

carbonpositive

MANAGING MARITIME EMISSIONS

*Managing Carbon Emissions
The impact for ship owners and operators*



I'm carbonpositive

IMEAK DTO 10th April 2013

Presented by Helena Athoussaki CEO Carbon Positive

www.carbonpositive.com | 1

Agenda



- *Who we are*
- *Climate Change*
- *Shipping and CO2*
- *GHGs Regulation and milestones*
- *EEDI, SEEMP, MRV, MBM*
- *Other emissions (SOx, NOx)*
- *Carbon Positive Programme for Ships*

Carbon Positive



CP Profile:

- *Independent Service-Provider for managing Maritime Emissions*
- *Accredited by a European flag-state*
- *Main office in Greece*

International agency network

CP Vision:

Support the shipping industry to:

- *contribute in the fight against Climate Change*
- *become more efficient and competitive*
- *prepare for future regulation*



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Carbon Positive: Programmes



Carbon Positive Programme for Ships (CPPS) and Ports (CPPP)

The first carbon reduction programmes specifically designed for the maritime industry.

Carbon Positive's Certification Scheme (CPCS)

The first maritime Certification Scheme as a proof of measurement/monitoring and reduction.

Carbon Positive: **Covering areas**



- + Monitoring and Reporting*
- + Energy and CO2 management*
- + Energy efficiency assessment and analysis*
- + Energy performance improvement*
- + Policy and market intelligence*
- + Carbon Risk management*
- + Carbon Offsetting Strategy*
- + Climate change CSR*
- + Marketing and communication*



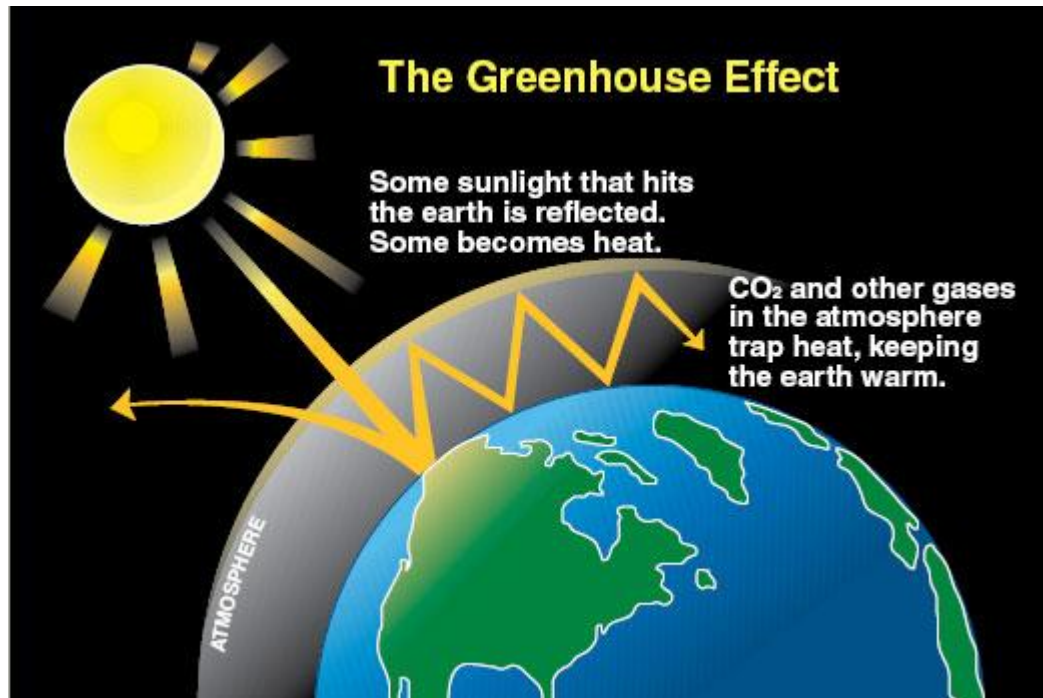
Climate Change Impacts and Threats



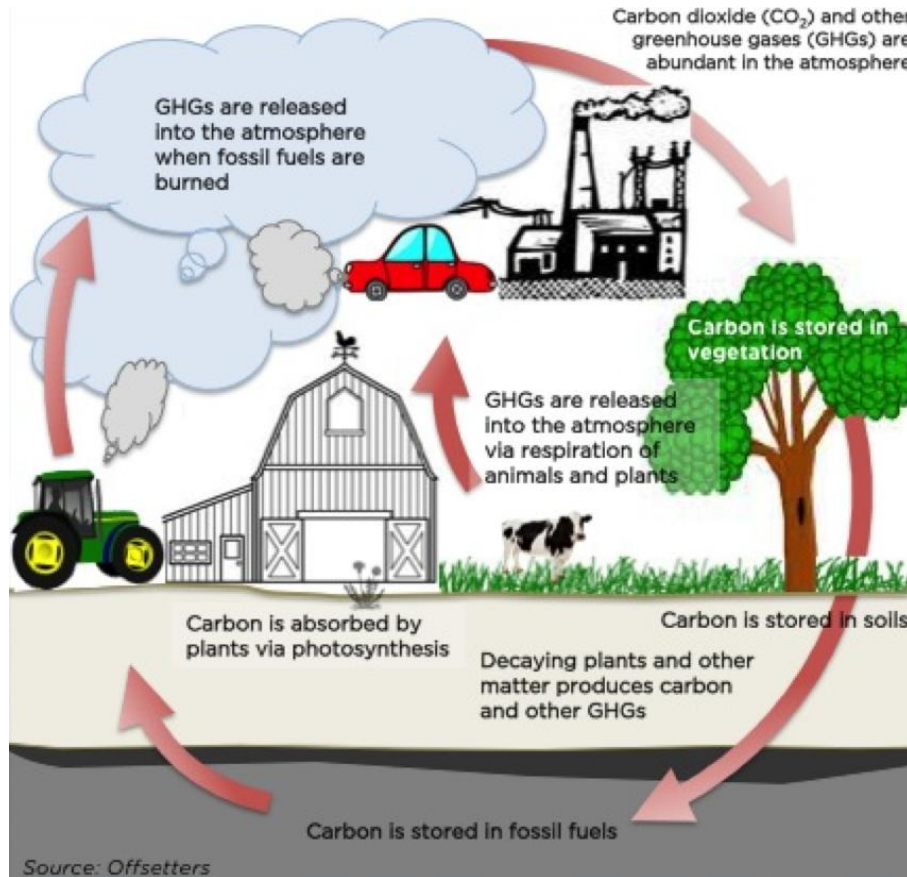
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Climate Change The GH effect



