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Korea Center for International Maritime Safety Cooperation

EKC2022
Europe-Korea Conference on Science and Technology



IMO Strategy on Decarbonization and Autonomous Ships

Mingyu Kim, Ph.D., Head of Research

Korea Center for International Maritime Safety Cooperation (KMC)

한국해사안전국제협력센터
Korea Center for International Maritime Safety Cooperation

21 July 2022

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Introduction to KMC



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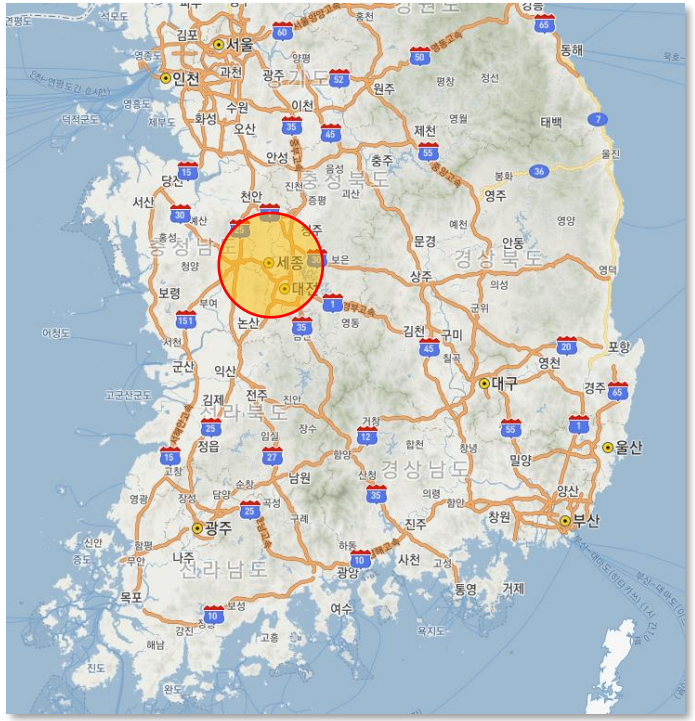
Korea Center for International Maritime Safety Cooperation

1. Introduction to KMC

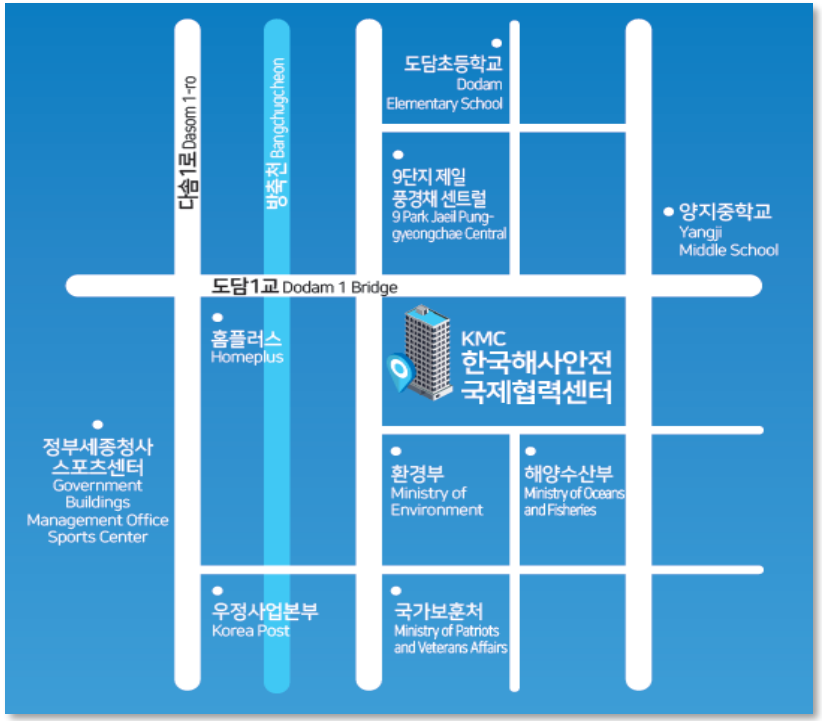
- **Name:** Korea Center for International Maritime Safety Cooperation (KMC)
- **President:** Booki Kim (also, President of KRISO)
- **Established:** January, 2014
- **Vision**
  Aiming at developing Korea's shipping & shipbuilding industries, and improving the efficiency of Korea's activities for maritime safety & marine environmental protection in maritime sector, especially IMO
- **Member Organization**
  (8 Regular Members) KRISO, KOMSA, KR, KSA, KOSHIPA, KOEM, KSA, KIMFT
  (2 Associate Members) KOMDI, KTR
  (1 General Member) KOBC



1. Location







- **Address** F5, 492, Hannuri-daero, Sejong, 30103, Republic of Korea
- **Homepage** http://www.imokorea.org

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1. History of KMC

(2007.11) Establishment of KMC (Korea Maritime Center) & KMC UK Office in London

(2014.01) Establishment of KMC (Korea Center for International Maritime Safety Cooperation)

(2018.03) Opening of Maritime Research Institute in KMC (Busan)

(2019.03) Relocation of KMC (Sejong)

'07 — '14 — '18 — '19

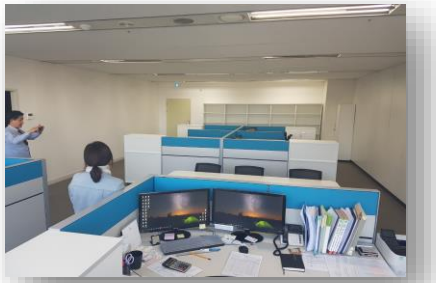


KMC Steering Committee (2013)



KMC Working Committee (2018)









Office & Meeting room (Sejong)

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1. Major Activities

Comprehensive Response to IMO and other related Organizations & Relevant Research on Maritime Policy

- **Responding to IMO and Conducting Relevant Research**
  (Development & review of IMO agenda, and proposal of countermeasures)
- **Research on Maritime Policy related to Maritime Safety and Marine Environmental Protection**
- **Supporting International Standardization of Korea's New Technologies**
  (Supporting Stakeholders in Korea according to Changes in International Standards)
- **Supporting Maritime Policy and International Cooperation of Korean Government**
- **Publication of Books and Newsletters regarding IMO and Maritime Issues**
  (IMO White Paper, International Maritime News, etc.)

