

## MARLOG 12

Innovative Technologies for Ports and Logistics  
Towards a Sustainable Resilient Future



Arab Academy

for Science, Technology and Maritime Transport

# Capacity Building for Maritime Industry Towards Zero Emissions

## AASTMT Vision Post COP27

*Presented by*

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AASTMT

*Prepared by: AASTMT Team*



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# Capacity Building for Maritime Industry Towards Zero Emissions

AASTMT Vision Post COP27



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## Climate Change & COP27 Outcomes

Global  
Climate Change

COP27  
Outcomes

Maritime Industry  
& Climate Change

## Maritime Industry Response

Maritime Forecast  
2050

Maritime Industry  
Response

Digitalization & AI

## Technical/ Operational Challenges

Safety Challenges

Ports  
Readiness

Financial Challenges

## AASTMT & Capacity Building

Professional MET

Facilities  
& Instructors

Training Programs  
& Accreditations

GMP-BoK  
Implementation

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# Climate Change & COP27 Outcomes

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**Global Climate Change**

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**COP27 Outcomes**

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**Maritime Industry & Climate Change**

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## What is Climate Change?

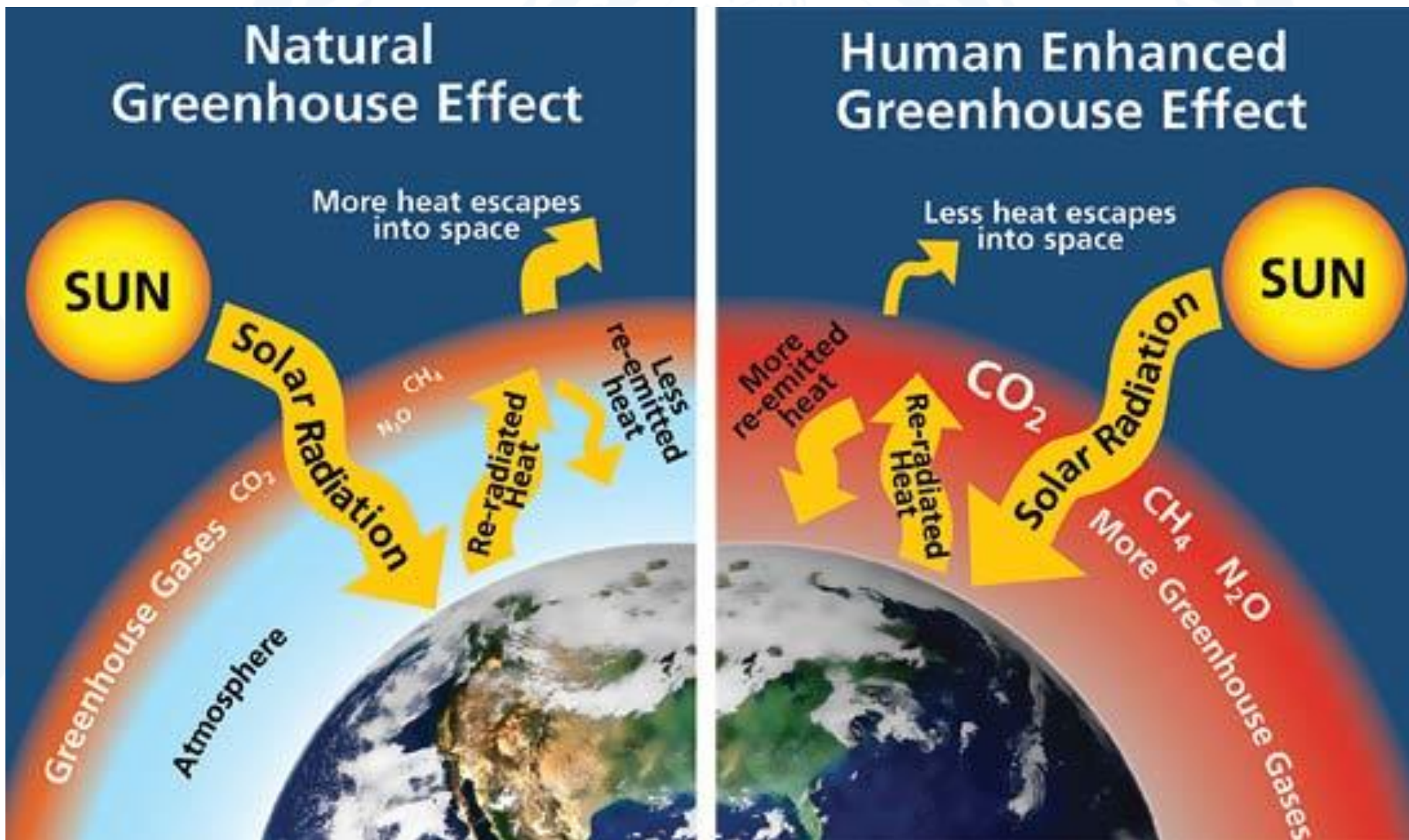
Climate change is a change in the pattern of weather, and related changes in oceans, Sea Level, land surfaces, and ice sheets, occurring over decades or longer.

NASA scientists observed Earth's surface warming, and the warmest years happened in the past 20 years.