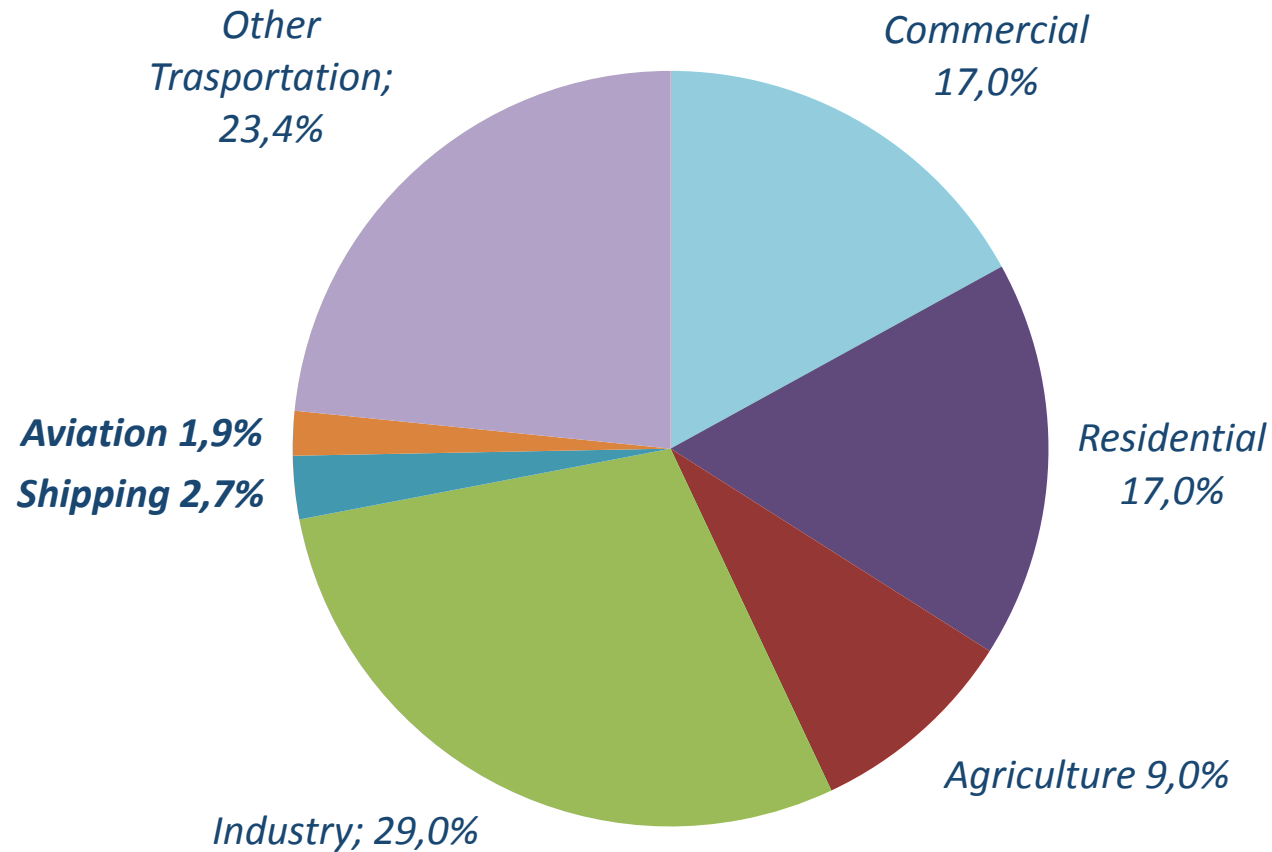
Climate Change GHGs cycle



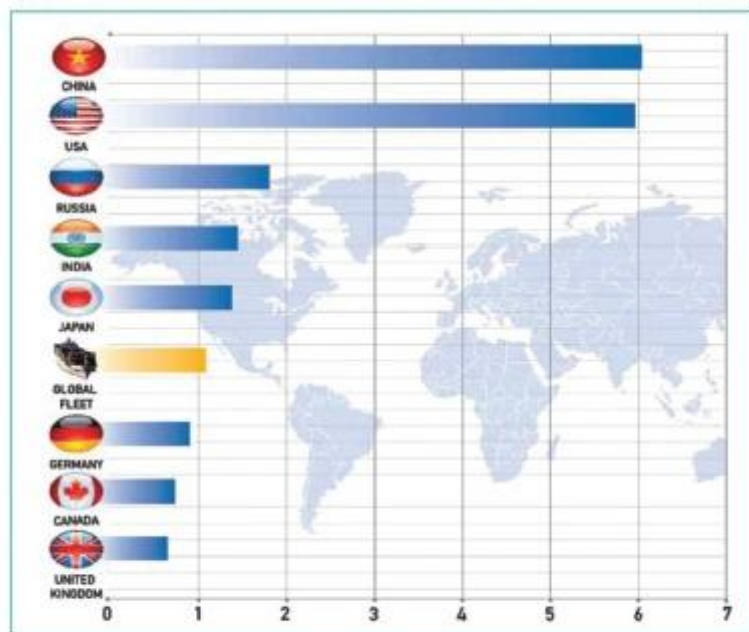
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Transportation CO2



Shipping CO2



Emissions (Gigatons CO₂)

Source: *Review of Maritime Transport*, various issues. For 2006–2010.

- CO2 emissions **projected to grow 150%** by 2050 if no action is taken

Climate Change Finance

- Green Climate Fund:
\$100bn per year by 2020
- Maritime Contribution: \$4-9bn per year, \$20-25 t/CO₂

The Challenge



Commercial

The industry is developing a new mindset towards fuel efficiency, as charterers increasingly look for evidence of performance monitoring and enforce fuel efficiency standards, which is driving ship owners to achieve fuel-saving improvements.

Regulation

Under an increased pressure to join the global effort to reduce CO₂ emissions and curb pollution levels Shipping would face high costs over the next few years.

Corporate Social Responsibility (CSR)

As the foundation of global trade, shipping is at the heart of the green supply chain for the consumer and so needs to consider its reputation on a global, consumer-facing level.

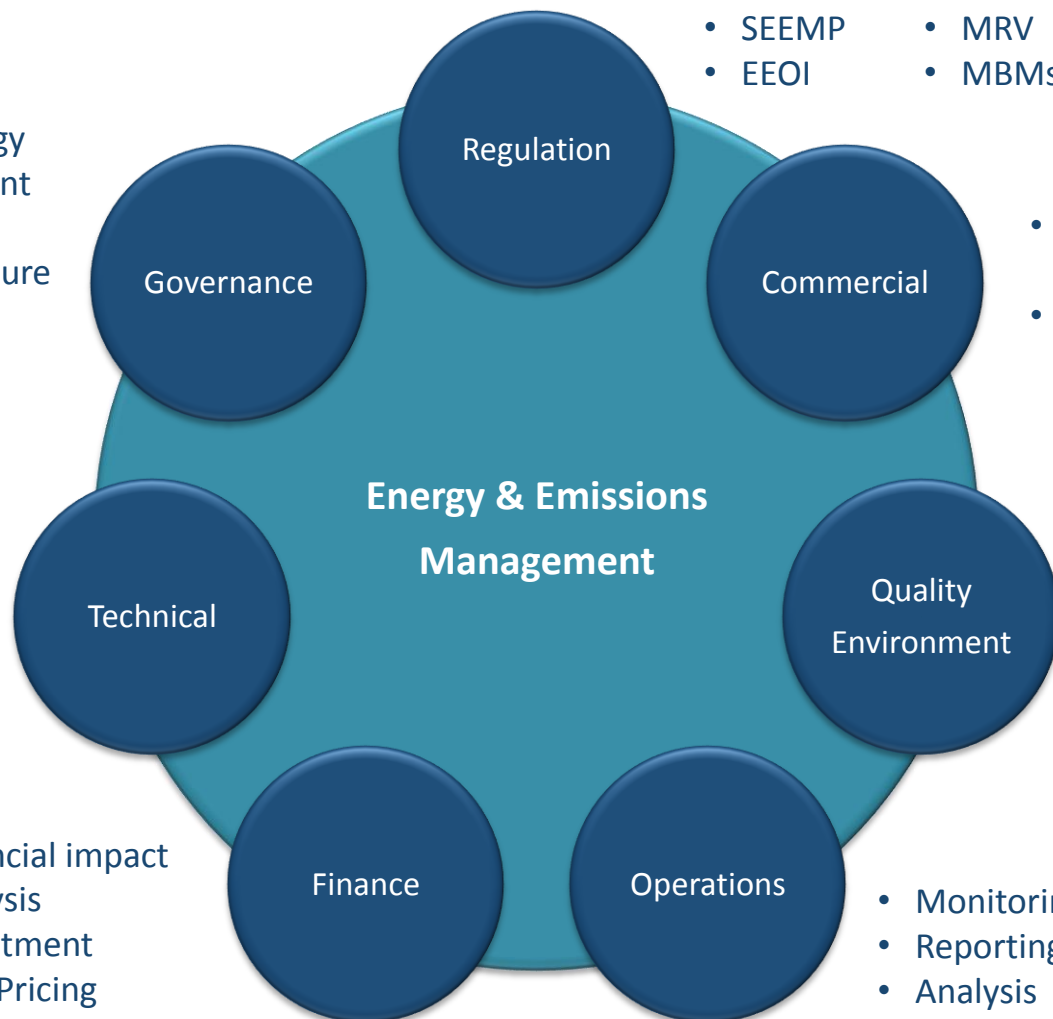
Energy and Emissions Management **Affects all Business Decisions**



- Low-Carbon strategy
- Carbon management systems
- Carbon Risk disclosure
- CSR

- Efficiency
- Measure selection
- Maintenance

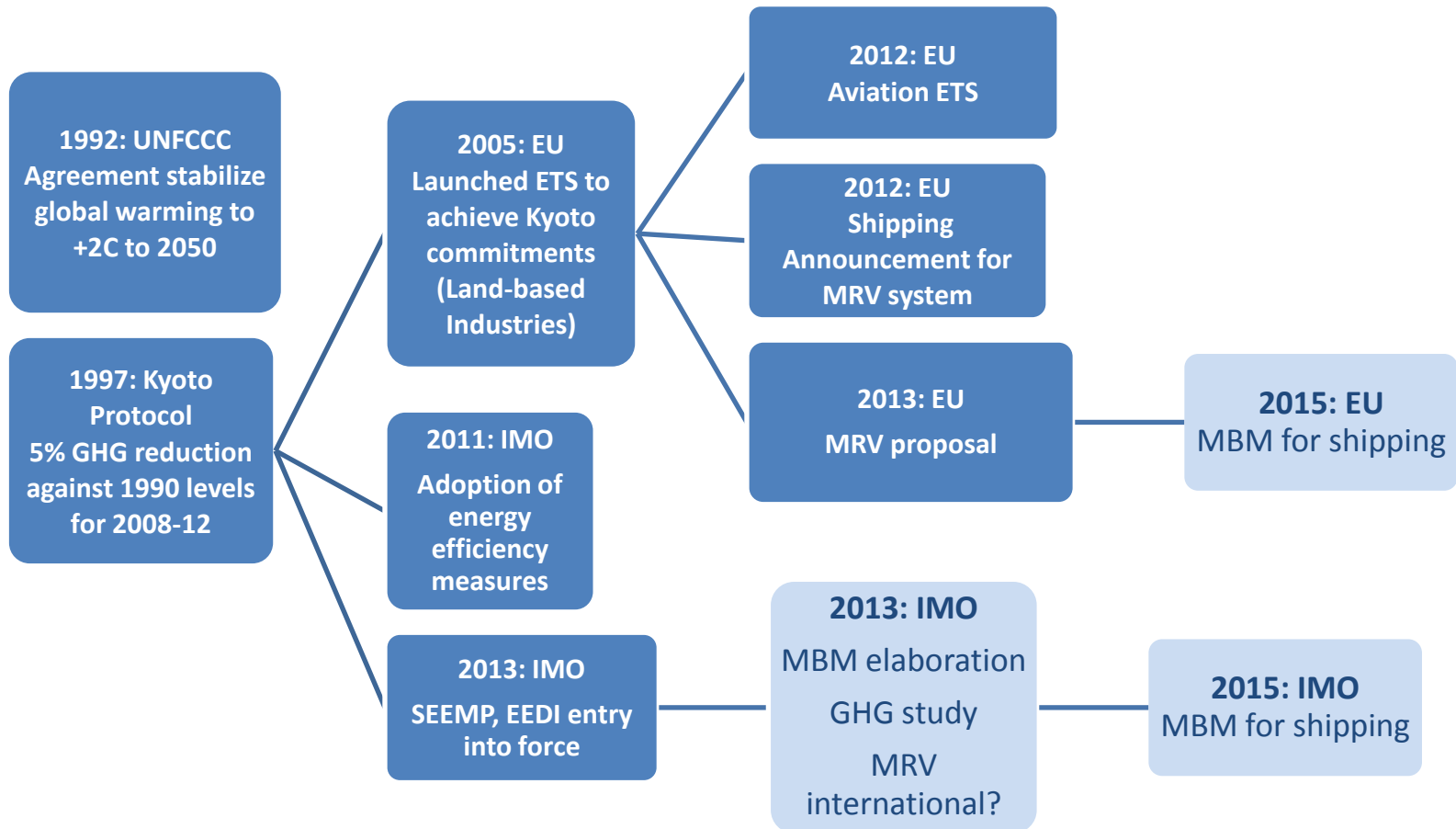
- Financial impact analysis
- Investment
- Fuel Pricing