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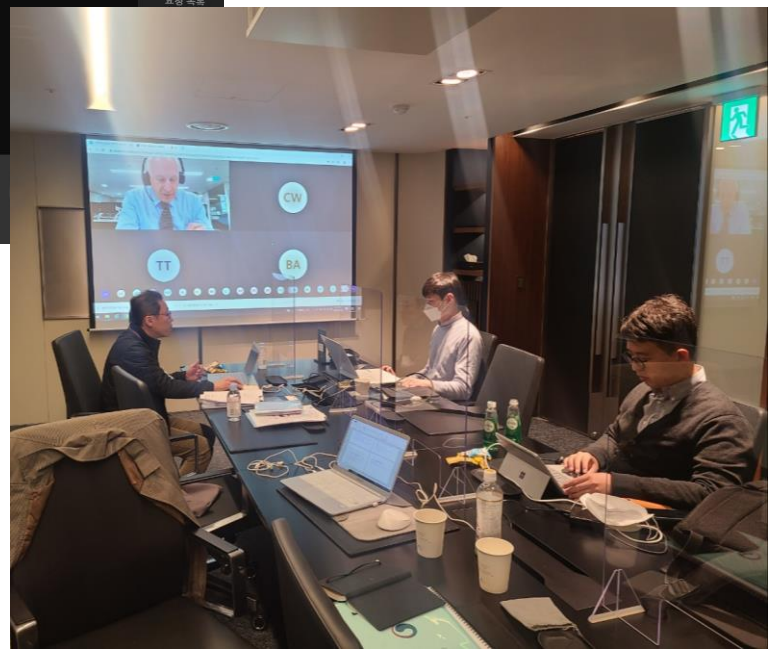
1. Major Activities







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1. Major Activities









Events & Meetings for International Cooperation
related to Maritime Fields

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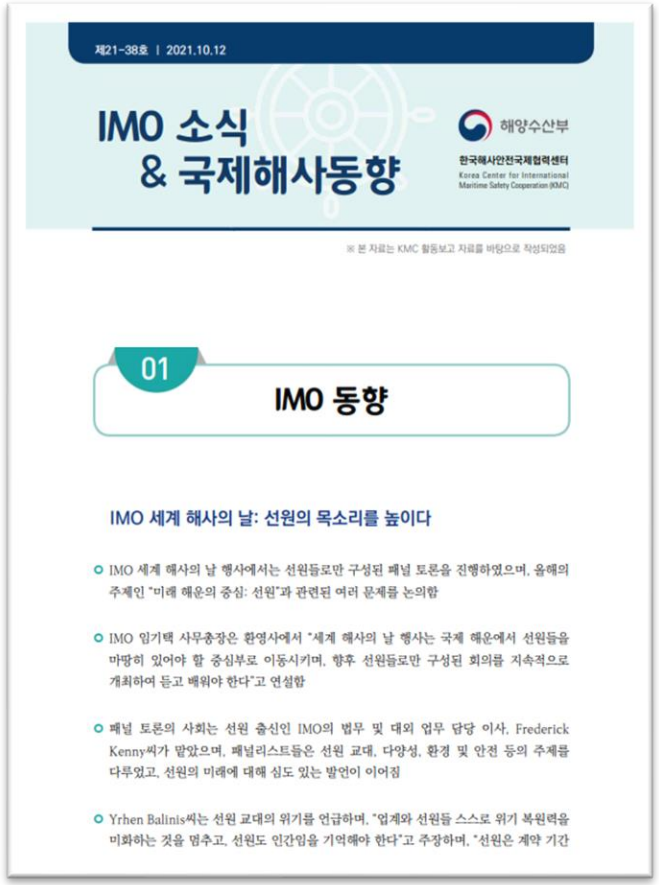
1. Major Activities


제21-38호 | 2021.10.12

IMO 소식
& 국제해사동향

해양수산부
한국해사안전국제협력센터
Korea Center for International Maritime Safety Cooperation (KMC)

※ 본 자료는 KMC 활동보고 자료를 바탕으로 작성되었음

01 IMO 동향

IMO 세계 해사의 날: 선원의 목소리를 높이다

- IMO 세계 해사의 날 행사에서는 선원들로만 구성된 패널 토론을 진행하였으며, 올해의 주제인 "미래 해운의 중심: 선원"과 관련된 여러 문제를 논의함
- IMO 임기택 사무총장은 환영사에서 "세계 해사의 날 행사는 국제 해운에서 선원들을 마땅히 있어야 할 중심부로 이동시키며, 향후 선원들로만 구성된 회의를 지속적으로 개최하여 듣고 배워야 한다"고 연설함
- 패널 토론의 사회는 선원 출신인 IMO의 법무 및 대외 업무 담당 이사, Frederick Kenny씨가 맡았으며, 패널리스트들은 선원 교대, 다양성, 환경 및 안전 등의 주제를 다루었고, 선원의 미래에 대해 심도 있는 발언이 이어짐
- Yrhen Balinis씨는 선원 교대의 위기를 언급하며, "업계와 선원들 스스로 위기 복원력을 미화하는 것을 멈추고, 선원도 인간임을 기억해야 한다"고 주장하며, "선원은 계약 기간

Weekly Newsletter on IMO and International Maritime Trends


해사안전소식

2021 가을호(통권 제54호)
Maritime Safety World July-September, 2021

KMC 한국해사안전국제협력센터

Maritime Newsletter (quarterly basis)