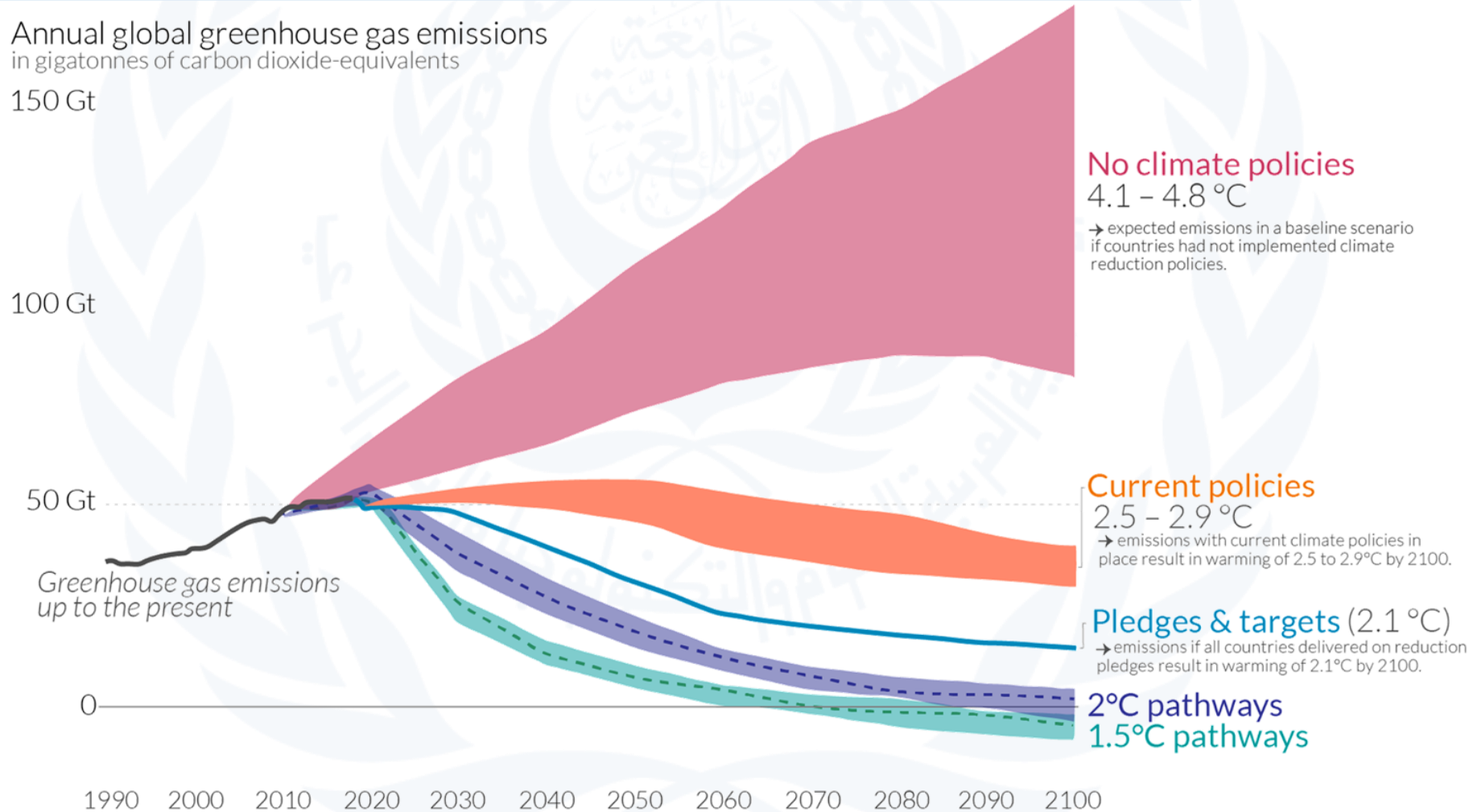


# Greenhouse Effect



# The Global Greenhouse Gas Emissions Scenario

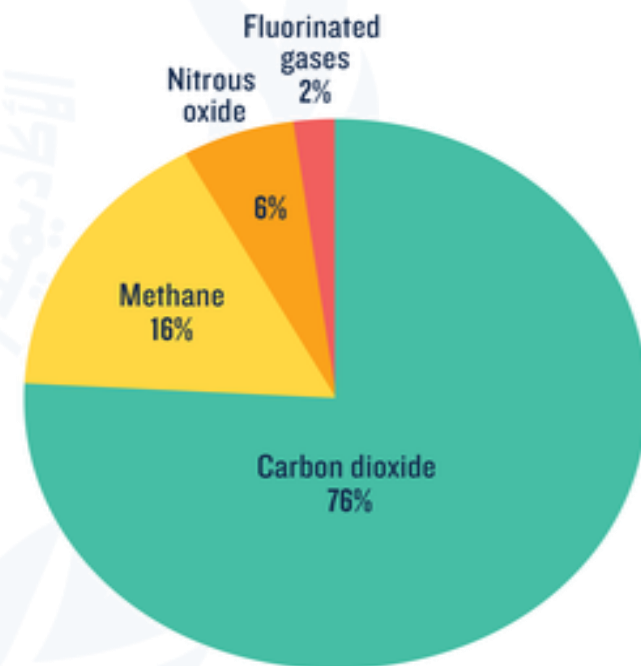
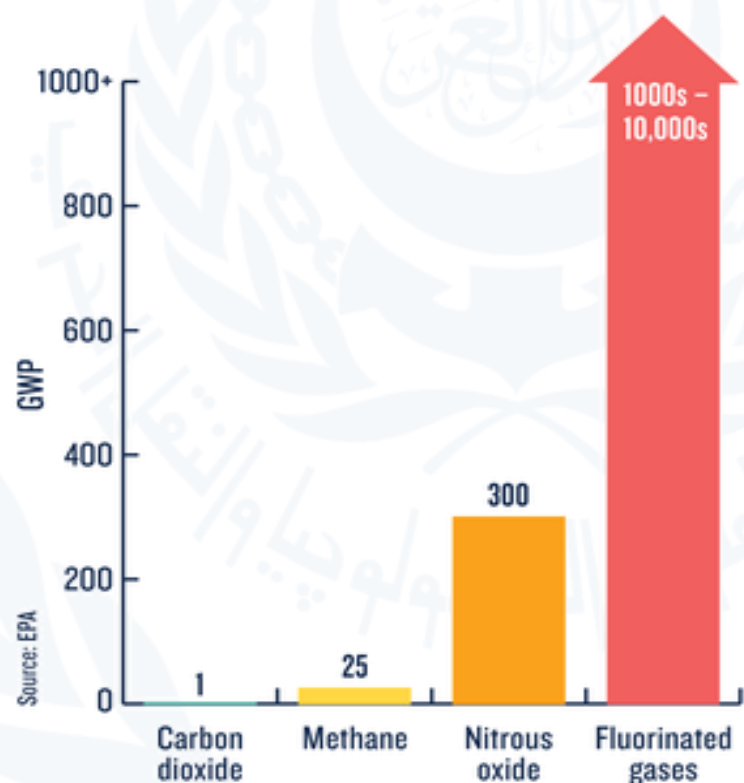
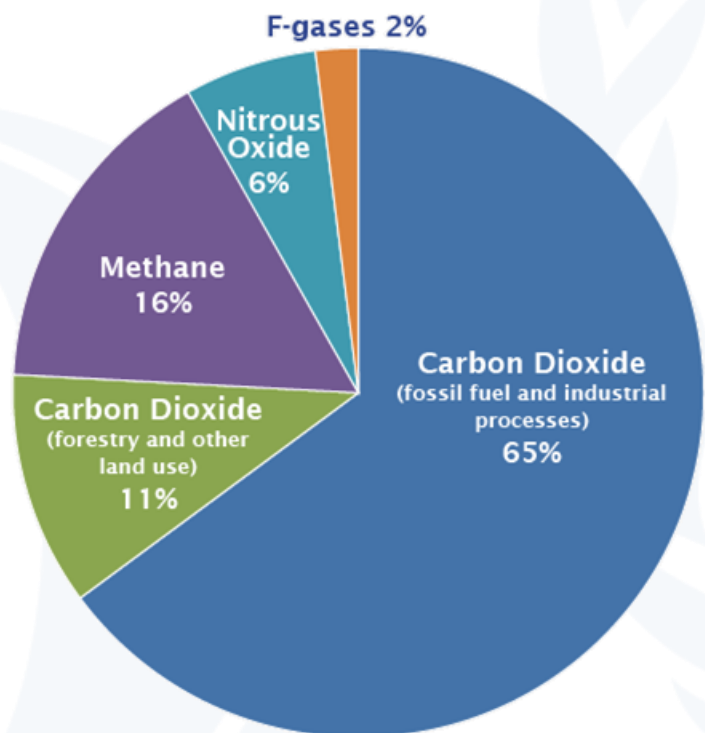
**Paris Agreement Goal: Global Warming below 2 Degrees compared to Pre- Industrial Levels**



**COP27 EGYPT**

# Greenhouse Gases (GHGs)

## HOW GREENHOUSE GASES WARM OUR PLANET



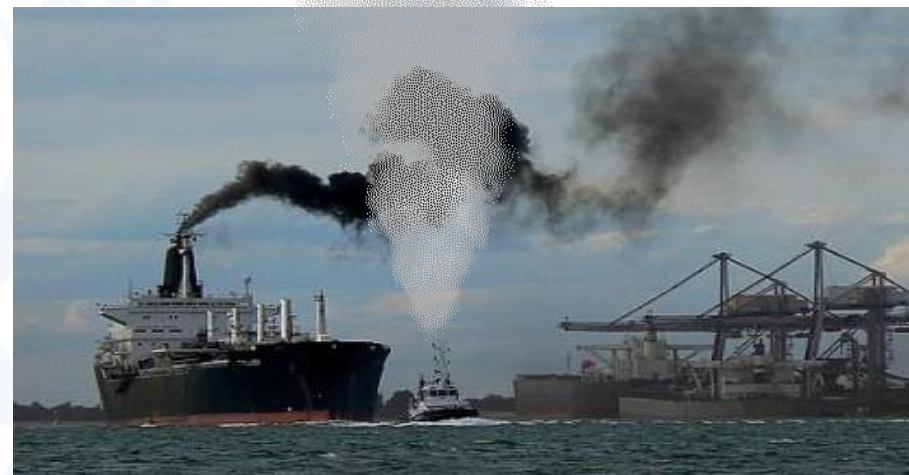
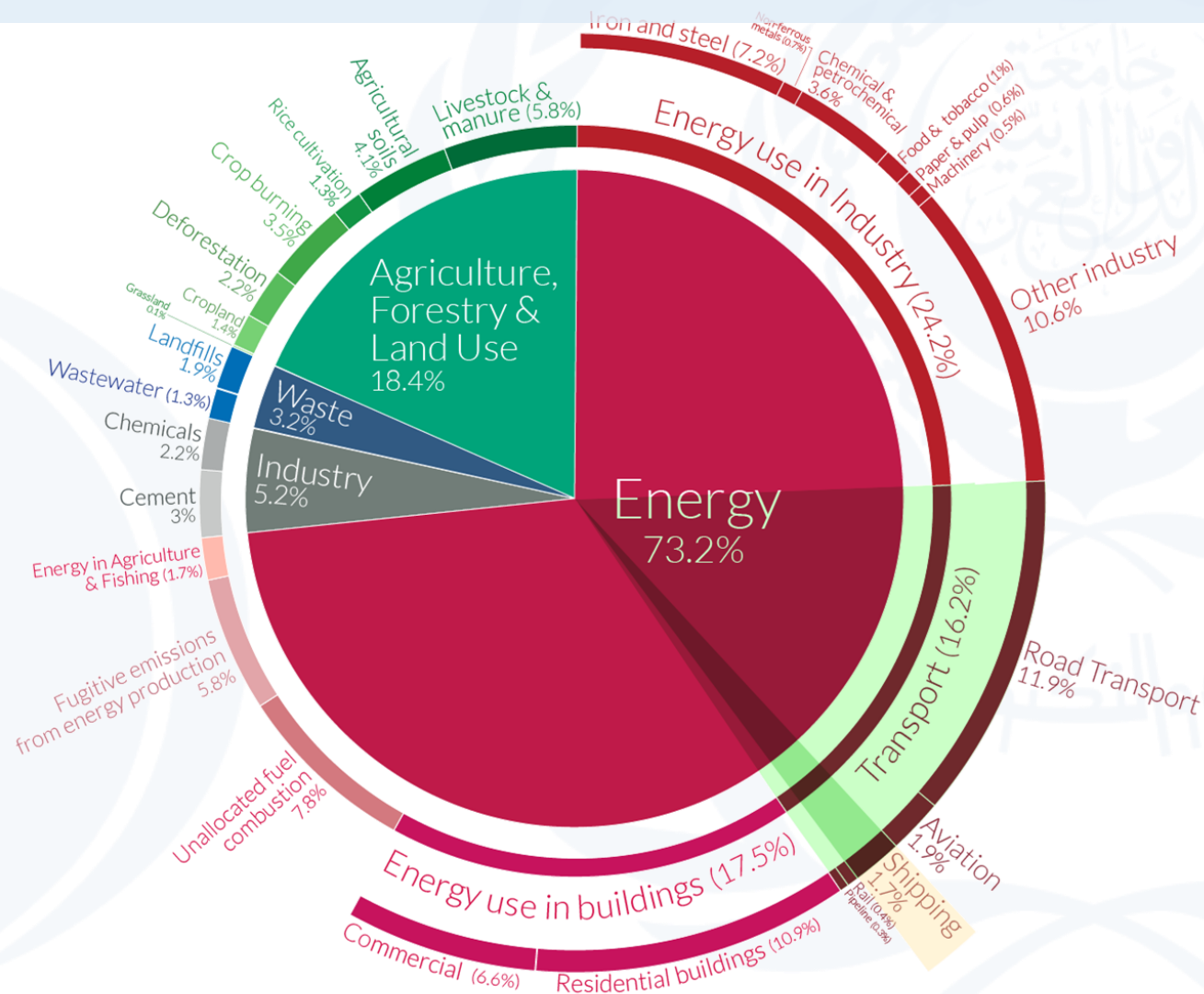
Source: IPCC (2014)

The global warming potential (GWP) of human-generated greenhouse gases is a measure of how much heat each gas traps in the atmosphere, relative to carbon dioxide.

How much each human-caused greenhouse gas contributes to total emissions around the globe.