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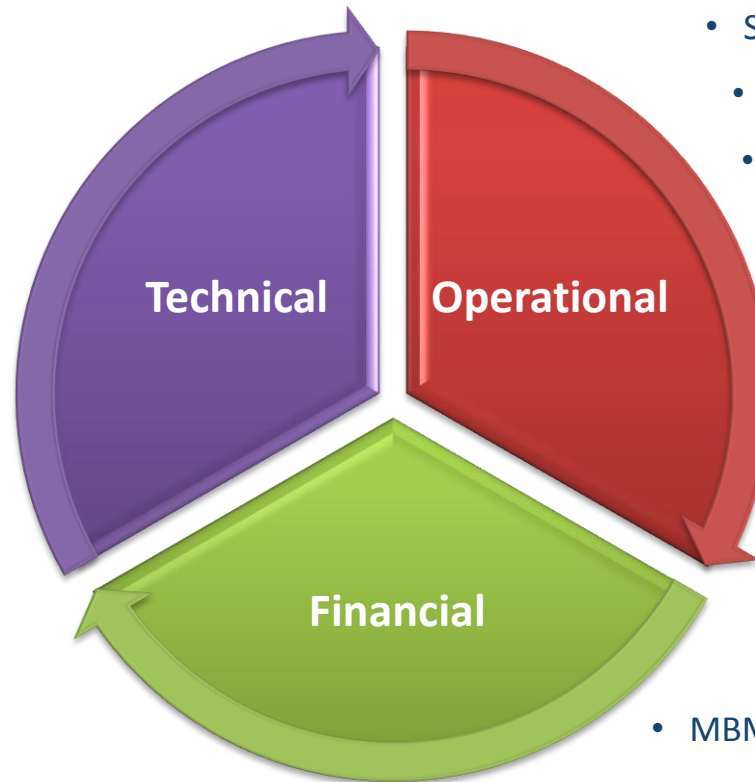
Climate Change & shipping: *Regulation milestones*



CO2 Measures



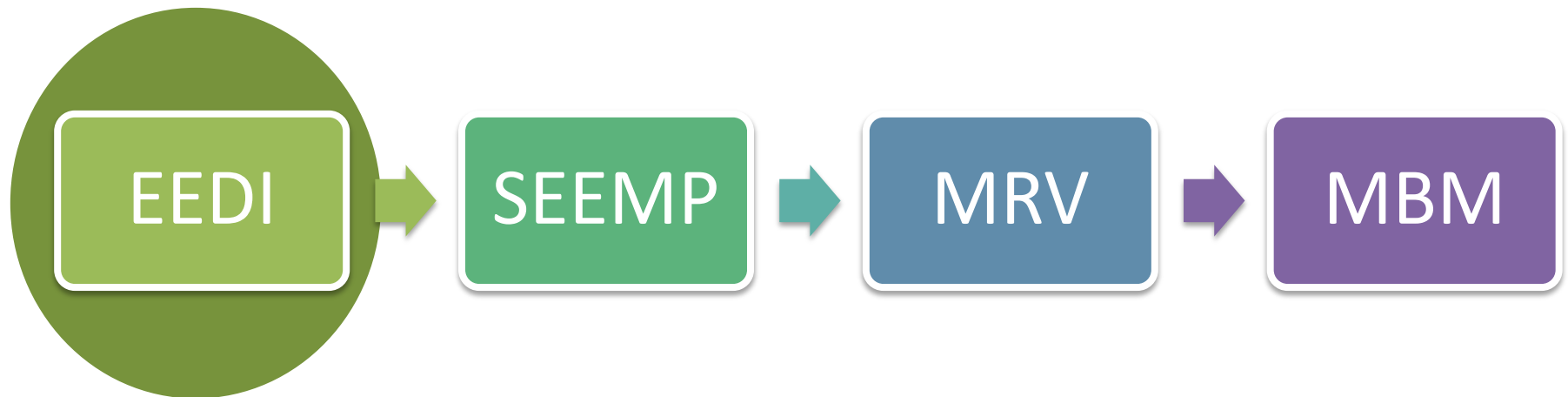
- Hull (coating, rudder, optimisation)
- Propeller (Boss Fin Caps, coating, speed nozzle)
- Engine (waste heat recovery, fuel homogenisers, Turbochargers, combustion process)
- Speed Control of Pumps and Fans
- Wind / Solar Energy/LNG



- Speed optimisation
- Trim optimisation
- Weather Routing
- Virtual arrival
- Hull Cleaning
- Optimised Voyage planning

- MBMs
- Levy (GHG fund)
- ETS (CDM, JI)

EEDI *Energy Efficiency Design Index*



GHGs: EEDI



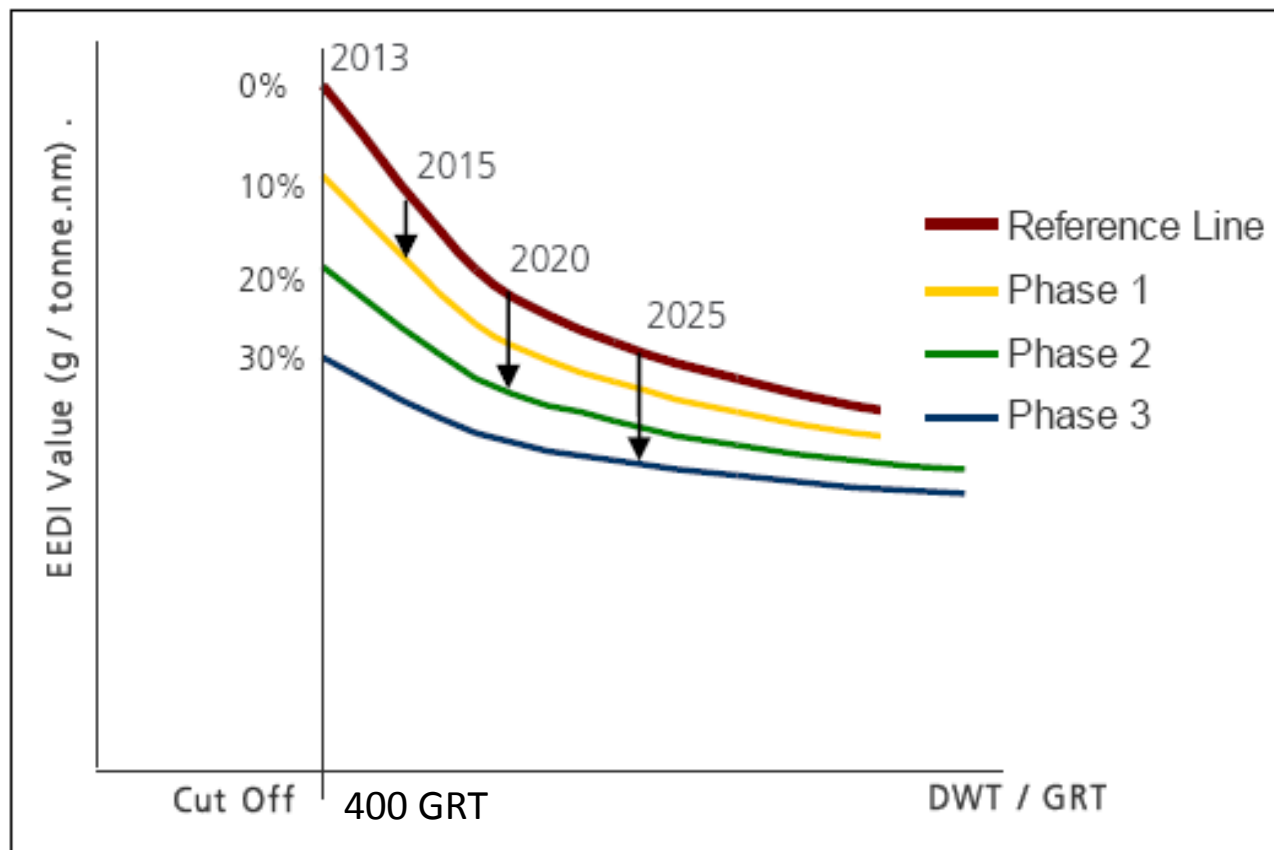
- The EEDI is a performance-based mechanism that requires a certain minimum energy efficiency in new ships.
- Ship designers and builders are free to choose the technologies to satisfy the EEDI requirements in a specific ship design.

$$\begin{array}{c}
 \begin{array}{ccccc}
 \text{Main engine(s)} & \text{Auxiliary engine(s)} & \text{Shaft Motor} & \text{Energy saving technologies (auxiliary power)} & \text{Energy saving technologies (main power)}
 \end{array} \\
 \begin{array}{c}
 \left(\prod_{j=1}^M f_j \right) \left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + (P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^*) + \left(\left(\prod_{j=1}^M f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEff(i)} \right) C_{FAE} \cdot SFC_{AE} \right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}^{**} \right) \\
 \hline
 f_i \cdot f_c \cdot \text{Capacity} \cdot f_w \cdot V_{ref} \\
 \hline
 \text{Transport work}
 \end{array}
 \end{array}$$