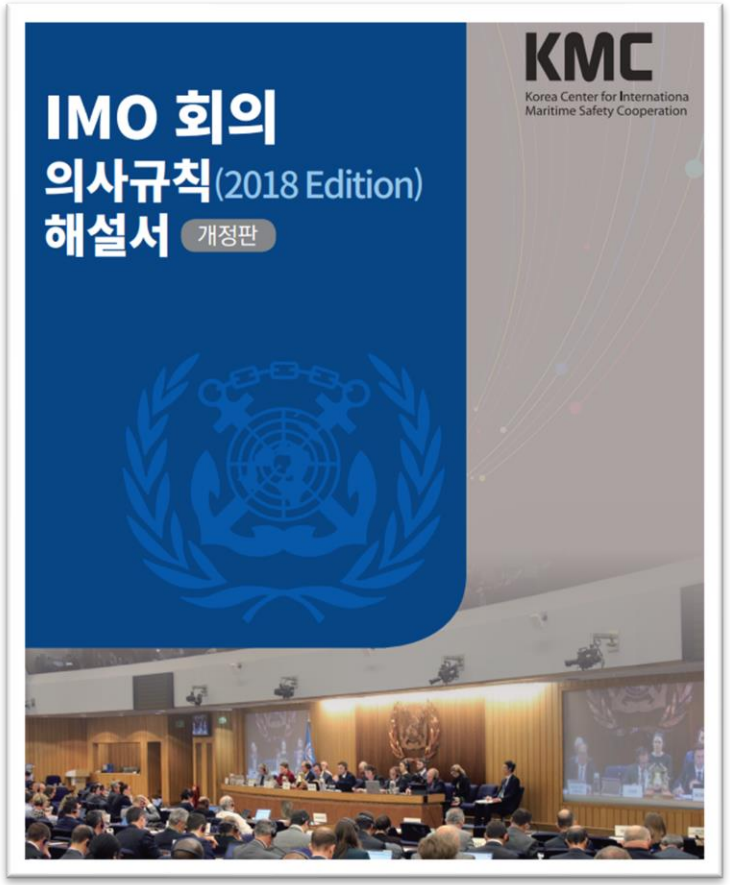

KMC 한국해사안전국제협력센터

IMO Annual White Paper
IMO 연간활동백서
2021

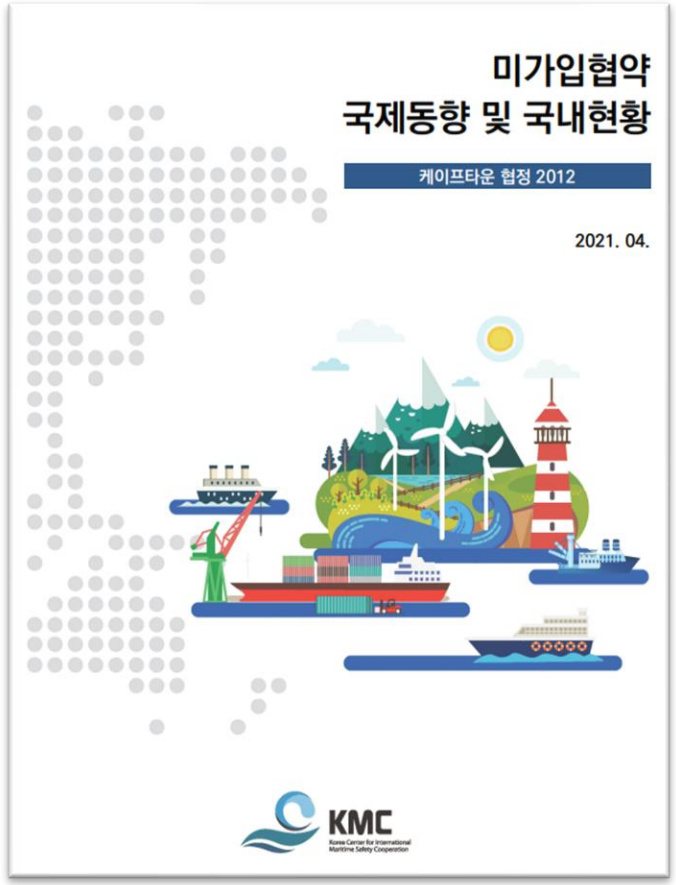
2021 The 2021 Mock IMO Assembly
모의IMO총회

IMO White Paper (annual basis)

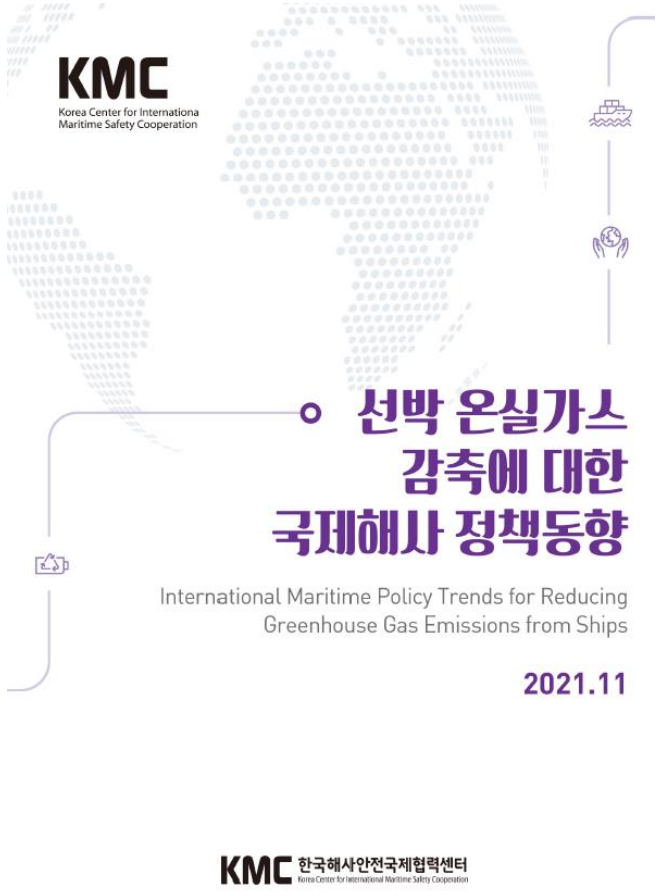
1. Major Activities



Guidebook of IMO Rules of Procedure



Research on IMO Instruments



Research on Maritime Policy

1. Research Projects

- Development of lifecycle innovation technology for eco-friendly ships (2022-2031)
- Development of safety-based technologies for hydrogen-fueled ship and relevant system (2022-2026)
- Development of maritime network technology and diversification of LTE-Maritime user equipment (2022-2023)
- Research on IMO environmental regulations and standards (2021-2022)
- IMO strategic research (2020-2022)
- Research on establishment of foundation for commercialization of eco-friendly ship (2021-2022)
- Capacity-building in international maritime sector (2021-2022)