# Global Greenhouse Gas Emissions by Sector



Sector	GHG Emission Share	Further Breakdown
Transport	16.2%	Road 11.9% Aviation 1.9% Rail 0.4% Pipeline 0.3% Ships 1.7%

## COP27 Outcomes

**The Longest COP ever (2 Weeks), with highest levels of representation.**

### COP27 Achievements

- A new Fund System for the Developing Countries to recover from the losses due to Climate Change Impacts caused by the Developed Countries
- The Global Methane Pledge, 30% reduction by 2030
- Renewable Sources of Energy “Mentioned for the First Time”
- The S.G. of the UN Antonio Guterres Regret that the largest polluting Countries did not enforce more commitments to Reduce Global Warming To 1.5 by 2100



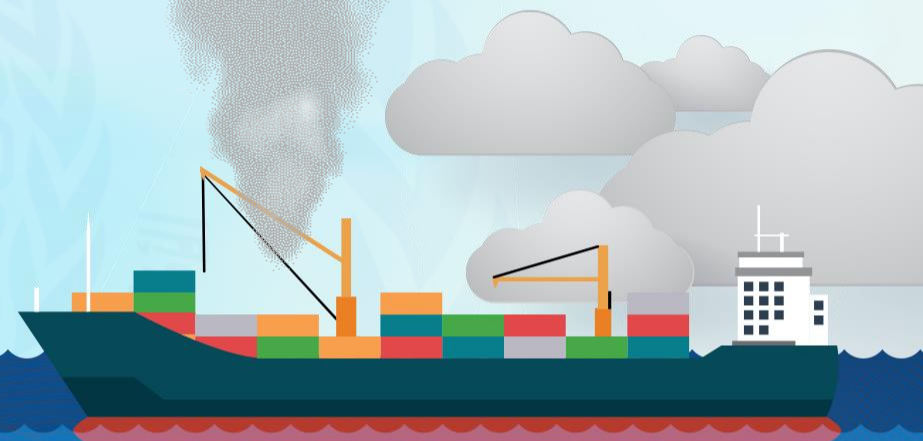
**COP27**

**SHARM EL-SHEIKH  
EGYPT 2022**



# Global Shipping is a Polluting Industry

## Burning Dirty Fuel



Global shipping industry was **NOT** included in the UNFCC Paris Agreement



Left unchecked, global shipping emissions could grow to

**17%**

of all CO<sub>2</sub> emissions by 2050\*

Germany



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Japan



\*Cames, M., Graichen, J., Slemmons, A., & Cook, V. (2015). Emissions reduction targets for International aviation and shipping. European Parliament.

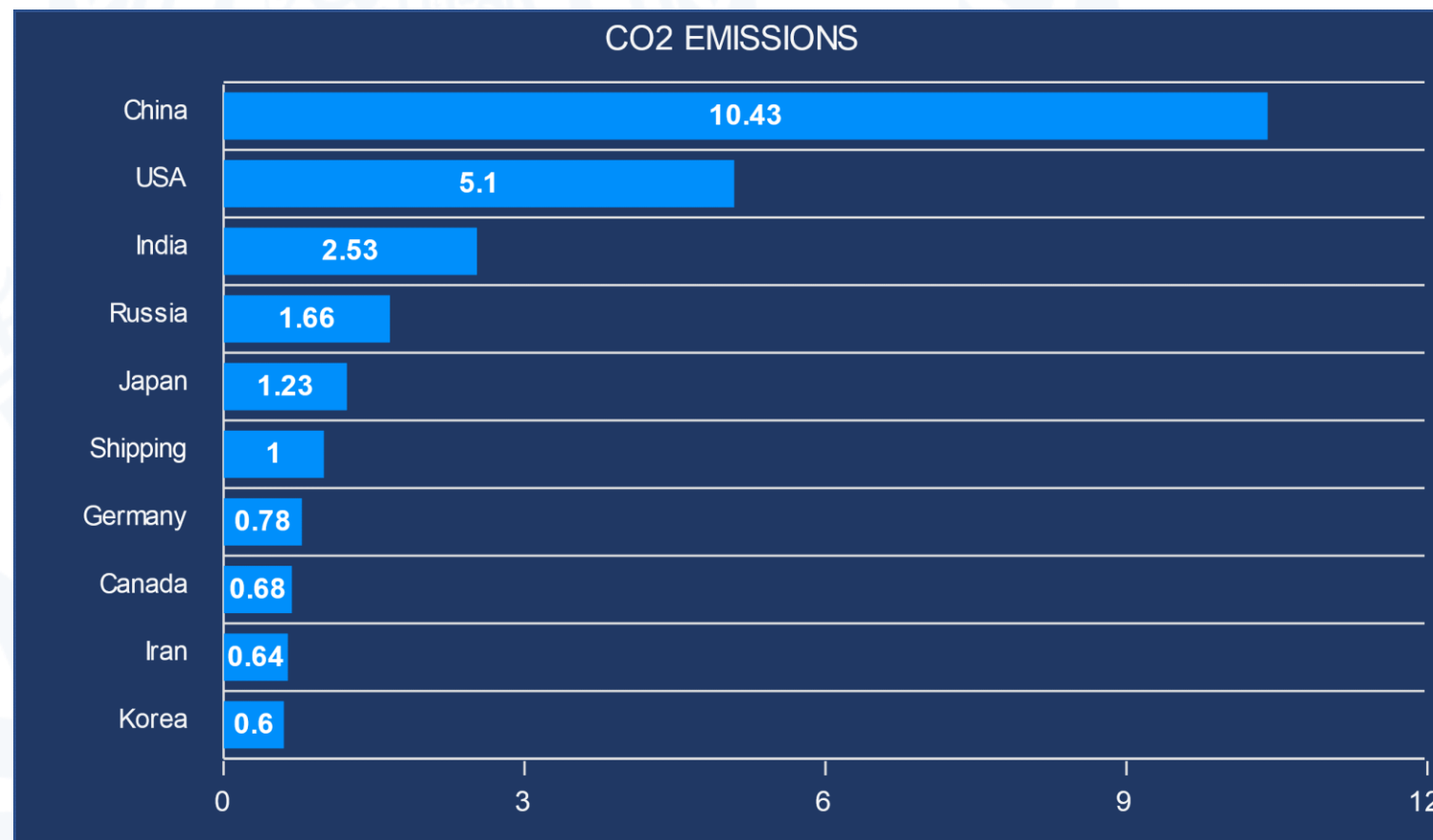


## A Significant Factor in Climate Change

Global shipping emissions are now responsible for roughly 3% of the world's greenhouse gases (GHGs).

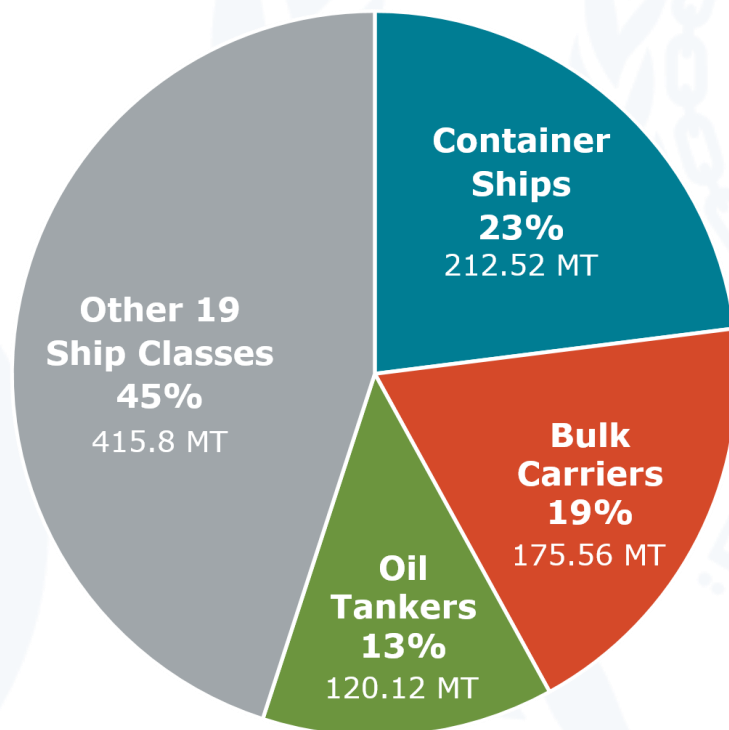
If shipping were a country, it would be the 6th-biggest CO<sub>2</sub> emitter.

### CO<sub>2</sub> Emissions Factor

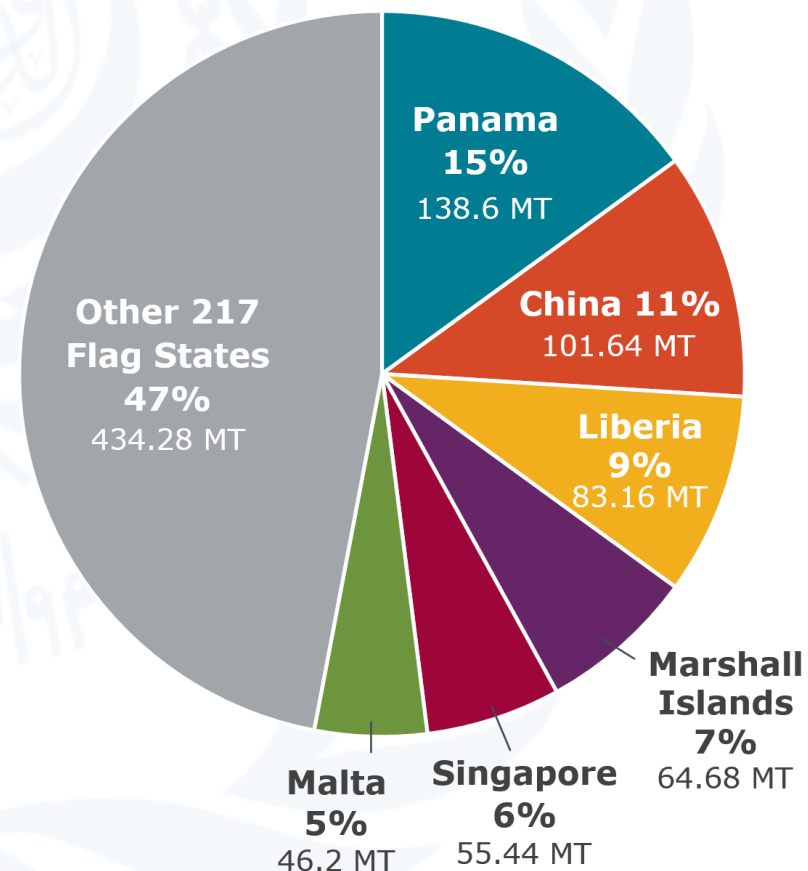


# Maritime Industry and Climate Change

Share of CO<sub>2</sub> Emissions by Ship Type  
in Million Tons (MT)