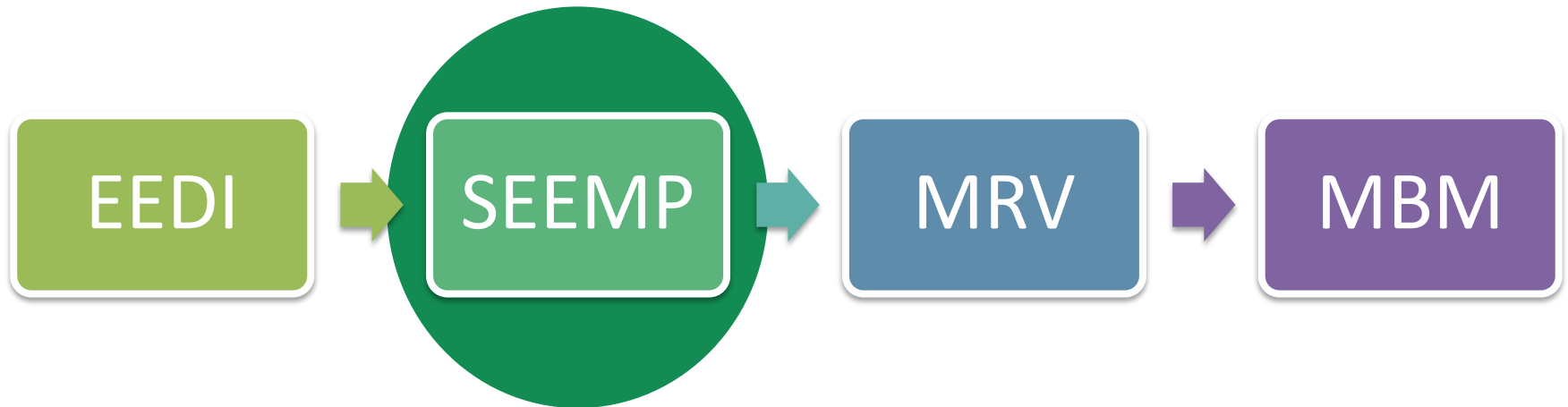
Simply put:

$$EEDI = \frac{\text{Power} \cdot \text{Specific Consumption} \cdot \text{Carbon Conversion}}{\text{Capacity} \cdot \text{Speed}}$$

GHGs: EEDI



SEEMP *Ship Energy efficiency Management Plan*



GHGs: SEEMP

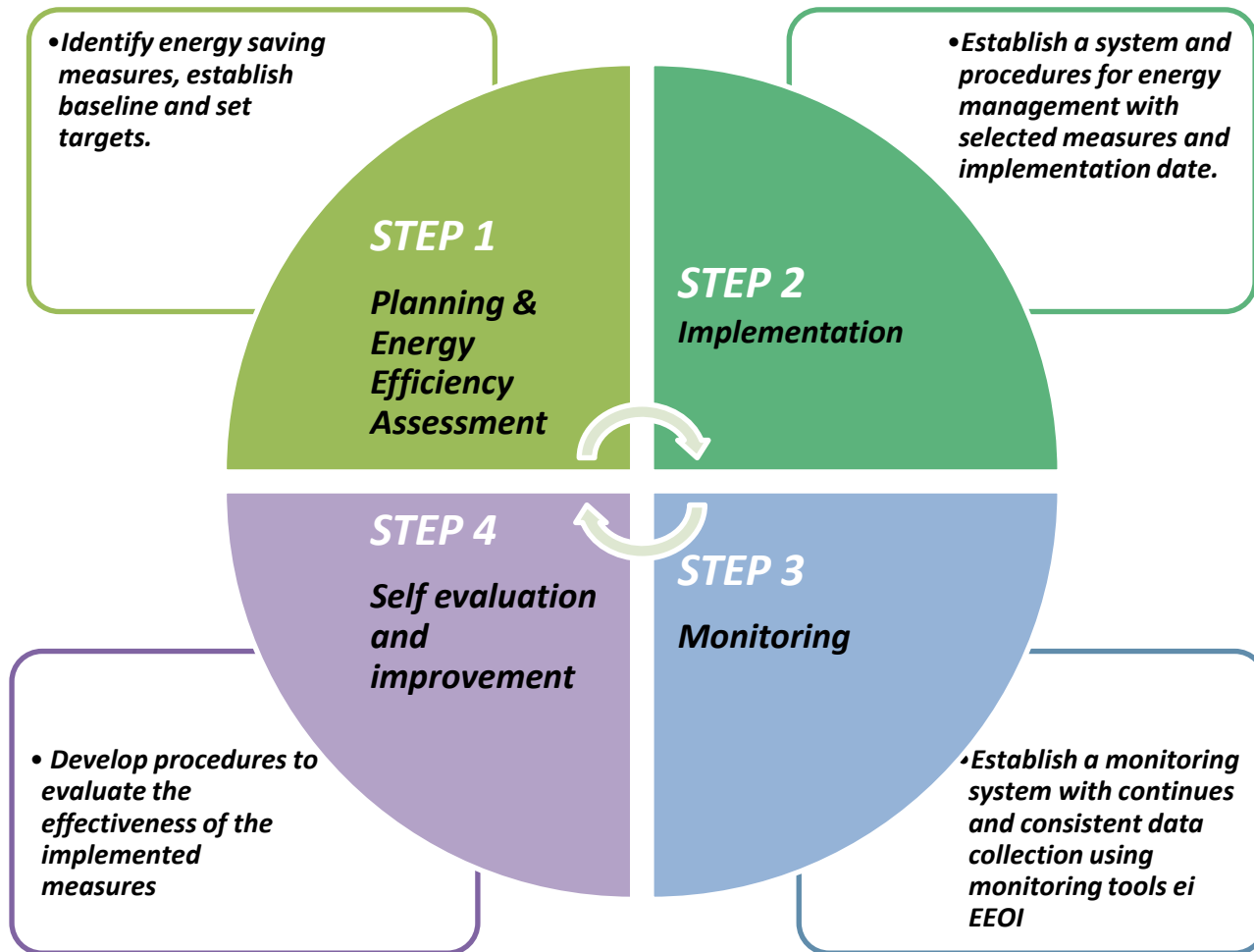


SEEMP is intended to be a management tool for operators to monitor and improve the energy efficiency of ships.

SEEMP Facts

- *Mandatory for all ships >400 GT*
- *SEEMP must be onboard and subject to periodical survey*
- *Can be linked to an Energy Management System, an Environmental Management System or form part of SMS*
- *ISM audit will require SEEMP to be implemented*
- *Should be carried out by shore staff*