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IMO Strategy on Decarbonization



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2. Evolution of Fuels for Ships

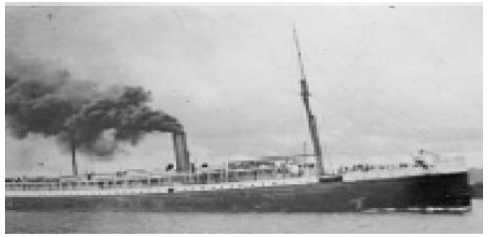
Key Driving Forces

- Technology
- Cost competitiveness
- Safety, Effectiveness and Efficiency
- **(New) Regulations for emissions (NOx, SOx, GHG, Etc.)**
- **(New) Infrastructure and Supply for Alternative Fuels**



Great Smog of London, and Clean Air Act(1956)





World first steam turbine ship : Turbina (1894)



World first diesel engine ship : M/S Selandia (1912)



World first LNG-Fuelled Container Ship : Isla Bella (TOTE Maritime) (2015)

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2. Adoption and Progress of the Conventions on Climate Change



1st World Climate Conference (WCC)



Adoption of Kyoto Protocol



Doha Climate Gateway (2013-2020)

1979 — **1992** — **1997** — **Kyoto Regime** — 2005 — 2012 — **2015** — **2021** — **Post-2020 Climate Regime**

Adoption of UNFCCC

Kyoto Protocol entered into force

Paris Agreement



Note:
- ✓ UNFCCC: United Nations Framework Convention on Climate Change
- ✓ Limitations of the Kyoto Protocol: refusal to participate in some advanced countries, absence of obligations for developing countries, etc.
- ✓ Goal of Paris Agreement is to limit global warming to well below 2, preferably to 1.5℃, compared to pre-industrial (1850-1900) levels

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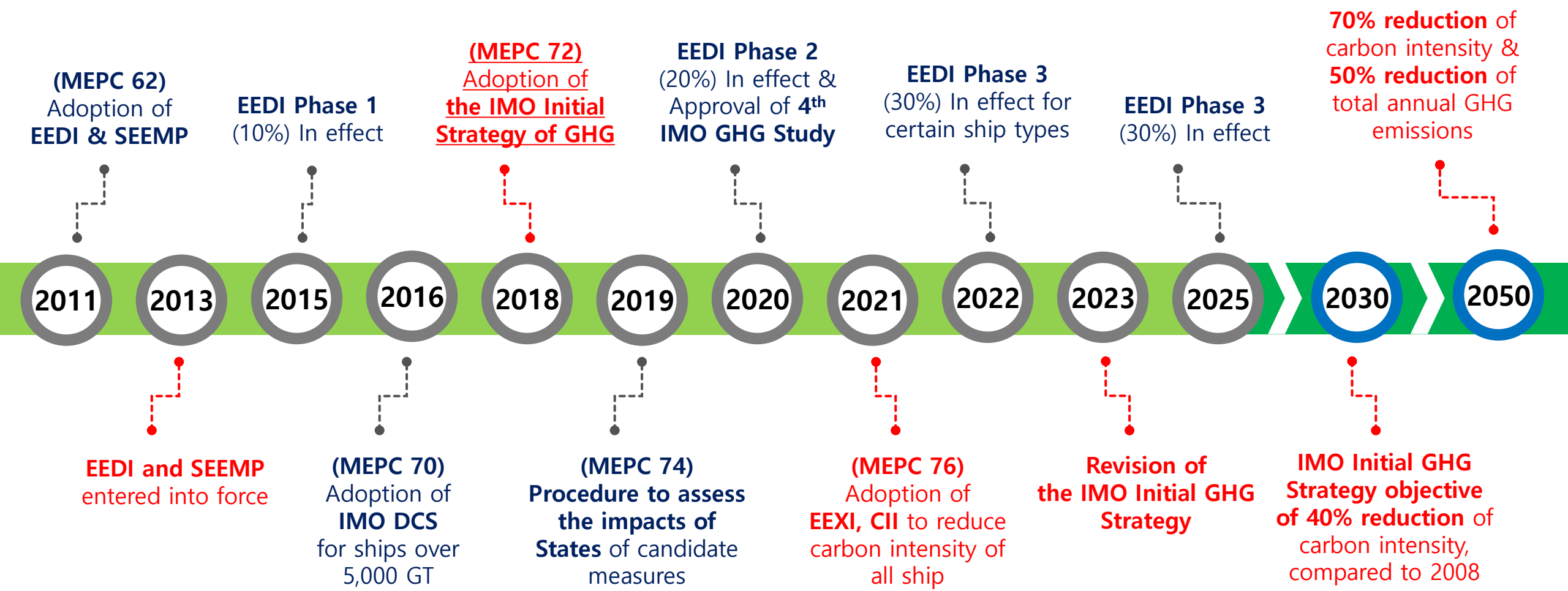
2. Overview of IMO Roadmap for Reducing GHG



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2. IMO Strategy for Reducing GHG Emissions from Ships