Share of CO<sub>2</sub> Emissions by Flag State  
in Million Tons (MT)



Source: "Greenhouse Gas Emissions from Global Shipping, 2013–2015" by the International Council on Clean Transportation (ICCT)  
[https://theicct.org/sites/default/files/publications/Global-shipping-GHG-emissions-2013-2015\\_ICCT-Report\\_17102017\\_vF.pdf](https://theicct.org/sites/default/files/publications/Global-shipping-GHG-emissions-2013-2015_ICCT-Report_17102017_vF.pdf)

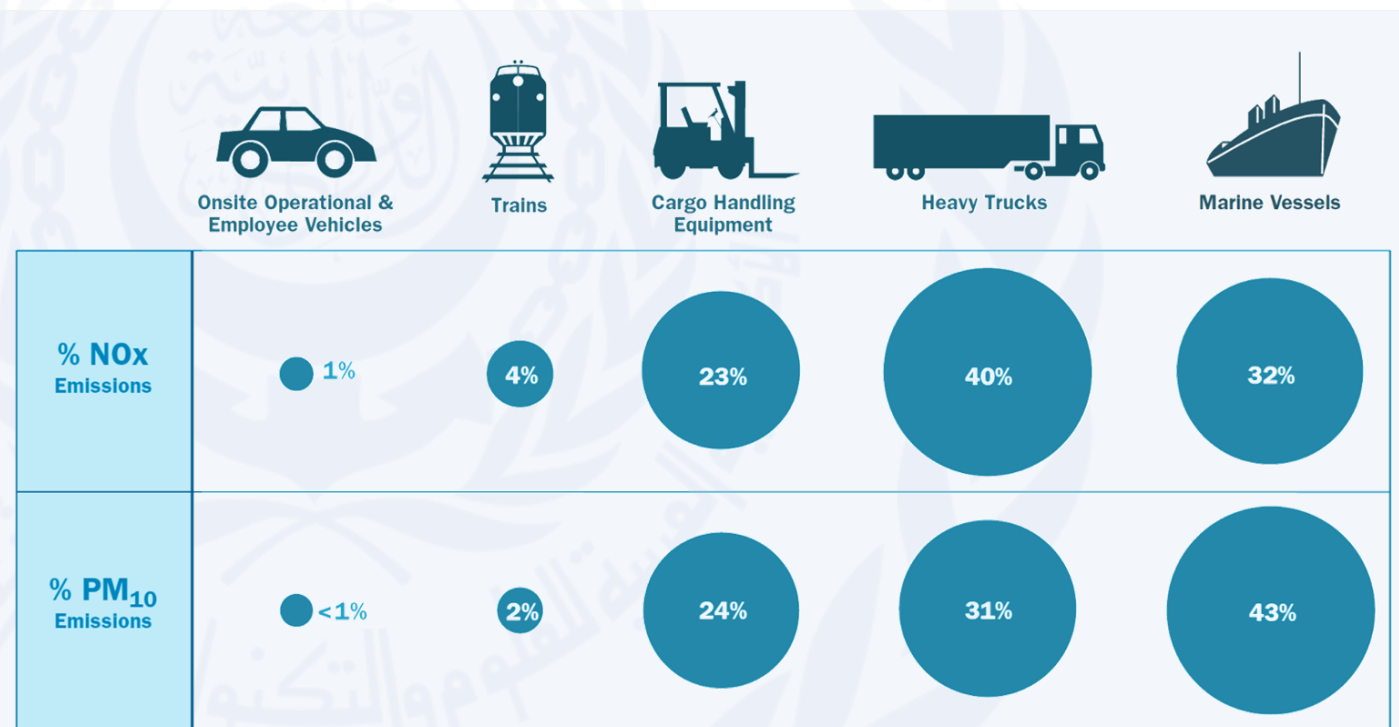
# Ports Emissions

## Sources:

- Cargo loading and unloading processes/devices.
- Trucks and other land-based transportation units.
- Buildings and building facilities.
- Harbor crafts/vessels.
- Ships calling at port.

## Main Emissions of Concern:

- Nitrogen Oxides (NO<sub>x</sub>):.
- Particulate Matters (PM):
- Sulphur Oxides (SO<sub>x</sub>):
- VOC (Volatile Organic Compounds) - Some ports
- Some carbon monoxide and unburned hydrocarbons



**Average Contributions of Various Port-Related Sources to Total Nitrous Oxide (NO<sub>x</sub>) and Particulate Matter (PM<sub>10</sub>) Emissions from a Container Port**



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# Maritime Industry Response & Opportunities

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**Maritime Forecast 2050**

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**Maritime Industry Response**

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**Digitalization & AI**

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## DNV Maritime Forecast to 2050 Energy Transition Outlook 2022

### Addressing the Future Energy Transition Outlook

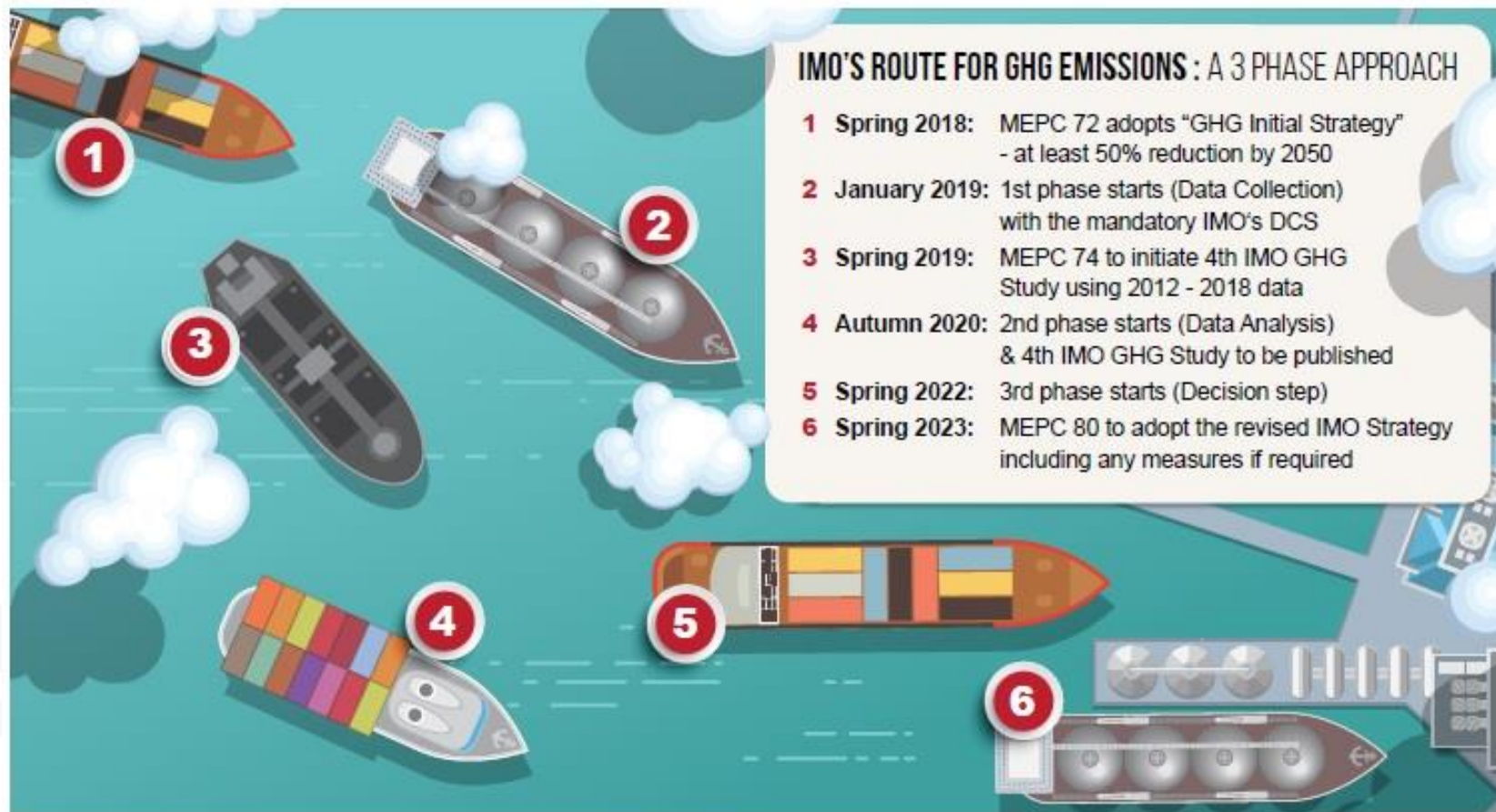
- Maritime Transport is expected to be doubled by GT by 2050
- The focus is on green fuel availability to tackle the shift to carbon-free fuels
- Around 5.5% of operating ships and 33% of the on order, are on alternative fuels
- LNG as the dominant fuel, Methanol, LPG, Ammonia and hydrogen are the future fuels with Higher levels of Safety Risks



# IMO Steps Towards Climate Neutral and Zero Emissions

IMO Initial GHG Strategy to reduce CO<sub>2</sub> emissions, by at least 40% by 2030