GHGs: SEEMP



EEDI vs EEOI

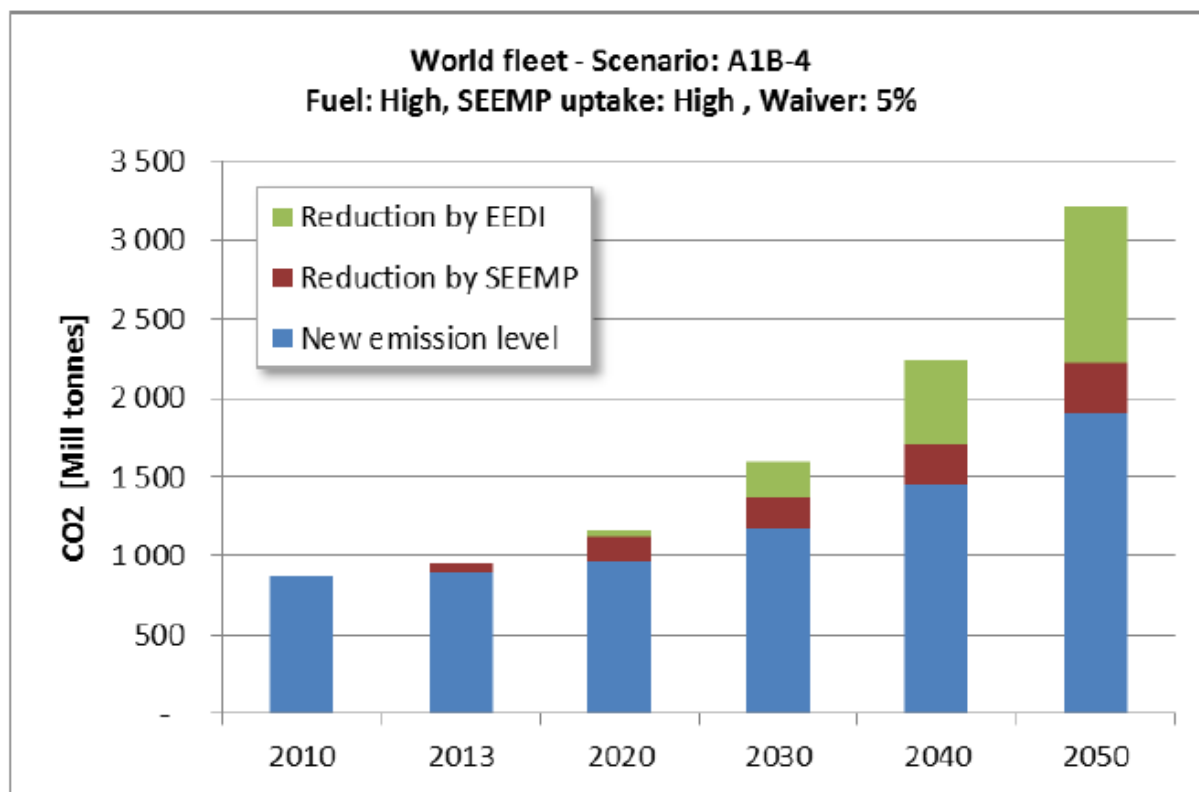
The difference between EEOI and EEDI



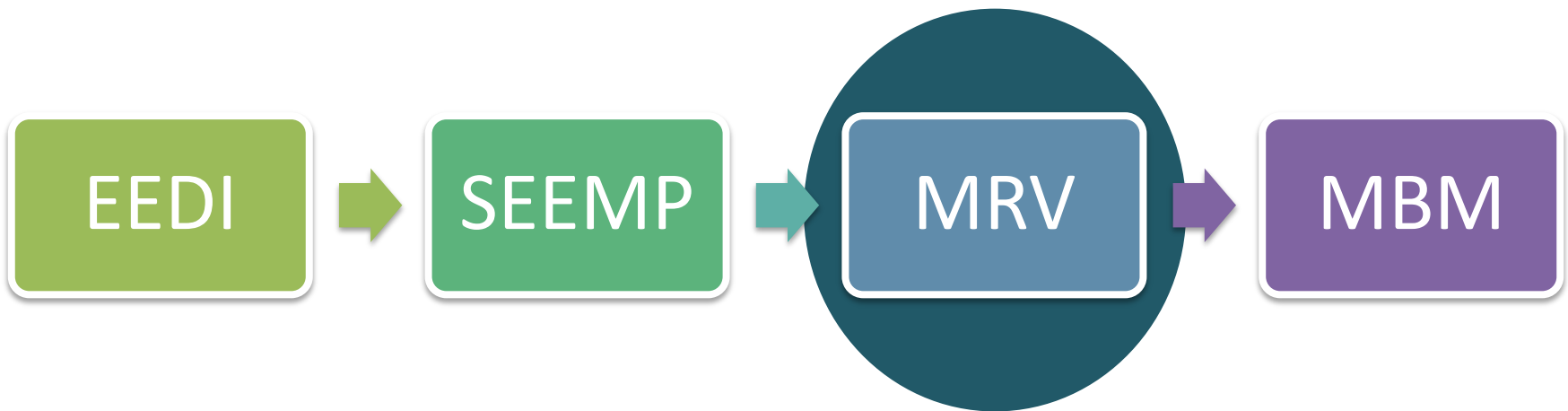
- *EEOI: operational efficiency over time*
- *EEDI: design efficiency at a single design point and condition*

	Fuel consumption	Distance	Capacity
EEDI	Engine power and specific fuel Consumption	Design Speed	Available capacity (deadweight)
EEOI	Actual reported fuel burn	Actual distance sailed	Used capacity (cargo transported)

Reduction by EEDI and SEEMP



MRV *Monitoring Reporting and Verification*



MRV: EU announcement



*October the 1st 2012 European Commissioners Hedegaard and Kallas first announced that in 2013 the Commission would propose legislation for **Monitoring, Reporting and Verification (MRV) of emissions of maritime transport.***

- The scope of the MRV scheme is to establish a reliable and verifiable monitoring procedure for shipping on fuel consumption and energy efficiency on an annual basis.*

- Compliance with the MRV obligations would be a condition for entry into EU ports*

MRV: Preparation of a global measure (MBM)



- Result to 2% reduction GHGs and a 1.2 billion net savings from the sector
- Robust system for reliable information on fuel consumption and energy efficiency
- Focus on CO2
- All journeys from and to EU port of call (incoming and outgoing)
- Ship-owner is responsible for MRV
- Data collection and approval by Independent third parties
- Data must be provided to the Competent Authority (Port, Flag)

MRV Principles



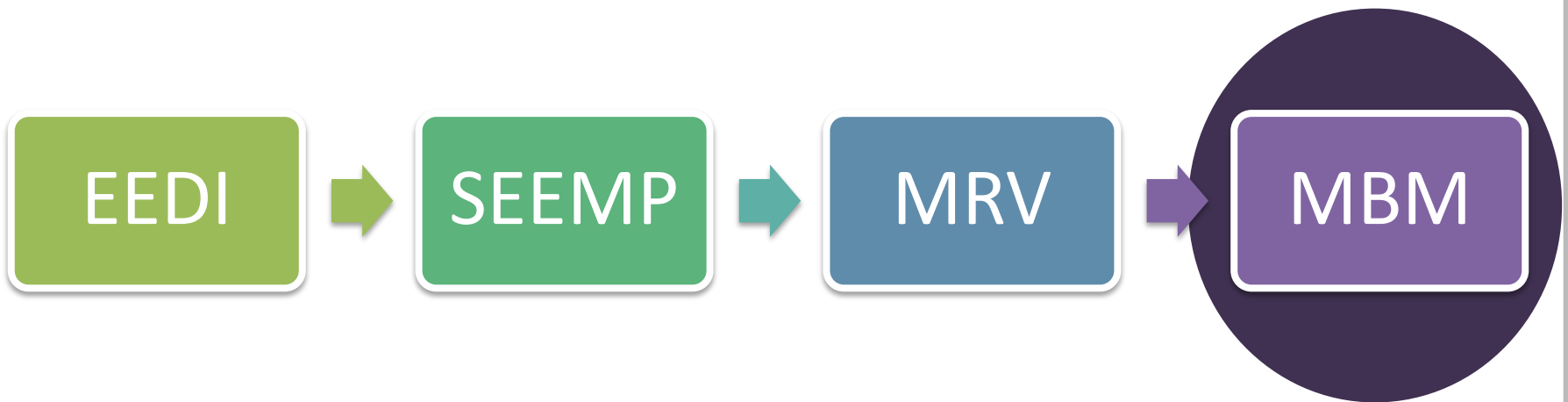
- *Completeness: Covers all processes and emissions related activities on board*
- *Consistency: Allows for comparison over time, using the same methodologies and data sets.*
- *Cost effectiveness: Aims for highest achievable accuracy and balances against additional costs.*
- *Transparency: All data is recorded, compiled, analysed and documented for verification , allowing intended used to make decision with confidence*
- *Faithfulness: Verified emission measurements are produced to demonstrate credibility*
- *Trueness: It shall be ensured that the emissions determination is systematically neither over nor under true emissions*

MRV Three step approach



1. **Monitoring:** *A standardize methodology to continuously observe all information related to GHG emissions*
2. **Reporting:** *A template with the intention of relaying the monitored information in widely presentable form*
3. **Verification:** *The independent verification of the monitored and reported information enabling the verifier to affirm that the that the procedure meets the requirements.*

MBM Market Based Measure



MBM ETS (Emission Trading Scheme)



- The Emissions Trading Scheme (ETS) is Europe's main tool since 2005 for reaching its Kyoto target (20% by 2020).
- The EU ETS requires companies in power, heavy industry and now in Aviation to submit carbon units each year corresponding to their emissions.
- Such units maybe EU allowances (EUAs)-either handed out for free or bought from others - or credits from Clean Development Mechanism (CDM) and Joint Implementation (JI).
- The Clean Development Mechanism (CDM) enables developing countries to host emission reduction projects.
- These projects should facilitate sustainable development and technology transfer as well.

MBM Carbon Fund (Levy)



- *A Carbon fund is a surcharge of a fixed amount per tonne to be collected in respect of bunker fuels purchased by ships*
- *The primary goal of the international GHG contribution fund is to reinforce incentives for companies to develop and adopt fuel saving technologies which lead to a reduction of GHG emissions from ships*
- *It is expected that shipping companies will seek to reduce their GHG contribution costs by implementing technologies and operational measures that cut their bunker fuel purchases and consumption.*
- *Never applied before, there is no experience how the system can work*

MBM Carbon Cost Scenario

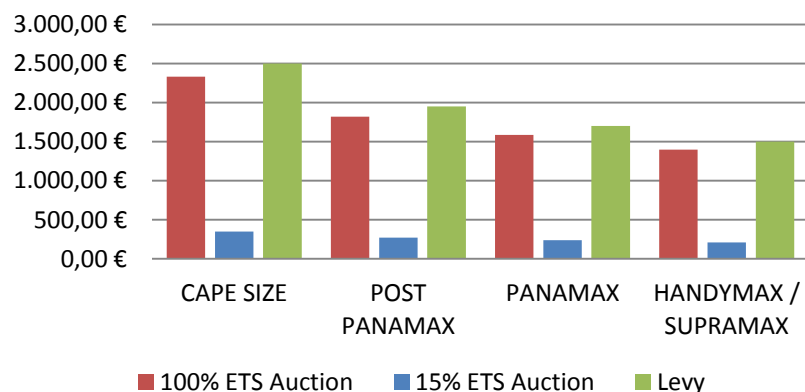
CO2 daily carbon cost scenario*

ETS cost: 15€ t/CO2

Levy cost: 50 € t/CO2**



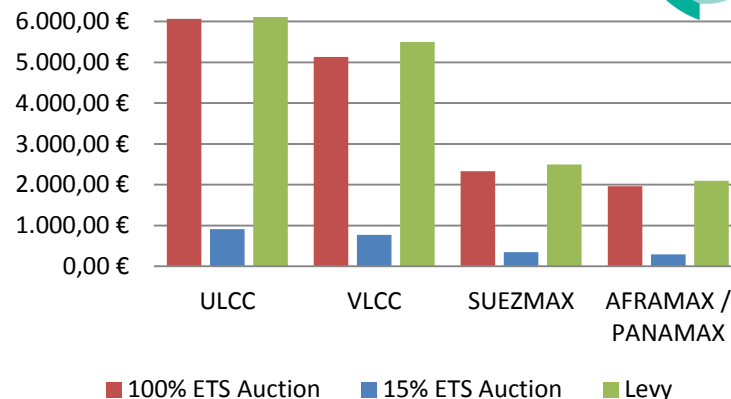
BULK CARRIERS



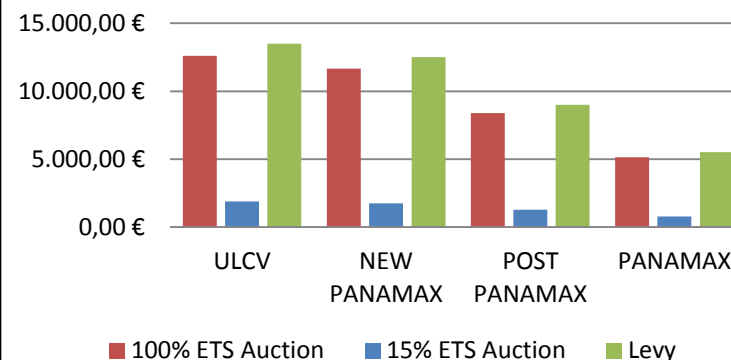
*Based on CPPS Data and Studies

* *Devanney, J.W. (2010), "The Impact of EEDI on VLCC Design and CO2 Emissions"