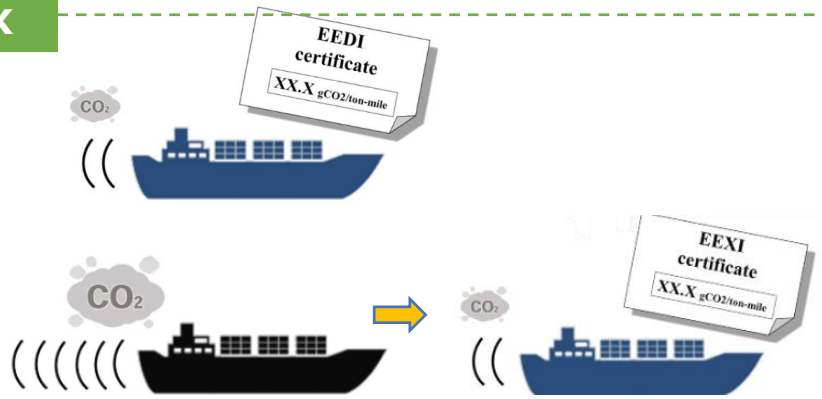
IMO GHG Strategy

IMO Energy Efficiency Framework

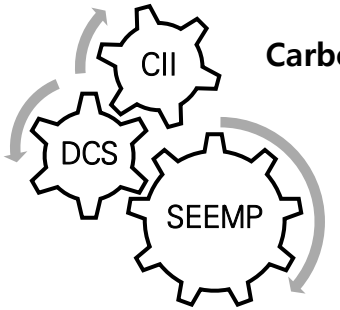
Technical Measures

NEW SHIP — **EEDI:** Energy Efficiency Design Index

EXISTING SHIP — **EEXI:** Energy Efficiency Existing Ship Index



Operational Measures

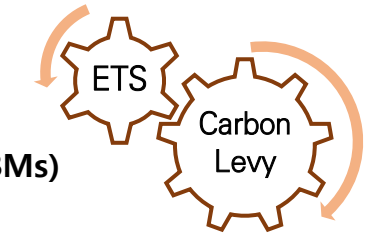


Carbon Intensity Indicator (CII)

Data Collection System (DCS)

Ship Management Plan to Improve Energy Efficiency (SEEMP)

Market Based Measures



International Maritime Research and Development Board (IMRB)

Market Based Measures (MBMs) **?**

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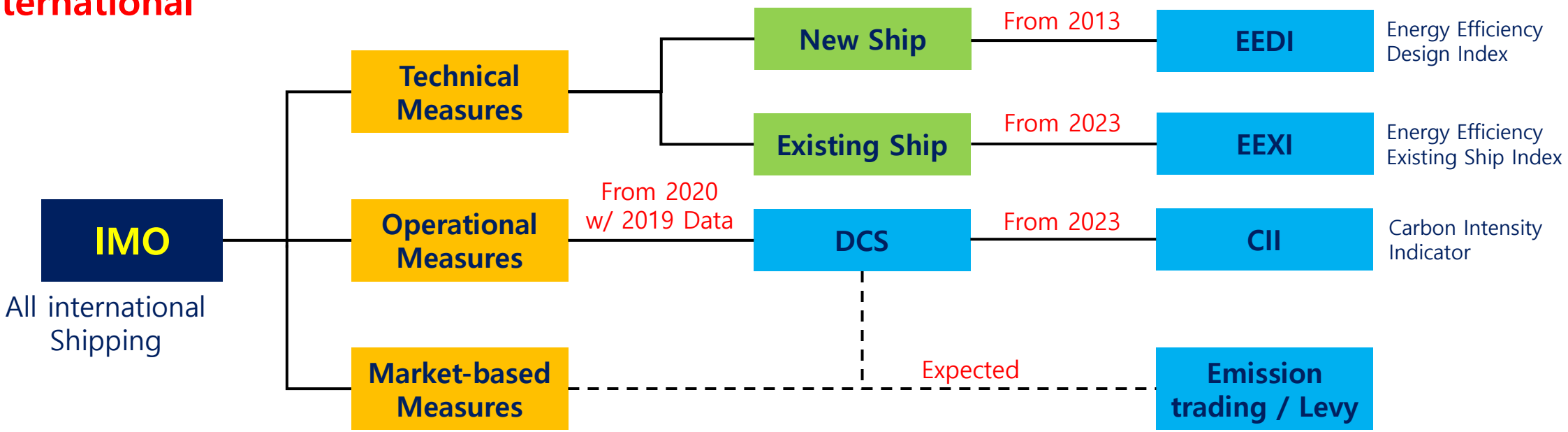
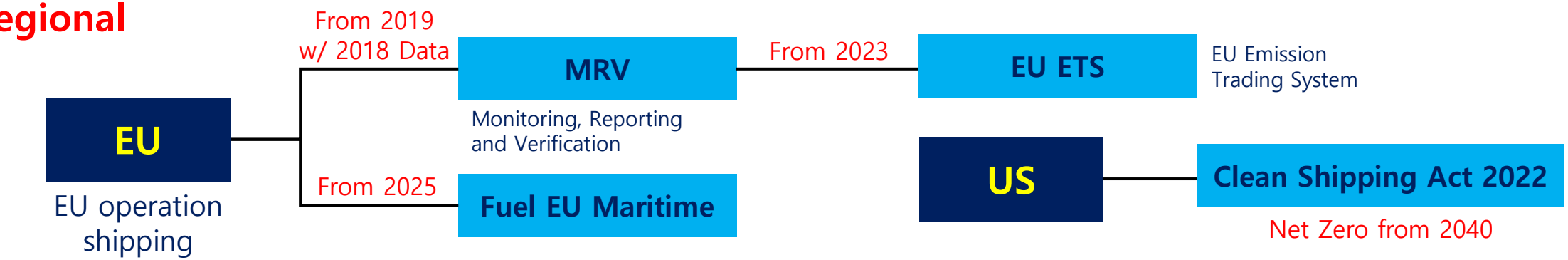
2. International and Reginal Measures for Reducing GHG

- **International**



- **Regional**



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2. IMO Roadmap for Reducing GHG (Now and Near Future)