Pursuing efforts towards 70% by 2050





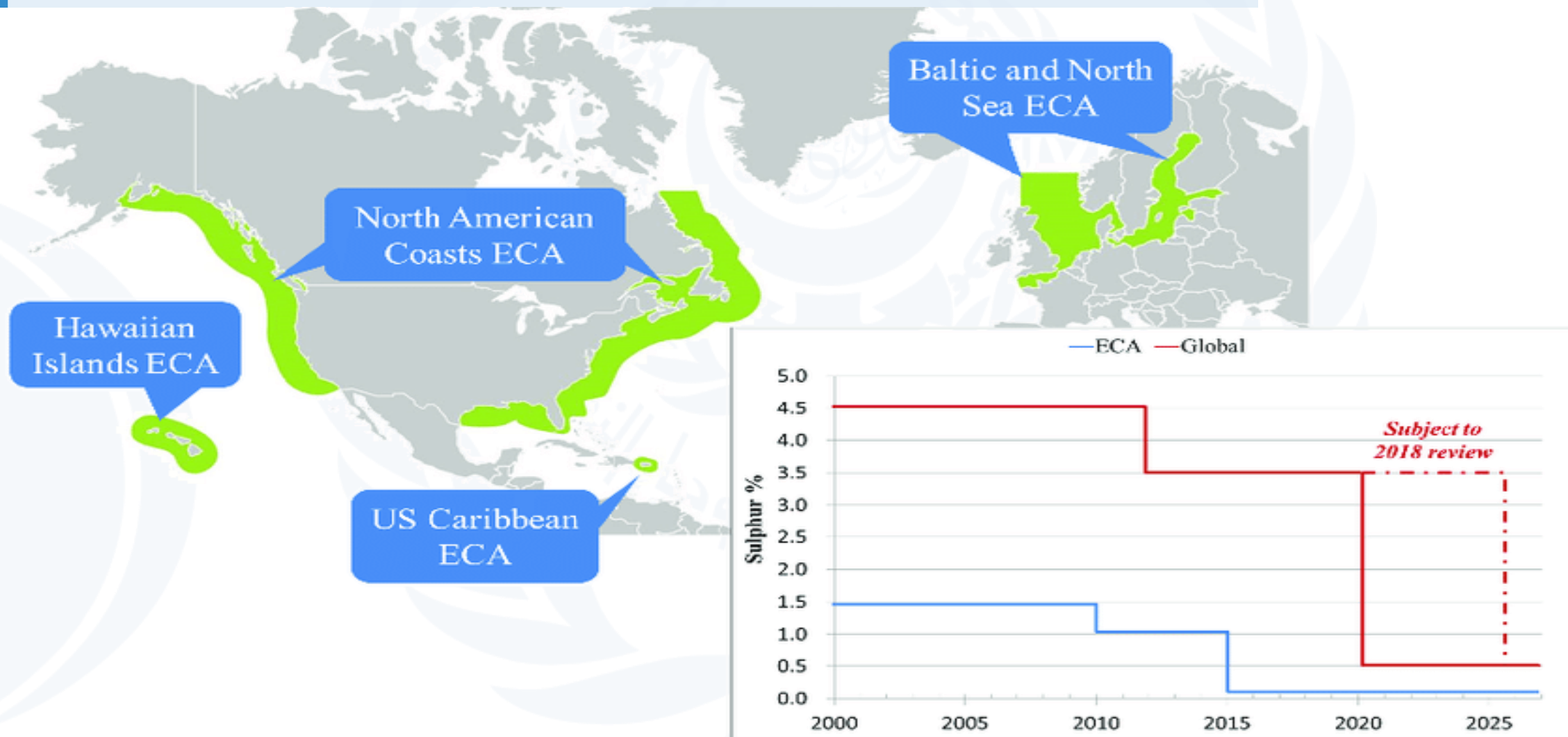
# Legal Approach IMO (Climate Action) and IMO-GHG Strategy

In 2018 the IMO developed a GHG Strategy that includes:

- Amendments of MARPOL ANNEX VI – Regarding Air Pollution - The next come Into force 1st May 2024
- The Current Wave of Regulations came into force 1st Jan 2023:
  - The Carbon Intensity Indicator (CII)
  - Energy Efficiency Design Index (EEDI)
  - Energy Efficiency Existing Ship Index (EEXI)
  - Ship Energy Efficiency Management Plan (SEEMP) P-III



# IMO and Sulphur Content in Ships Fuels

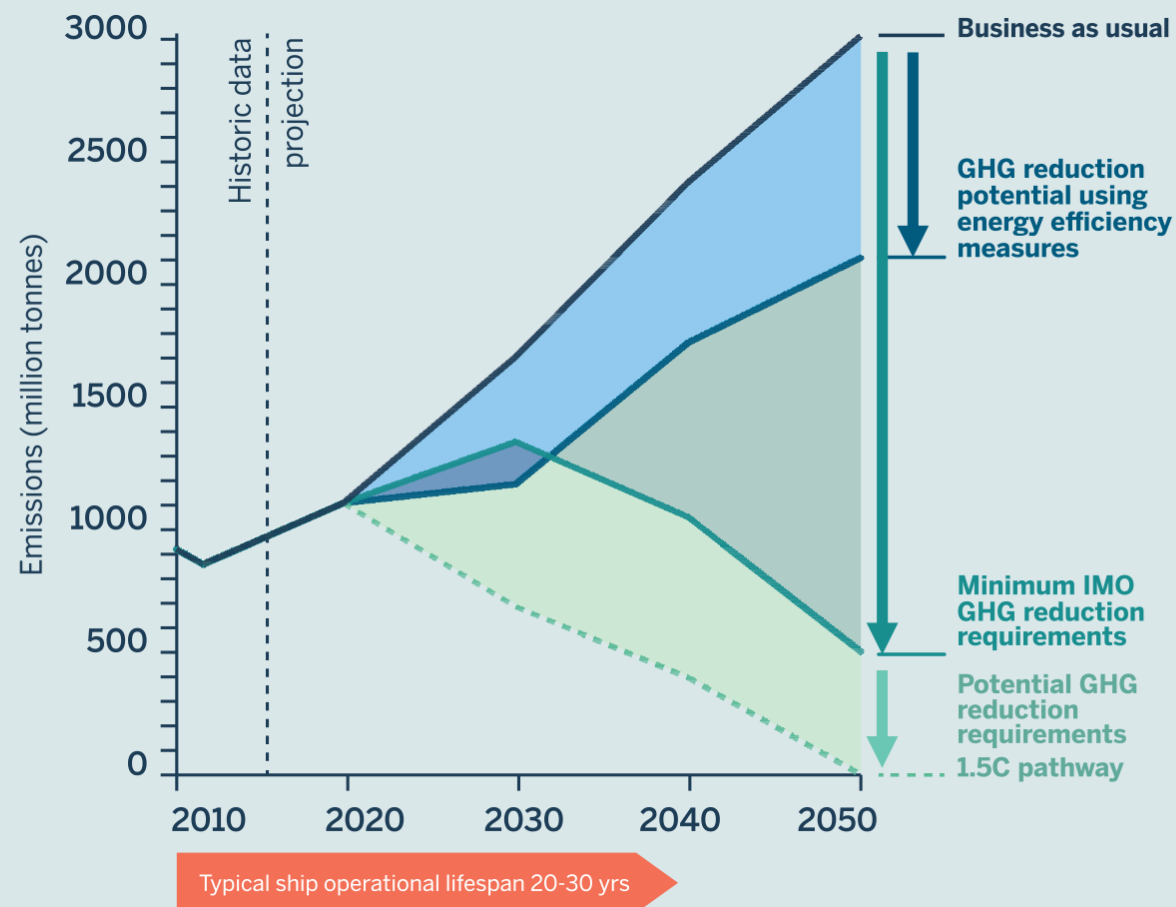


# Shipping Decarbonization

1

## Pathways for international shipping emissions

The International Maritime Organization (IMO) has committed to reducing greenhouse gas (GHG) emissions from international shipping **by at least 50%** by 2050 (compared to 2008 emissions), with a strong emphasis on reaching zero emissions.

