26, 2015.
- “Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues”. Congressional Research Service. November 17, 2008.
- Furstenberg, S, Mohn, H, Sverud, T. “Study on discharge factors for legal operational discharges to sea from vessels in Norwegian waters”. Hoevik: Det Norske Veritas, 2009.
- "Grey water dumping threatments ocean health and people". WWF. May 19, 2020.
- “All You Need to Know About Greywater Discharge From Ships”. Ocean Conservancy. MAY 2019.
- "Guidelines for the safe use of wastewater. excreta and greywater: Volume IV excrea and greywater use in agriculture". WHO. April 2013.
- “Health Information: Grey Water Re-use”. Government of B.C., 2017.
- “Using Graywater and Stormwater to Enhance Local Water Supplies: An Assessment of Risks, Costs, and Benefits”, The National Academies Press (NAP), 2016
- Ed White. “Grey Water from Passenger Vessels in Alaska 2000-2019”. Ocean Conservancy. 2021
- Ahn Yongsung. “A Study on Management Standards and Assessment Model for the Atomospheric Environment of Ports” Korea Maritime Institute. 2020

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