Short-Term(ST)
Mid-Term(MT)/Long-Term(LT)
IMO Initial Strategy

ST: '18~'23 (implement from '23)
MT: '23~'30 (develop and Implement)
LT: '30~ (develop and Implement)

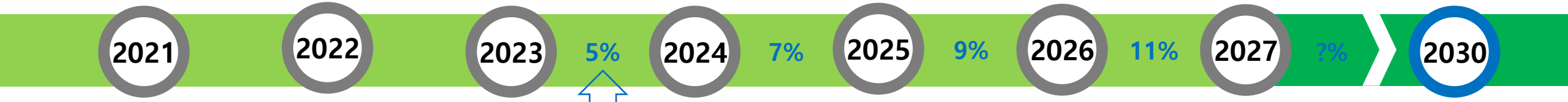
(MEPC 76)
Adoption of **EEXI, CII**

('23.1.1.)
Entering in Force of **EEXI, CII**

(MEPC 80) Revision of the IMO Initial GHG Strategy & LCA Guidelines

('26.1.1.)
Completion of Review on **Short-Term Measures**

Revised Initial GHG Strategy objective of **?% reduction** of carbon intensity, compared to 2008



Reduction Rate of CII

(MEPC 76~78)
Initial Consideration of Proposals for **Mid-/Long-Term Measures**

(MEPC 78~80)
Assessment and Selection of **Mid-/Long-Term Measures**

('24~'26)
Expected that Development of **MT Measures** to be finalized **with agreed target date(s)**

(**Note1**) 3 factors for assessment of MT measures
1) Feasibility
2) Effectiveness to achieve target
3) Impact on States

(**Note2**) 3 Proposals for MT measures
1) Technical
2) Economical (ETS, GHG Levy)
3) Combined

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2. IMO Conventions to Measures for Reducing GHG

EEDI	Energy Efficiency Design Index	→ **MARPOL Annex VI, Chapter IV** **Reg. 20 (Attained EEDI) / Reg. 21 (Required EEDI)**
SEEMP	Ship Energy Efficiency Management Plan	→ **MARPOL Annex VI, Chapter IV** **Reg. 22 (SEEMP) – Part I for CII / Part II for DCS**
DCS	Data Collection System	→ **MARPOL Annex VI, Chapter IV** **Reg. 22A** (Collection and reporting of ship fuel oil consumption data)
EEXI	Energy Efficiency Existing Ship Index	→ **MARPOL Annex VI, Chapter IV** **Reg. 20A (Attained EEXI) / Reg. 21A (Required EEXI)**
CII	Carbon Intensity Indicator	→ **MARPOL Annex VI, Chapter IV** **Reg. 22 (SEEMP) – Attained CII / Required CII**
MBM	Market-based Mechanism	→ 8 MBM proposals, *suspended discussions from MEPC 65
Initial IMO Strategy		→ **Resolution MEPC.304(72)** adopted at MEPC 72

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IMO Strategy on Autonomous Ships



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3. Expected Effects of Introduction of Autonomous Ships

Items	Expected Effects
Reduction of Marine Accidents	• Reduction of human errors and marine accidents due to accident prevention and response system • Improvement of safety by predicting, diagnosing and servicing engines and systems in advance
Resolving the Shortage of Seafarers	• Resolving the shortage of seafarers, and improving the working environment • Growing demand for professionals on shore
Reduction of Ship Operating and Managing Costs	• Reducing fuel and labor costs • Reduction of operating costs due to reduction of maintenance and downtime
Reduction of GHG Emissions from Ships	• Reduction of GHG through optimization of flight and ship operation • Increase of operational efficiency and reduction of GHG by reducing waiting time in ports
Etc.	• Industrialization of shipbuilding and shipping with smart technology • creation of new industries and expansion of existing ones.

3. Expected Effects of Introduction of Autonomous Ships

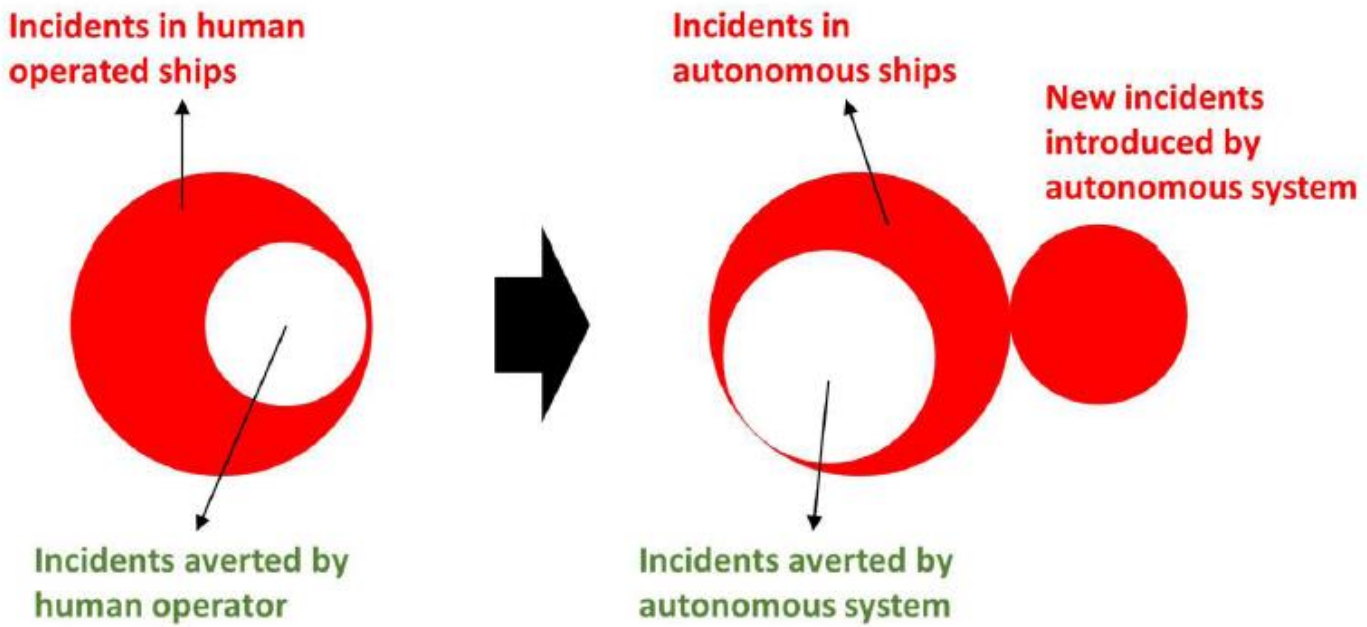

Figure 3. Remaining incidents in the autonomous ship after implementing autonomous navigation systems [59].