TANKERS



CONTAINERS



MARPOL Annex VI ECAS (Emission Control Areas)



- *MARPOL defines certain sea areas as "special areas" in which, the adoption of special mandatory methods for the prevention of sea pollution is required.*
- *Under the Convention, these special areas are provided with a higher level of protection than other areas of the sea.*
- *Annex VI Regulations for the Prevention of Air Pollution from Ships establishes certain sulphur oxide (SOx) Emission Control Areas (ECAs) with more stringent controls on sulphur emissions.*

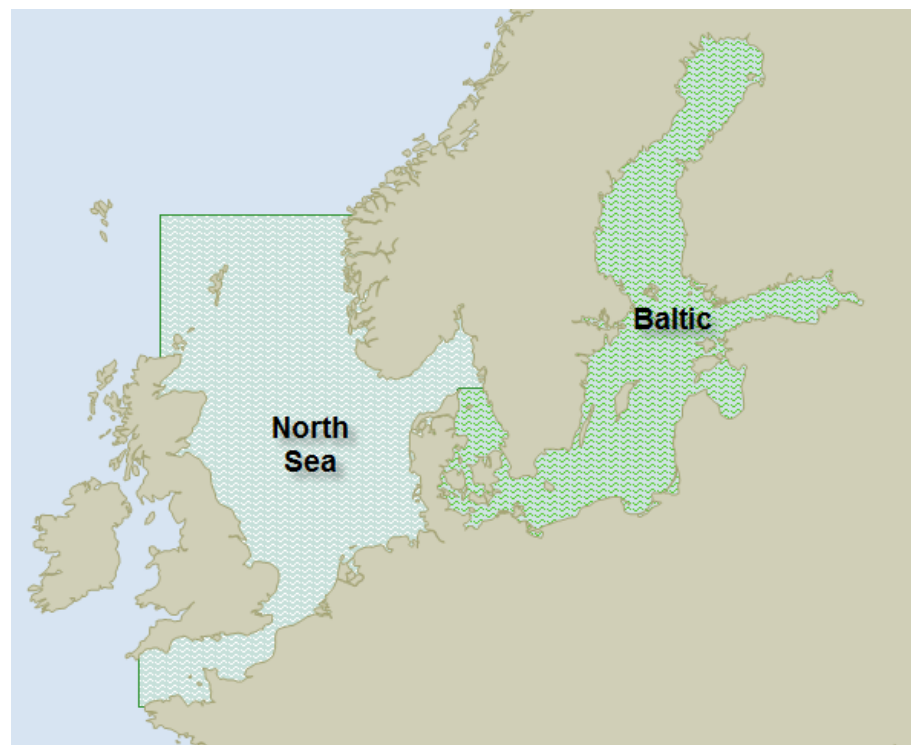
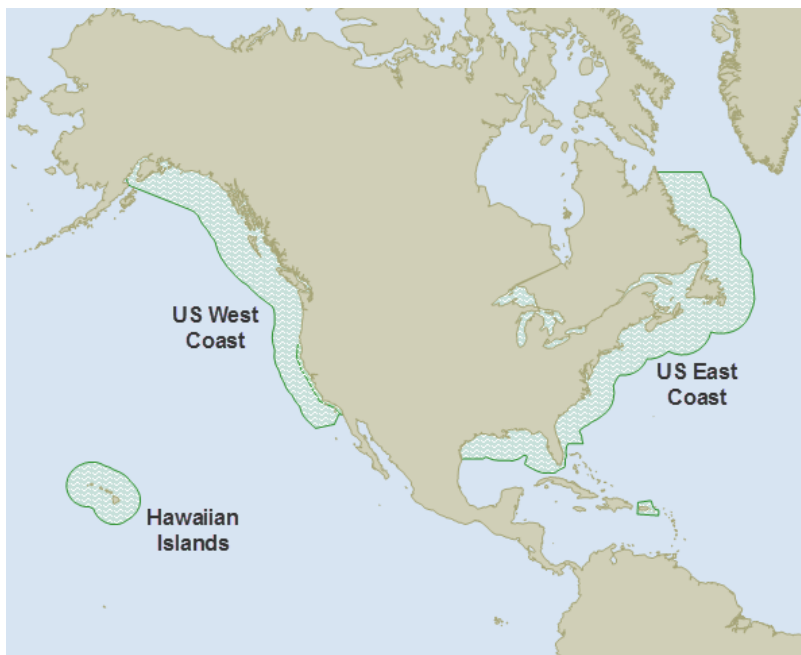
MARPOL Annex VI *Prevention of air pollution by ships*



<i>Special Areas</i>	<i>Adopted #</i>	<i>Date of Entry into Force</i>	<i>In Effect From</i>
<i>Baltic Sea (SOx)</i>	<i>26 Sept 1997</i>	<i>19 May 2005</i>	<i>19 May 2006</i>
<i>North Sea (SOx)</i>	<i>22 Jul 2005</i>	<i>22 Nov 2006</i>	<i>22 Nov 2007</i>
<i>North American (SOx, and NOx and PM)</i>	<i>26 Mar 2010</i>	<i>1 Aug 2011</i>	<i>1 Aug 2012</i>
<i>United States Caribbean Sea ECA (SOx, NOx and PM)</i>	<i>26 Jul 2011</i>	<i>1 Jan 2013</i>	<i>1 Jan 2014</i>

Source: <http://www.imo.org/>

ECAs USA & Baltic



Other emissions **NO_x**

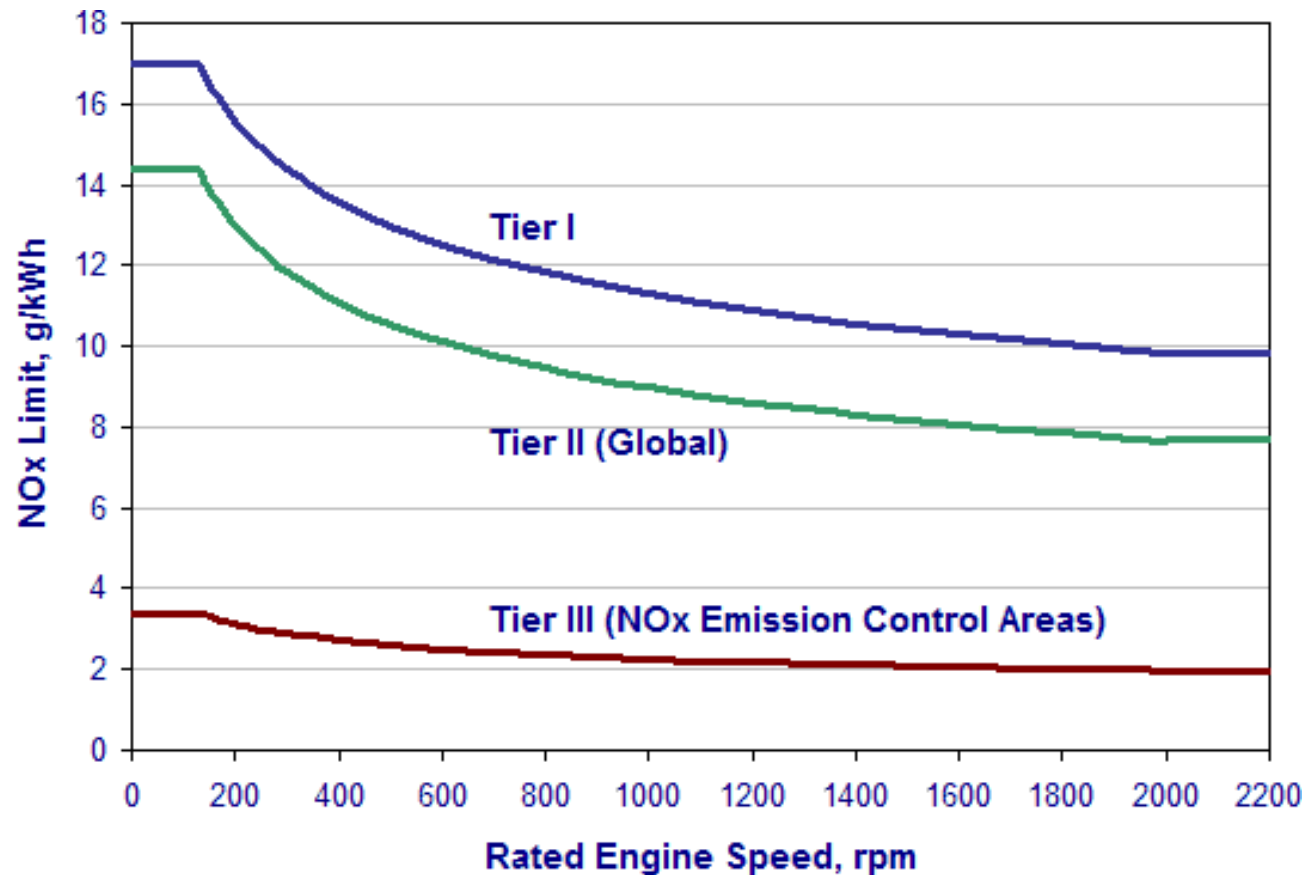


NO_x emission limits are set for diesel engines depending on the engine maximum operating speed (n , rpm), as shown in the following Table. Tier I and Tier II limits are global, while the Tier III standards apply only in NO_x Emission Control Areas.