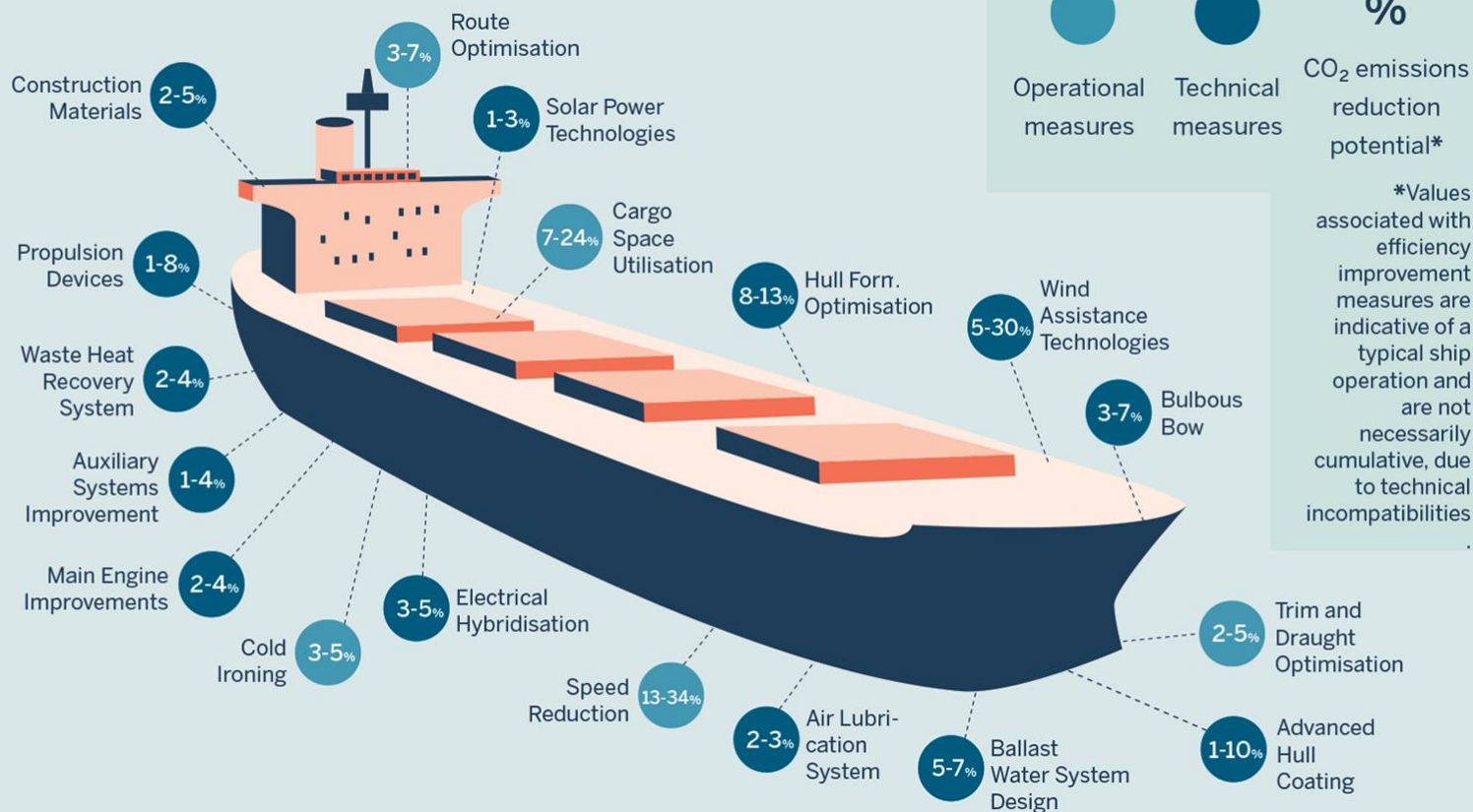


# Shipping Decarbonization

2

## Efficiency measures

Some of the needed emissions reductions can be achieved immediately using technical and operational energy efficiency measures.





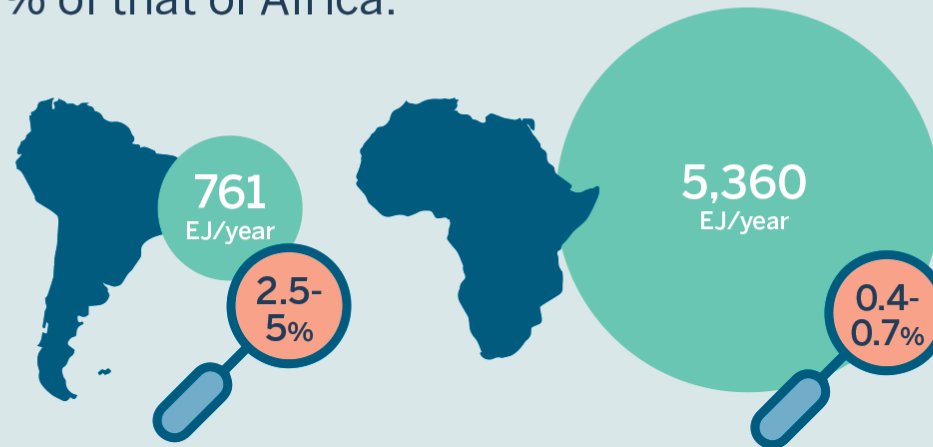
# Shipping Decarbonization

## 3 Renewable energy potential

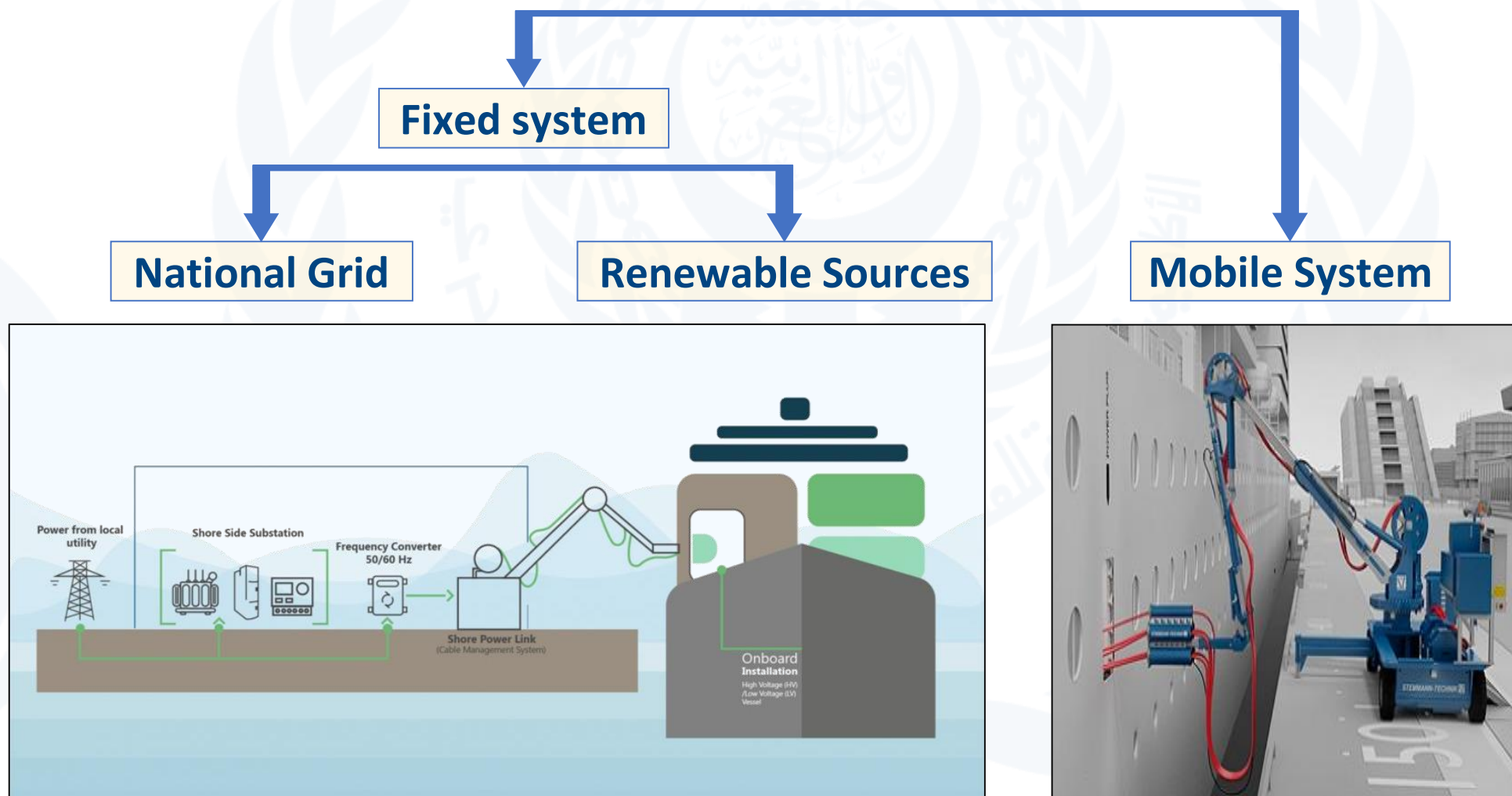
Efficiency gains alone can't achieve the IMO's GHG reduction targets. A transition to zero-carbon fuels and electricity from renewable energy resources is needed.

International shipping will need approximately **20-40EJ of energy a year**. For example, this is about 2.5-5% of South America's total renewable energy potential or 0.4-0.7% of that of Africa.

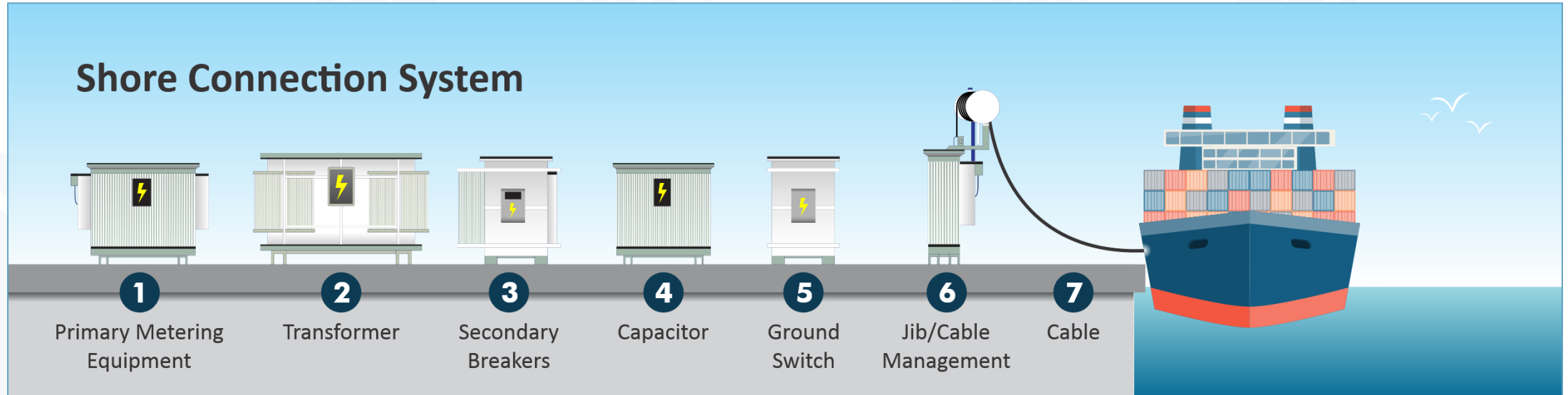
- Regional renewable energy potential
- Proportional share of global shipping's future energy needs



# Onshore Power Supply (OPS) (*Cold Ironing*)



## OPS Shore-Side Infrastructure and Components



- Transformer for voltage reduction
- Switchgear for electrical safety
- Frequency converter
- Automation system



## Digitalization & AI

Digitalization and AI for Energy Efficiency can achieve up to 15 % GHG emission saving by 2050.