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3. Decisions on Development of IMO Instruments on MASS

IMO Meetings	Date	Decisions
MSC 98	**July 2017**	Agreed to include the Regulatory Scoping Exercise (RSE) for the use of MASS in the post-biennial agenda of MSC
MSC 100	**Dec. 2018**	Approved the framework and methodology for RSE for MASS, including preliminary definitions of MASS and degrees of autonomy
MSC 103	**May 2021**	Completed the RSE for MASS, and agreed that proposals for new outputs would be needed to address the various gaps in IMO instruments identified in the RSE.
MSC 104	**Oct. 2021**	Agreed to develop a goal-based instrument for MASS, and included a new output on "Development of a goal-based instrument for MASS".

Note:

- ✓ RSE 1st Step: identify current provisions in an agreed list of IMO instruments and assess how they may or may not be applicable to ships with varying degrees of autonomy and/or whether they may preclude MASS operations.
- ✓ RSE 2nd Step: determine the most appropriate way of addressing MASS operations, taking into account, inter alia, the human element, technology and operational factors.

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3. Preliminary Definition of Degrees of Autonomy

MASS Degree 1	MASS Degree 2	MASS Degree 3	MASS Degree 4
Ship with automated process and decision support	**Remotely controlled ship with seafarers on board**	**Remotely controlled ship without seafarers on board**	**Fully autonomous ship**
• Seafarers on board • Some operations automated and at times unsupervised with seafarers ready to control	• Controlled and operated from another location • Seafarers available on board to take control and operate	• Controlled and operated from another location • No seafarers on board	• The operating system of MASS is able to make decisions and determine actions by itself

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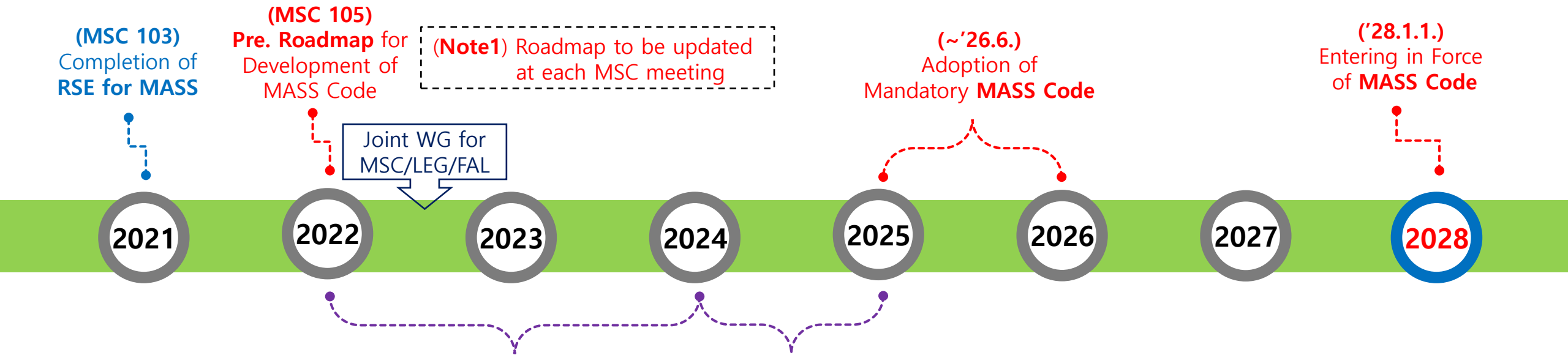
2. IMO Roadmap for Development of MASS Code



(**Note2**)
Definition for MASS and degrees of autonomy may be amended.

(MCC 106~108)
Development of
Non-mandatory Goal-based MASS Code

Approval of
Non-mandatory MASS Code, and
Finalization of the
draft mandatory MASS Code

(**Note3**) Initial direction of development of the Code
: Non-mandatory, cargo ship
(application to passenger ships at a later stage

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Maritime Policy in Korea



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4. The Oceans and Republic of Korea



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2. Korea's Status in International Maritime Sector

Raised the Status of Korea through Cooperative Activities

Republic of Korea



The World Merchant Fleet

No. 7



Shipbuilding Orders, Competitiveness

No. 1



'15 IMO Secretary-General

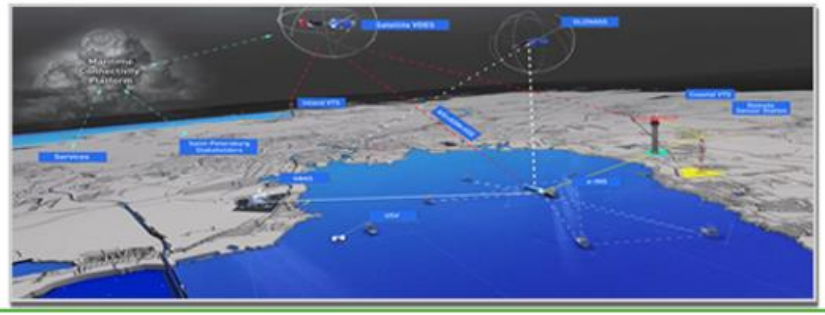
'19 IMO A Member for 10th consecutive term (2019, DEC)

Leading IMO Discussion through Technological Development

Spearheading ballast water market



International standardization of e-Nav.