Tier	Date	NO _x Limit, g/kWh		
		$n < 130$	$130 \leq n < 2000$	$n \geq 2000$
Tier I	-2000	17.0	$45 \cdot n^{-0.2}$	9.8
Tier II	2001-2011	14.4	$44 \cdot n^{-0.23}$	7.7
Tier III	- 2016†	3.4	$9 \cdot n^{-0.2}$	1.96
† In NO _x Emission Control Areas (Tier II standards apply outside ECAs).				

Further technical details pertaining to NO_x emissions, such as emission control methods, are included in the mandatory “NO_x Technical Code”

Other emissions **NOx**



MARPOL Annex VI NOx Emission Limits

Other emissions: SO_x

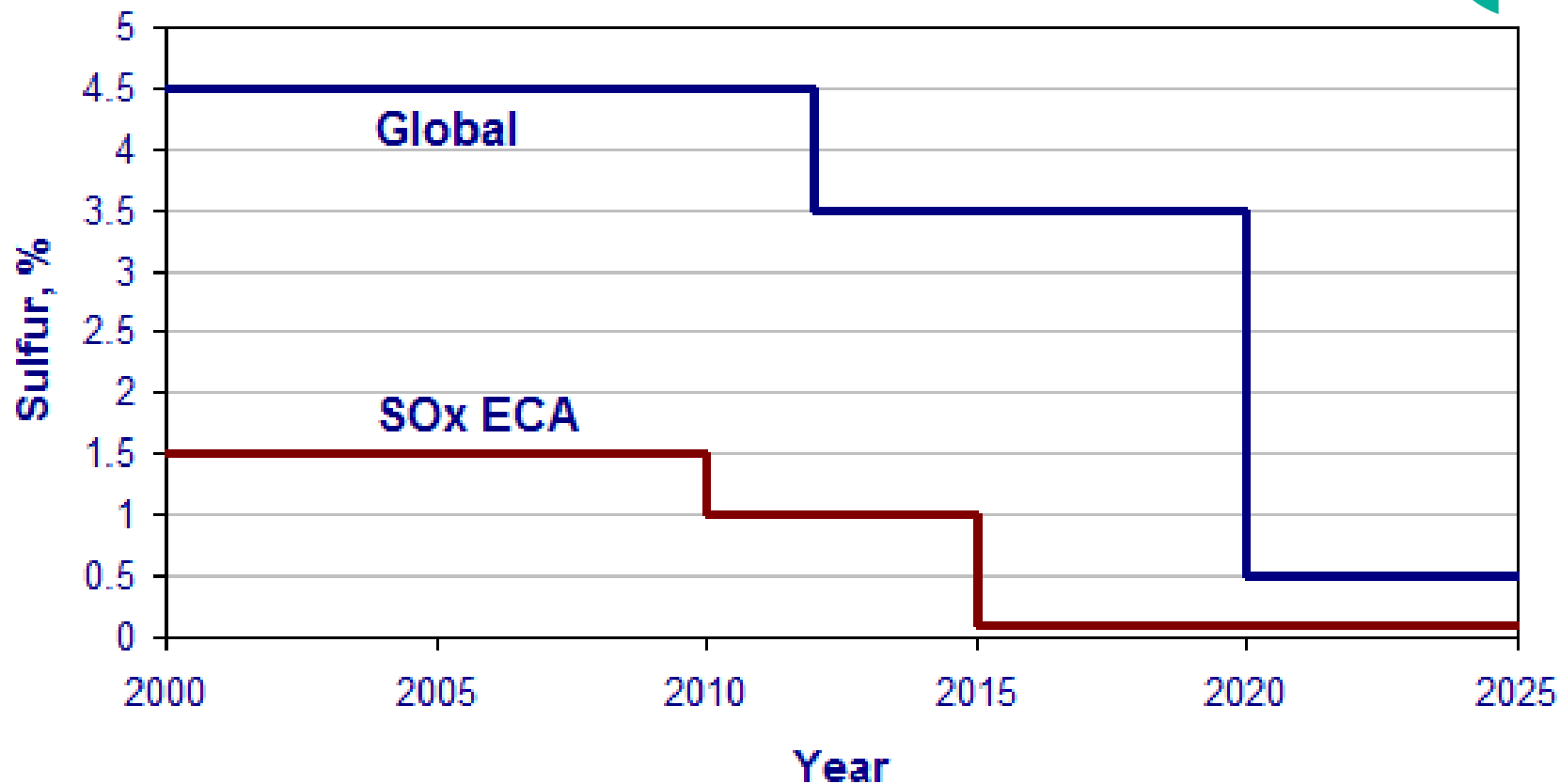


- Annex VI regulations include caps on sulfur content of fuel oil as a measure to control SO_x emissions and, indirectly, PM emissions (there are no explicit PM emission limits).
- Special fuel quality provisions exist for SO_x Emission Control Areas (SO_x ECA or SECA).

Date	Sulfur Limit in Fuel (% m/m)	
	SOx ECA	Global
2000	1.5%	4.5%
2010.07	1.0%	
2012		3.5%
2015	0.1%	0.5%
2020 ^a		
a - alternative date is 2025, to be decided by a review in 2018		

- Heavy fuel oil (HFO) is allowed provided it meets the applicable sulfur limit (i.e., there is no mandate to use distillate fuels).
- Alternative measures are also allowed (in the SO_x ECAs and globally) to reduce sulfur emissions, such as through the use of scrubbers. For example, in lieu of using the 1.5% S fuel in SO_x ECAs, ships can fit an exhaust gas cleaning system or use any other technological method to limit SO_x emissions to ≤ 6 g/kWh (as SO₂).

Other emissions: SO_x

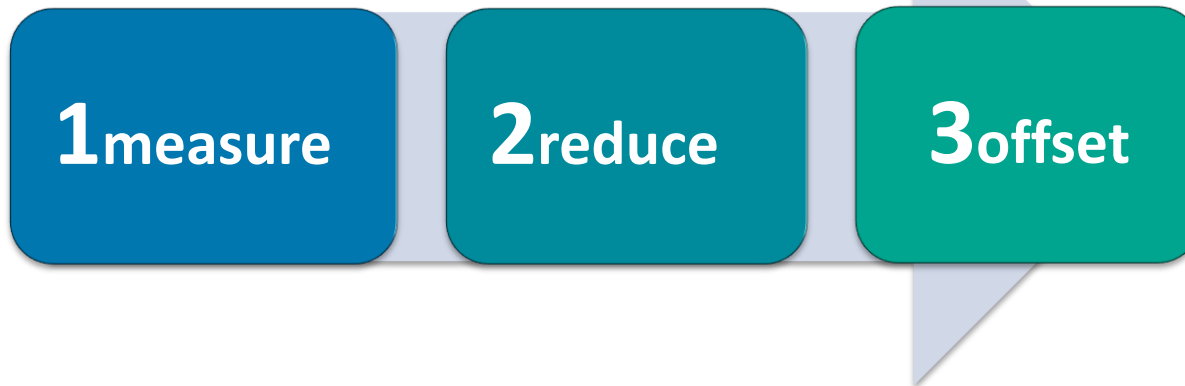


MARPOL Annex VI Fuel Sulphur Limits

CPPS: Carbon Positive Programme for Ships



*CPPS is an independent, **holistic** three phased approach to vessel Carbon Reduction and Energy efficiency based on MRV System (Monitoring Reporting Verification)*



The CPPS approach:

PRINCIPLES, METHODOLOGY, TOOL, PROOF

CPCS: Carbon Positive Certification Scheme



*Upon completion of each phase, the award of the **Carbon Positive Certificate** signifies that a vessel is committed to a carbon reduction plan following a standardised methodology and demonstrates transparency by reporting the footprint and the reductions.*

- *The **CPPS** is accredited by a European flag and can be verified by IACS class.*
- *We can help you to communicate this to your stakeholders.*



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CPPS: Benefits



The Carbon Positive Programme for Ships is the best solution to energy and carbon emissions management for reducing costs and improving market position

- + Manages cost effectively carbon emissions and fuel consumption*
- + Safeguard for future regulation and costs*
- + Rewards and communicates achievements to stakeholders*
- + Complies with international and commercial standards and requirements*
- + Address environmental Corporate Social Responsibility (CSR)*

CPPS: core design elements



- + *Follows certain principles: completeness, consistency, cost effectiveness, transparency and faithfulness*
- + *Measure fuel consumption based on activity data*
- + *Facilitates CO₂ reduction with minimum cost*
- + *Automated monitoring and reporting in standardised format*
- + *Operates with all data sources (manual or software)*
- + *Covers both commercial and regulatory requirements (SEEMP)*
- + *Applicable to all vessels*
- + *Monitors all energy efficiency data*
- + *Auditable and Verifiable reporting*
- + *Minimum administrative effort*
- + *Continuous process*

CPPS: The Methodology



- *EU guidelines (MRV - Monitoring, Reporting and Verification)*
- *IMO guidelines for SEEMP (Design, Implementation, Monitoring, Self evaluation)*
- *ISO 50001 (Energy Efficiency Management)*
- *ISO 14064 (Quantification and Reporting of GHGs)*
- *UNFCCC/Intergovernmental Panel for Climate Change (IPCC) guidelines*

CPPS fulfills emissions requirements and is recognised by commercial standards

- *Environmental Ship Index (ESI)*
- *Clean Shipping index*
- *Green Award*
- *RightShip*
- *OCIMF/TMSA*
- *more to come (ie IACS index)*

1 measure: How it works



1. *Collection & analysis of vessel's data*
2. *Real-time Energy Audit (Optional)*
3. *Development of Annual Emission Monitoring Plan*
4. *Monitoring/reporting of vessel's energy performance*
5. *Base lining and benchmarking*
6. *Annual Emission Report*
7. *Independent Verification of CO₂ emissions*
8. *CP Certificate for phase 1*

INPUTS: Vessel's Particulars, Daily Report from the vessel(Noon Report),Energy Audit (Optional)

OUTPUTS: Emission Monitoring Plan, CO₂ Annual Report, Verification, CP Certificate Phase 1