- Optimize Fuel Consumption, Optimum Route, Maintenance Prediction, Improve Safety
- Energy Efficiency of Ship Designs & Operations
- Optimizing GHG Performance for ships in operation
- “Digital twin” ship built, before physical construction



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### Capacity Building for Maritime Industry Towards Zero Emissions

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# Technical/Operational Challenges

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**Safety Challenges**

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**Ports Readiness**

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**Financial Challenges**

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## Safety Challenges of Future Fuels

### Addressing Safety Challenges of Future Fuels

- Risks of future fuels, a new challenge for the safety of maritime industry.
- Regulations alone not enough , but how ships Designed, Built and Operated (**Training, Research, Innovation**)
- Amend MET, e.g. STCW, to include safety of personnel and minimise risks of toxic, pressurised and highly flammable alternative fuels.





## Readiness of Ports

### Ports new policies and legislations to:

- Establish service, bunker facilities and **Risk Assessment Plans**
- Generate green onshore power supply (**OPS**)
- Just in time operations
- Monitor trucks, cargo handling devices and Harbour crafts Emissions
- Develop and join **Green Corridors**
- Advanced training for **Fast-Response Crisis Teams** to control prospect explosions and fires





## Readiness Needs of Port Operators **(Skills)**

**Ports need capacity building for safely receiving future ships, such as:**

- Advanced fire prevention and fire fighting for new fuels
- Advanced training for fast-response crisis teams to control prospect explosions
- Advanced plans for dealing with toxic gas release



## Financial Challenges

### Global Investment Needs for Neutral Fuels 2050

#### Annual Increase of Costs (Investments)

- Ship Building (On-board):  
**USD 8 Bn – 28 Bn**
- Infrastructure for new Neutral Fuels:  
**USD 28 Bn – 90 Bn**
- Costs of New Fuels:  
**USD 100 Bn – 150 Bn**





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Capacity Building for Maritime Industry  
Towards Zero Emissions

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**AASTMT  
& Capacity Building  
ARE WE READY**

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**Professional MET**

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**Facilities & Instructors**

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**Training Programs & Accreditations**

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**GMP-BoK Implementation**

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# AASTMT Professional MET

## Addressing the Role of Maritime Education and Training



Professional MET is preparing the future seafarers for maritime transition to ships' future fuels



# AASTMT Professional MET

## Addressing the Role of Maritime Education and Training

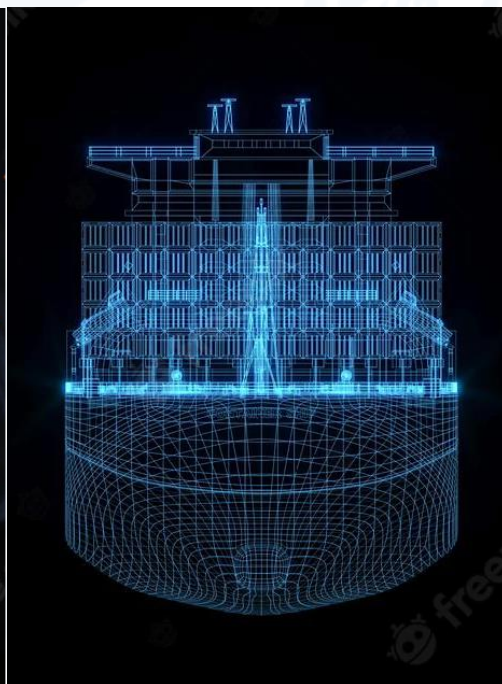


Safety challenges of ships' future fuels are addressed through outcome based MET



# AASTMT Professional MET

## Addressing the Role of Maritime Education and Training



Digitalization, which is one of focus areas of MET in AASTMT, is a requirement for future fuel transition

# Arab Academy Thematic Areas of Innovation

## Education, Training, Research and Consultancy

# 1

- **MET Educational Impact**

Globally accredited education providers:

- E-learning
- Vocational certificates
- Associate degrees
- Undergraduate degrees
- Masters degrees
- PhDs

## Arab Academy Thematic Areas of Innovation Education, Training, Research and Consultancy

# 2

### • Training at a glance

World-class training facilities:

- AIDA IV – An ocean-going training vessel
- Real-time maritime simulation technology
- Maritime Environmental Lab and Bio-fouling courses
- Maritime engineering workshops
- ROVs Lab
- Maritime safety institute
- Regional maritime security institute



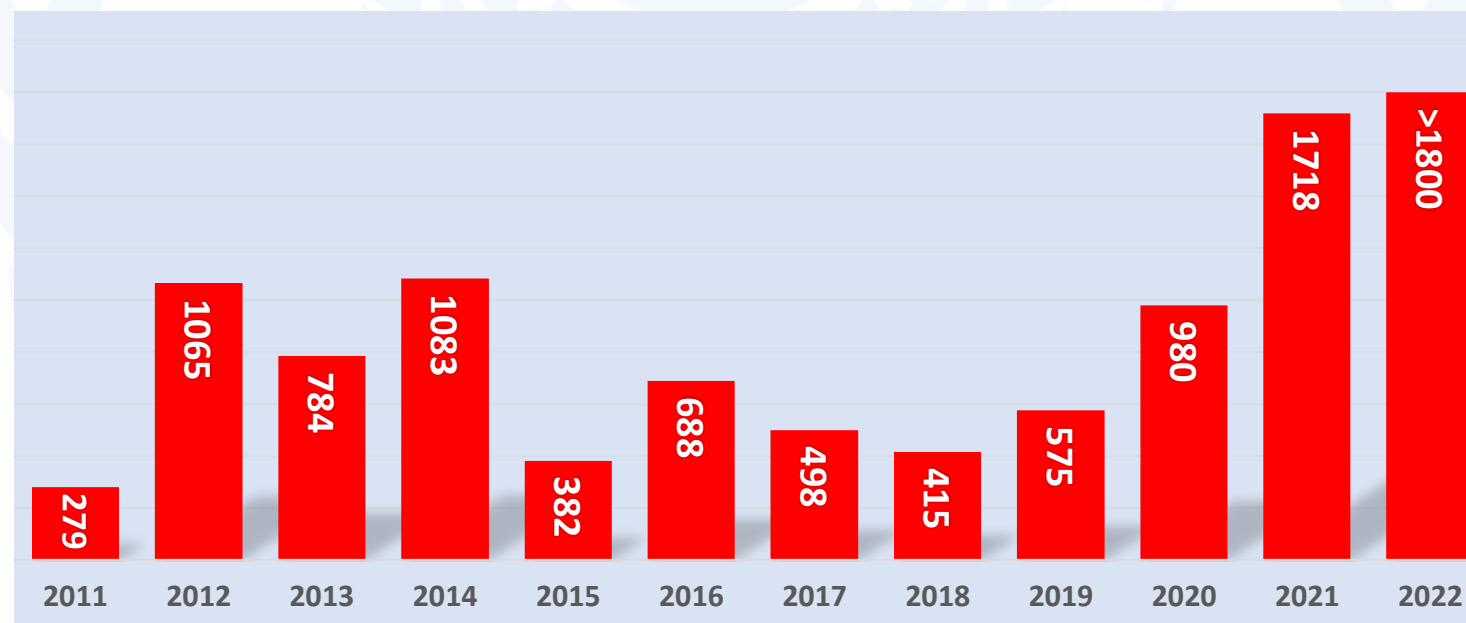


## Arab Academy Thematic Areas of Innovation Education, Training, Research and Consultancy

# 3

- **Research Impact**

World-class training Published research work in 10 years:



## Arab Academy Thematic Areas of Innovation Education, Training, Research and Consultancy

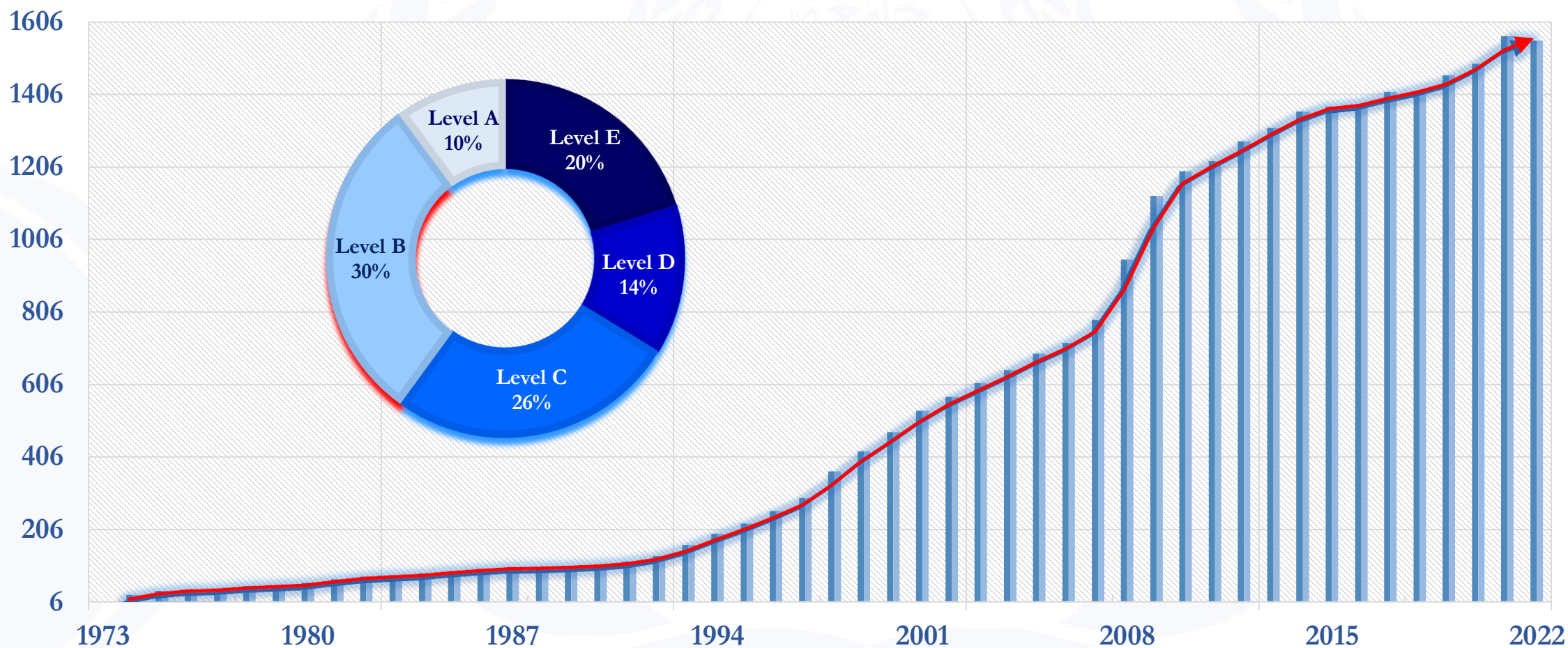
# 4

- **Consultancy and development**

World-class training Since, 1984 AAST has contributed over 400 studies and mega projects in Egypt and the region.