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4. Roadmap for Reducing GHG Emissions

+ IMO Regulation on Air Pollutants from Ships



- 2018: Initial IMO Strategy on reduction of GHG emissions
- 2020: Global 0.5% Sulphur Cap
- 2022: Discussion on EEDI phase 4
- 2025: 50% reduction in carbon intensity
- 2030: Carbon intensity: 70% reduction
- 2050: GHG a year: 50% reduction

IMO INTERNATIONAL MARITIME ORGANIZATION

- 2019: National roadmap to reduce GHG from ships
  - "2030 Green State-owned Green Vessels"
  - Pomulgation of "Marine Environment Management Act" for Sulphur emissions
- 2023: Leading the establishment of mid- and long- term strategy to reduce GHG from ships
- 2025: Technologies for industrialization of green vessels, including battery-fueled & hydrogen

+ Vision for Regulation

('22.10.) 2050 Carbon Neutral Strategy
(~2030) Reduction GHG by 40%
(~2050) Net-zero compared to 2018 level

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4. Roadmap (Infrastructure) for Reducing GHG Emissions

+ Green Port & Infrastructure

2019	2020	2018~2022	~2025	~2030	~2050
Expanded installation of AMP in major ports (Busan, Incheon, etc.)	Setting Sulphur ECA (0.1%) in major ports	Developing LNG bunkering key tech & operational system	Establishing LNG bunkering infrastructure at major ports	Developing tech. for zero-carbon ships and commercialization	Establishing carbon-free ocean space



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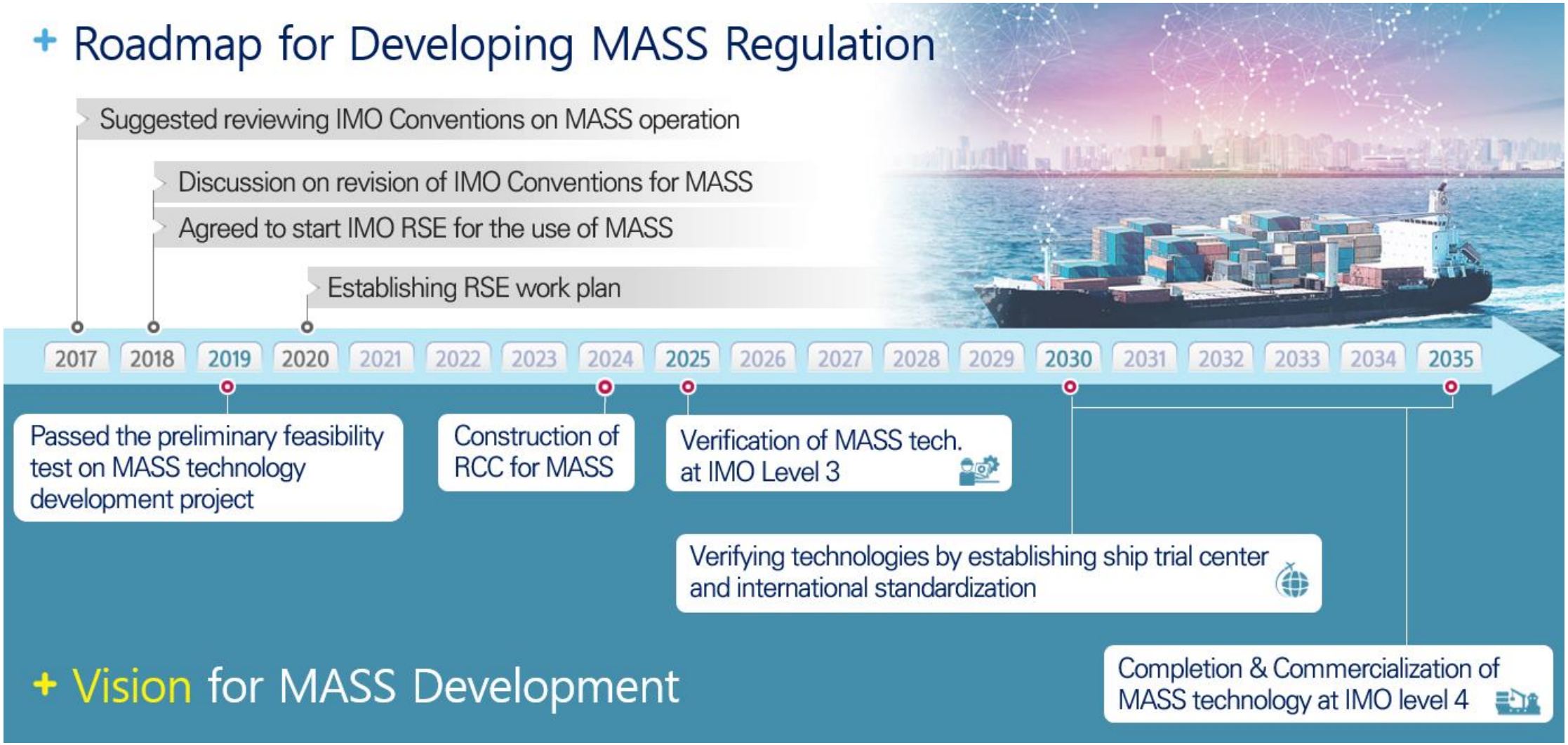
4. Roadmap for Developing Autonomous Ships



4. Roadmap (Infrastructure) for Developing Autonomous Ships

+ Smart Port & Infrastructure

2016~2020	2019	2020~2022	2022~2026	2026~2030
Establishment Project of Korean e-Nav.	Strategy Establishment of Smart Maritime Logistics	Providing e-Nav Service (LTE-M) to National Ships (Service since Jan. 30. '22)	Construction of Automated Smart Port Test Bed (Gwangyand Port)	Developing & Realizing Smart Maritime Logistics Technology



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EKC2022
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IMO KOREA
http://www.imokorea.org



Thank You for Your Attention

Q & A