1 measure: How it works

Monitoring

CPPS Annual Emission Monitoring Plan

- + **Vessel Profile:** Ship particulars, on-board equipment
- + **Measures applied :** Operational and technical
- + **Coverage:** all vessels, all voyages, steaming time, idle time, ballast and laden legs
- + **Monitored data:** energy efficiency related data (EPIs)
- + **EPIs:** CO₂, EEOI, fuel consumed (HFO, MDO), cargo, distance, engine load, SO_x, NO_x etc
- + **Monitoring Tool:** EEOI
- + **Data source:** Noon report, BDN, log books
- + **Data collection:** electronically – automated extraction of data (parsing)
- + **Frequency:** daily (current practice)
- + **Data assessment:** baselines for every EPI, benchmarking (internal & external)



1 measure: **How it works**

Reporting

CPPS Emissions Reports

- + *Frequency: Monthly, Annually*
- + *Total CO₂ emissions per vessel/ fleet:*
 - *per route*
 - *within port area (port emissions)*
 - *within certain regions, e.g. EU, Australia, China etc*
- + *Selected EPIs for reporting (fuel consumption, number of voyages, costs etc)*
- + *CO₂ variation from past years*
- + *Measures implemented (dates and proof)*



1 measure: How it works

Verification:

3rd Party verification is needed

- + Verification follows the ISO 14064-3:2006*
- + Verification of data rows (manual or automated)
- + Remote desktop review
- + Audit/technical review on submitted documents
- + Audit Report produced
- + Assurance statement



*Specification with guidance for the Validation & Verification of GHG Assertions

2 reduce: **How it works**



1. *Creation of SEEMP Plus*
2. *Development of Annual Emission Monitoring Plan*
3. *Selection & implementation of abatement measure(s) and EPIs*
4. *Monitoring/reporting of vessel's energy performance*
5. *Independent Verification of CO₂ emissions (Optional)*
6. *Review and Analysis of measure effectiveness*
7. *Annual Emission Report*
8. *CP Certificate for phase 2*

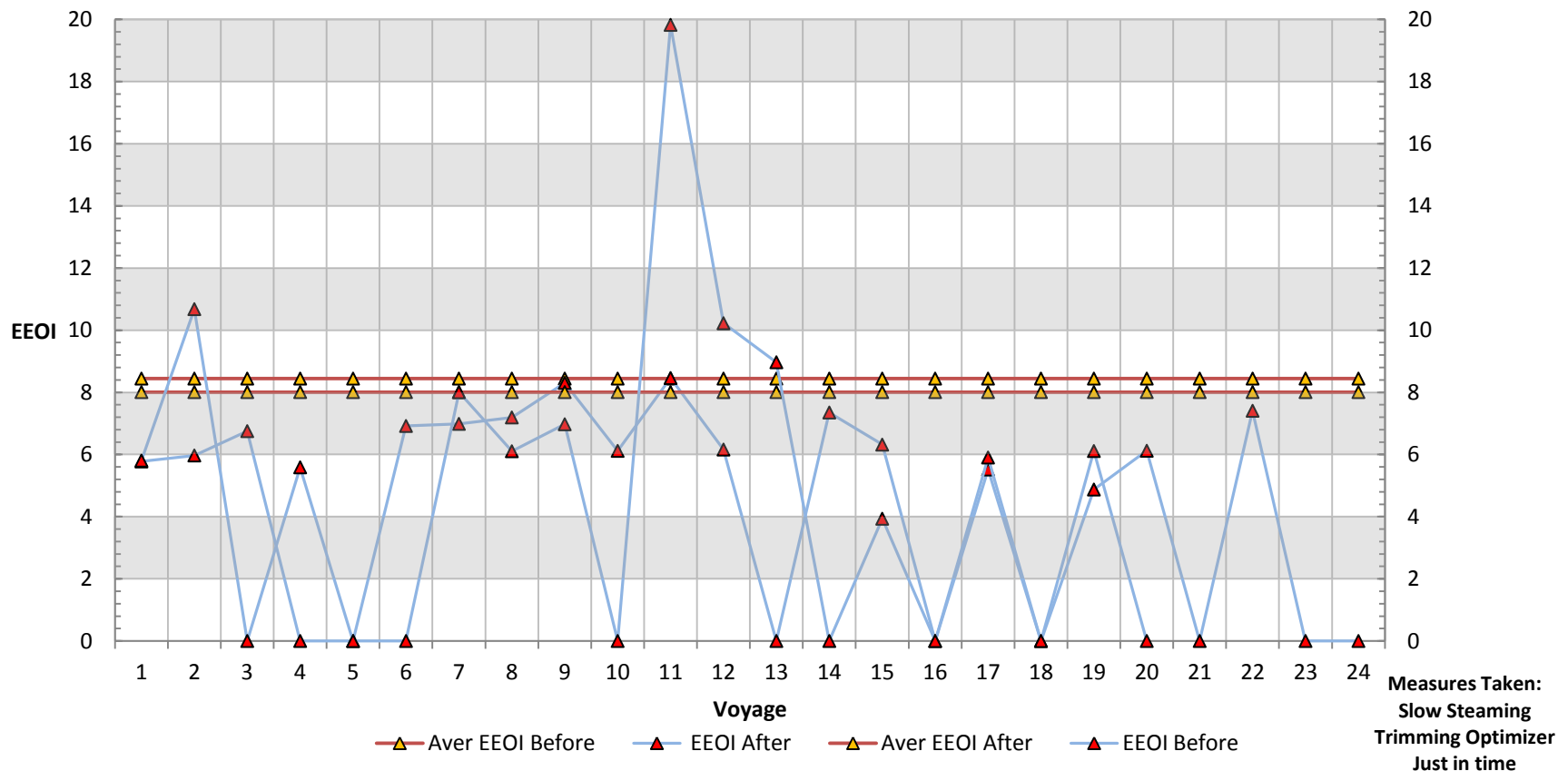
INPUTS: Measures (Technical/Operational), Daily Report from the vessel(Noon Report)

OUTPUTS: Emission Monitoring Plan, SEEMP, CO2 Annual Report, CP Certificate Phase 2

2reduce: EEOI Reduction



EEOI Reduction Based on absolute numbers



3 offset: How it works



1. *Latest Annual Emissions Report*
2. *Definition of offsetting target*
3. *Setting of communication objectives*
4. *Producing risk & financial analysis*
5. *Selection of the right carbon offsets*
6. *CP Certificate for phase 3*

INPUTS: Latest Annual emissions Report, Offsetting target, Offsetting Budget

OUTPUTS: Annual Emission Report, CP Certificate Phase 3

3 offset: CSR




projects must have:


- ✓ certified methodology
- ✓ independent verification process
- ✓ Independent registry

Emissions reductions must:

- ✓ Real
- ✓ Permanent
- ✓ Unique
- ✓ Additional*

*they would not have happened without the project

Kikonda, Buganda Kingdom, Uganda	Kikonda Forest Reserve	Status: Other														
																
<p>The Kikonda Forest Reserve in the heart of East Africa has faced a long struggle to preserve the last remaining natural forest. Through a combination of protecting and enriching the natural forests, an extensive planting scheme and sustainable forest management the Kikonda Forest Reserve has been transformed. It is the first in the country to be granted CarbonFix certification for its one-of-a-kind positive social and ecological impact.</p>																
<table><tr><td>Project Sector:</td><td>Forestry & Land Use</td></tr><tr><td>Transaction Type:</td><td>Buy Offsets / Credits</td></tr><tr><td>Market:</td><td>UnKnown</td></tr><tr><td>Unit Type:</td><td>VER+</td></tr><tr><td>Volume:</td><td>0</td></tr><tr><td>Price:</td><td>0</td></tr><tr><td>Brochure:</td><td>View Brochure</td></tr></table>			Project Sector:	Forestry & Land Use	Transaction Type:	Buy Offsets / Credits	Market:	UnKnown	Unit Type:	VER+	Volume:	0	Price:	0	Brochure:	View Brochure
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Brochure:	View Brochure															
View Project																

Chiapas, Mexico	Scolet Té - Plan Vivo	Status: Other												
														
<p>The Scolet Té project brings together indigenous communities in Mexico to help them manage their land responsibly and replant and protect endangered forests.</p>														
<p>It is a project under the Plan Vivo System which is a structure for community land use projects in developing states. The Plan Vivo System provides a way for farmers and land users to create plans to preserve and restore the land and forest areas through reforestation initiatives.</p>														
<table><tr><td>Project Sector:</td><td>Forestry & Land Use</td></tr><tr><td>Transaction Type:</td><td>Buy Offsets / Credits</td></tr><tr><td>Market:</td><td>UnKnown</td></tr><tr><td>Unit Type:</td><td>VER+</td></tr><tr><td>Volume:</td><td>0</td></tr><tr><td>Price:</td><td>0</td></tr></table>			Project Sector:	Forestry & Land Use	Transaction Type:	Buy Offsets / Credits	Market:	UnKnown	Unit Type:	VER+	Volume:	0	Price:	0
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Volume:	0													
Price:	0													
View Project														

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Other Services



Additionally to the CPPS, *Carbon Positive* offers the following individual services:

- **Monitoring and Reporting**

- *A certified procedure, accredited from a European Flag, aiming to assist the operator to monitor its fuel consumption and manage its carbon emissions*

- **Analysis and SEEMP Plus**

- *Energy efficient Assessment & Analysis of the annual data as well as development of a carbon emissions reduction Strategy*

- **Monitoring, Reporting and Verification (MRV)**

- *Issue of CP Certificate after the review of the collected data . A third party will verify the data*

- **Carbon Positive Certification**

- *Award of the Carbon Positive Standard Certificate*



THANK YOU

To join the Carbon Positive Programme for Ships,
or to speak to one of our consultants, please
contact us at:

info@carbonpositive.com

or visit

www.carbonpositive.com



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