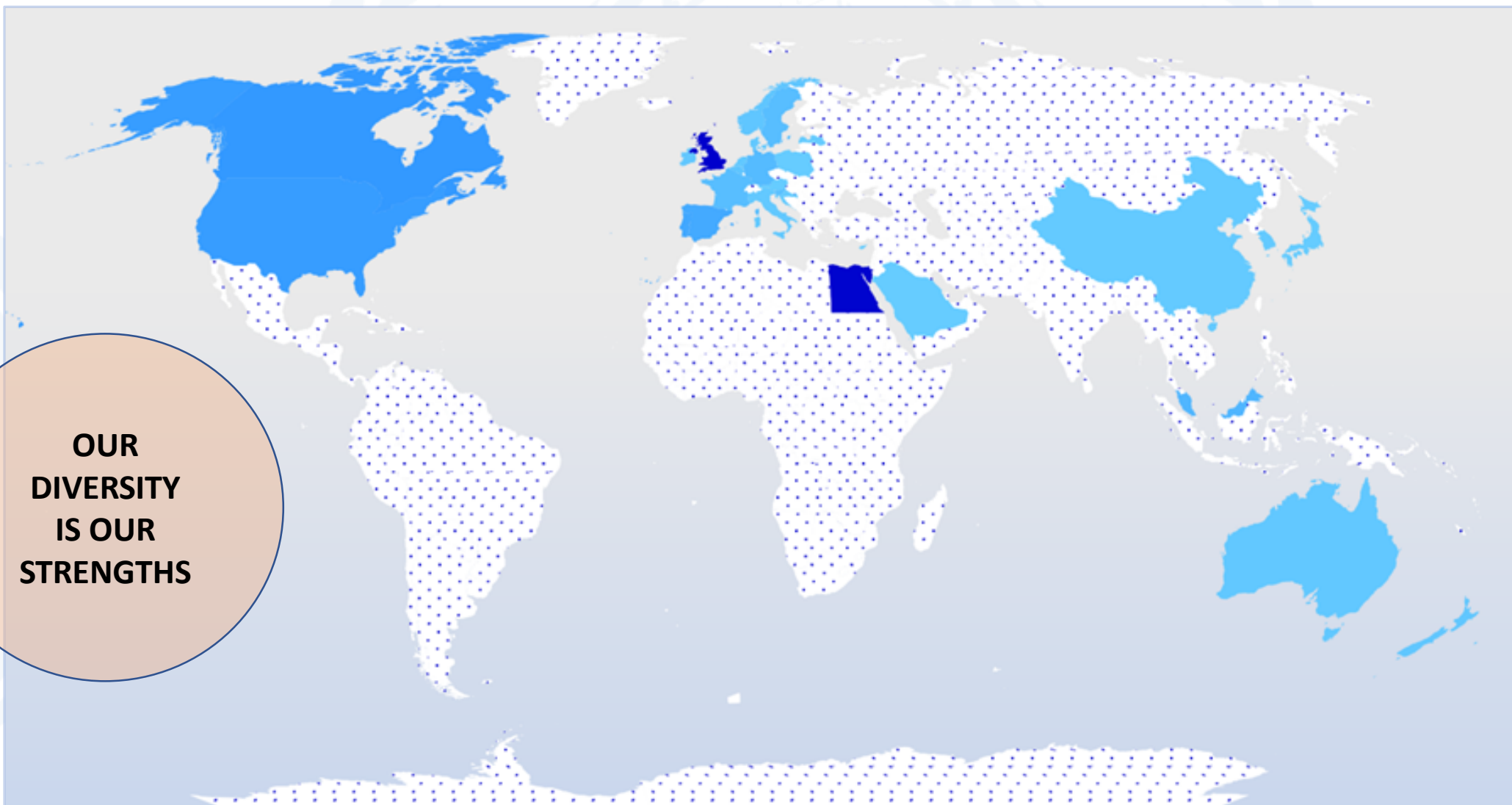
# Faculty Growth Over the Past 50 Years



Level A	Associate Lecturer	Level B	Lecturer	Level C	Senior Lecturer	Level D	Associate Professor	Level E	Professor
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## Faculty with Diverse Educational Backgrounds



**OUR  
DIVERSITY  
IS OUR  
STRENGTHS**

## Education and Training for the International Leaders of Tomorrow.

**+30**  
Nationalities

**+23,000**  
Enrolled  
Undergraduate  
Students

**+8,500**  
Enrolled  
Postgraduate  
Students



1972 - 2022



# International Training



College of Engineering & Technology



College of Engineering & Technology



Universitat Autònoma de Barcelona

College of Language & Communication

Graduate School of Business



College of Maritime & Technology



College of Engineering & Technology



College of Engineering & Technology



College of Management & Technology

College of Engineering & Technology

College of International Transport & Logistics



College of Management & Technology



College of Management & Technology



# AASTMT World Ranking

**QS STARS™ RATING SYSTEM**

*Arab Academy for Science, Technology and Maritime Transport*

The QS Intelligence Unit has, through rigorous and independent data collection and analysis of performance metrics as set out in the QS Stars™ methodology, rated Arab Academy for Science, Technology and Maritime Transport as a Five Stars institution.

★ ★ ★ ★ ★

CATEGORY	STAR RATING
Teaching	★★★★★
Employability	★★★★★
Academic Development	★★★★★
Internationalisation	★★★★★
Online Learning	★★★★★
Social Responsibility	★★★★★
Inclusiveness	★★★★★
Bachelor of Science in Maritime Transport	★★★★★
Overall	★★★★★

Ben Semter - Head of QS Intelligence Unit

QS Stars™ - © 2023 QS Intelligence Unit (a division of QS Quacquarelli Symonds Ltd) INTELLIGENCEUNIT

QS

**THE IMPACT RANKINGS**  
Times Higher Education  
World Impact Rankings 2022

**#1**

**AASTMT is #1 in Egypt  
#112 Worldwide  
for Quality Education**

TIMES

**Webometrics RANKING WEB OF UNIVERSITIES**

ranking

**1970**

Arab Academy for Science, Technology and Maritime Transport

January 2023 Ranking

WEBOMETRICS

# Accreditations & International Cooperation



# Accreditations & International Cooperation



ABET



Royal Institute of  
British Architects



Universitat Autònoma  
de Barcelona  
UNIVERSITY OF  
PLYMOUTH



Cardiff Metropolitan  
University | Prifysgol  
Metropolitan  
Caerdydd



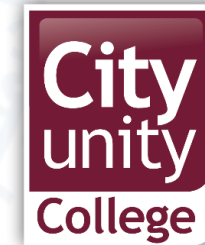
UNIVERSITY  
OF LONDON



THE LONDON SCHOOL  
OF ECONOMICS AND  
POLITICAL SCIENCE



UNIVERSITY  
OF HULL



FIBAA



University of  
Central Lancashire  
UCLan



Mizzou  
University of Missouri



University of  
Northampton



International Maritime  
Lecturers Association



DNV



MAERSK  
TRAINING



General  
Electric



KONGSBERG 44



## Training Programs for Capacity Building Based on COP27 Outcomes

الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري  
Arab Academy for Science, Technology & Maritime Transport

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دليل المهارات المطلوبة لوظائف  
قطاع النقل البحري والموانئ

International Labour Organization  
International Association of Ports and Harbors

- The Guide of Required Skills for Jobs in Maritime Transport and Ports
- Establish and Manage SEEMP – EEDI – EEXI – CII – CCS

## Training Programs for Capacity Building

- Advanced Training to Deal with H<sub>2</sub>S
- Advanced Fire Prevention and Fire Fighting (hydrogen – Methanol – Ammonia – LNG – LPG)
- Major Emergency Management Initial Response (MEMIR) (OPITO Accredited)
- Offshore Installation Management (OIM) Controlling Emergencies (OPITO Accredited)





## GMP-BoK Implementation

### Addressing Future of MET

- GMP-BoK is a new concept of outcome-based MET by Taxonomies
- It is addressing 28 focus areas of the future of maritime Industry on Four Tiers
- Risk Assessment of the Future Fuels is addressed
- AASTMT implemented Phase I of GMP-BoK and approaching Phase II



# GLOBAL MARITIME PROFESSIONAL

BODY OF KNOWLEDGE 2019



This GMP Body of Knowledge is the result of a Joint Project (The Global Maritime Professional Initiative) between the Nippon Foundation and the International Association of Maritime Universities (IAMU)





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Capacity Building for Maritime Industry  
Towards Zero Emissions

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*Thank You!*

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