



# **Shipping innovation challenges in a framework for sustainable transport**

**1st Sustainable Shipping Technologies Forum**

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# Challenge

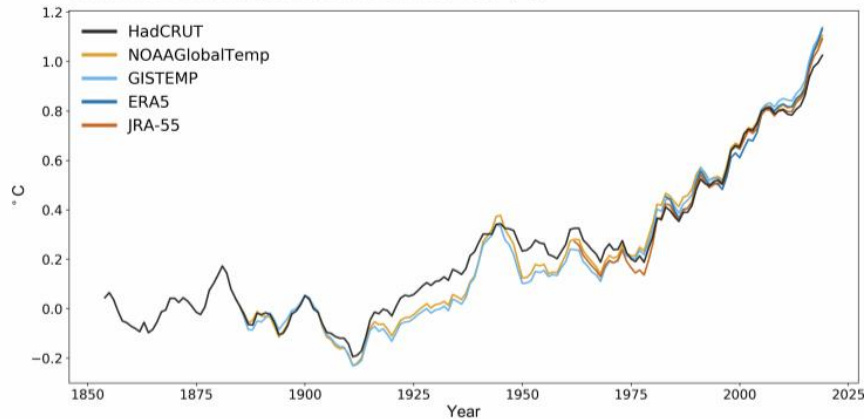


WORLD  
METEOROLOGICAL  
ORGANIZATION

**The world is heating!**

Met Office

Global mean temperature difference from 1850-1900 (°C)



© Crown Copyright. Source: Met Office

## 2015-2019:

- Warmest on record.
- CO2 increasing 20% faster than before.
- CO2 remains (centuries in air, longer in sea).
- Fastest Sea level rise 5mm/yr (2007-2016 4mm/yr, since 1993 average 3.2 mm/year).
- Extreme weather event; heat records (8,900 deaths), \$125 Bn 2017 Hurricane Harvey, \$16 Bn 2016 California Wild fires.

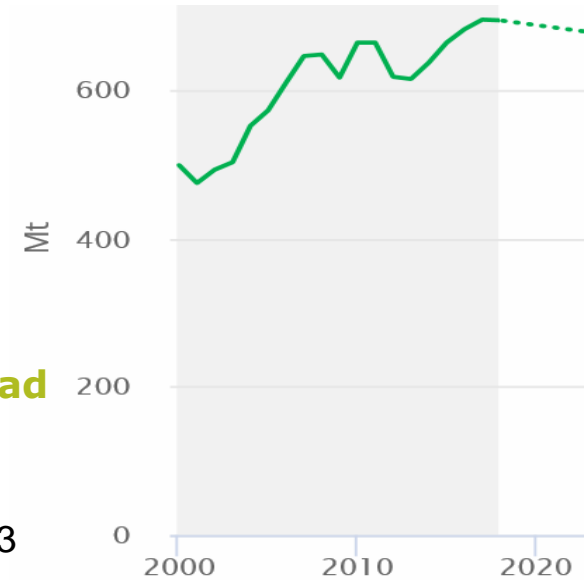
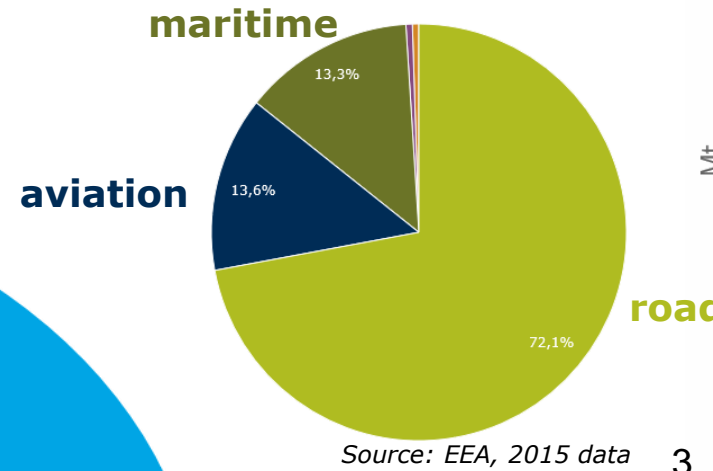
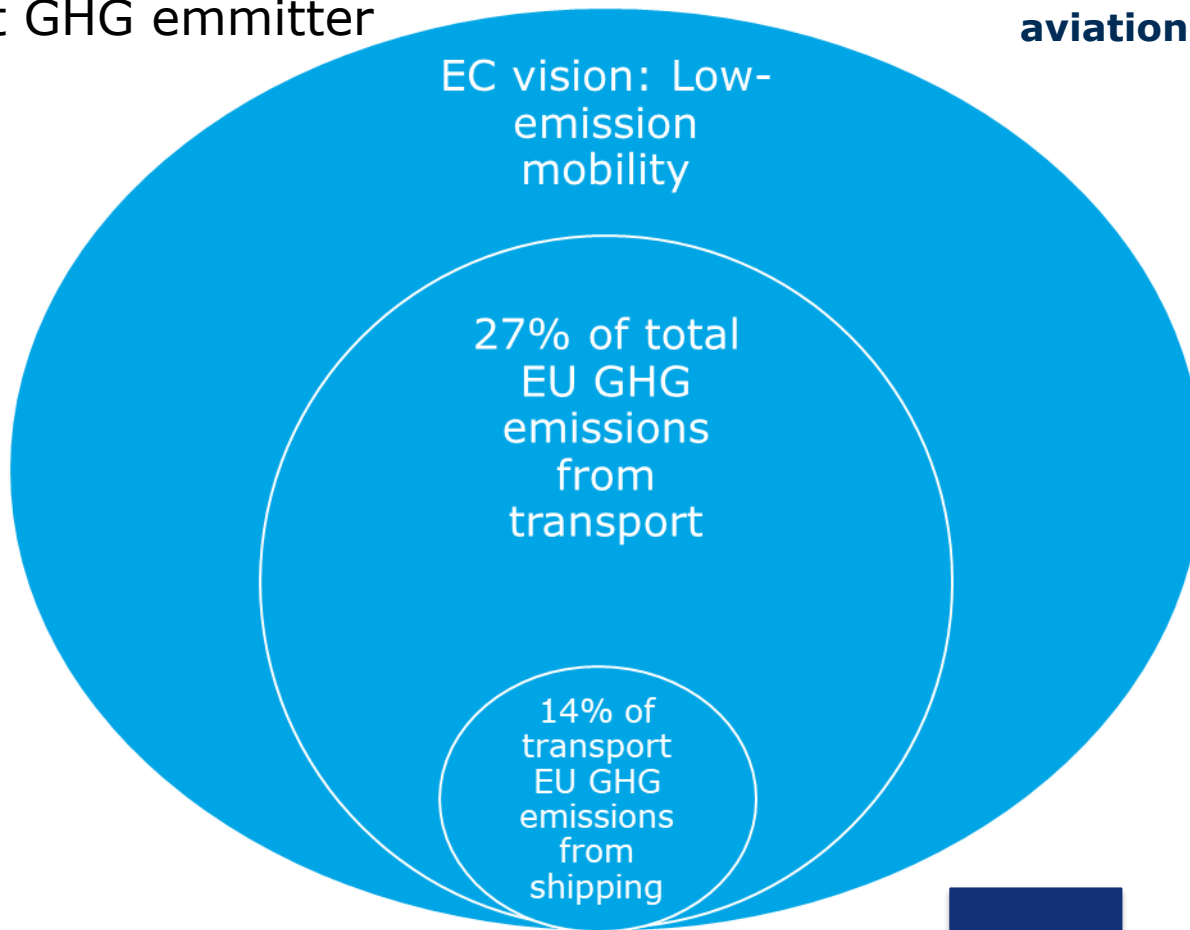
Five-year running average of global temperature anomalies (relative to pre-industrial) from 1854 to 2019 for five data sets: HadCRUT.4.6.0.0, NOAA GlobalTemp v5, GISTEMP v4, ERA5, and JRA-55. Data for 2019 to June



# Ships ?



- 2 to 3% of global GHG's,
- By 2050 without action + 50% to 250%
- If shipping was a country, it would be the 6th largest GHG emitter



IEA  
international  
shipping CO2

Estimated:

- 18 to 30 percent of Global Nox
- 9% of the Global Sox

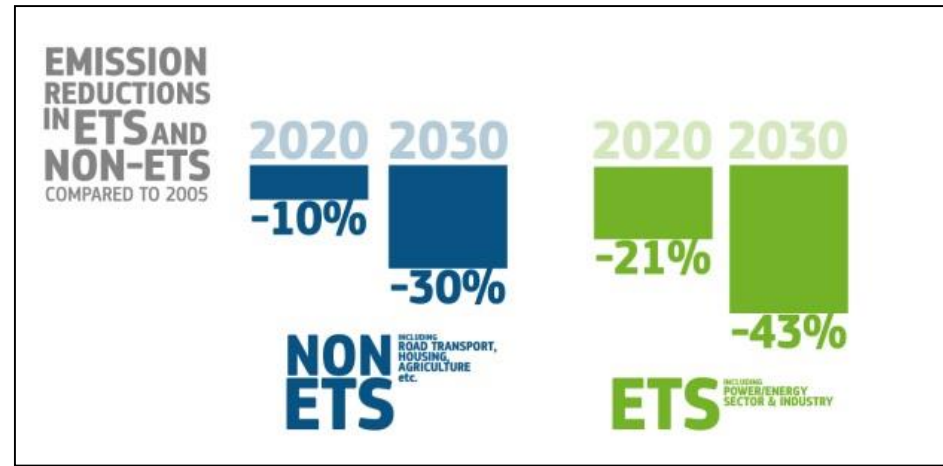
Approx 130 million tons of CO2  
per year from EU shipping



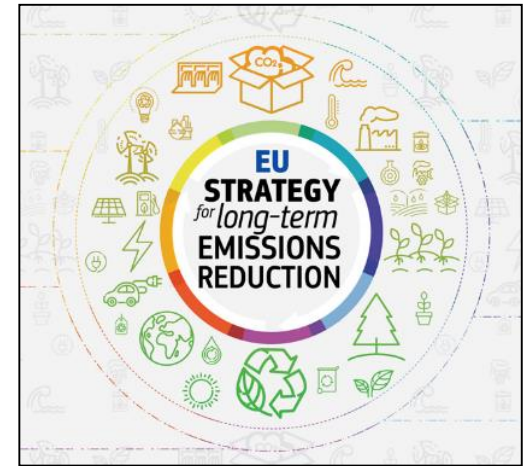
# Ambition !



Paris Agreement objective to limit global temperature increase to well below 2°C, try to limit increase to 1.5°C



EU commitment to reduce emissions by -40% below 1990 levels by 2030



Potential for net zero economy-wide emissions by 2050



By 2050, Minimum 50% net GHG cut compared to 2008 objective zero GHG by end of century





# A European Green Deal

Becoming the world's first climate-neutral continent is the greatest challenge and opportunity of our times. Action needs to be taken now.

- Possible extension of the ETS to the maritime sector.
- Possible more ambitious emission reduction targets for 2030.
- People and regions most affected should be supported, nobody should be left behind.



## MARITIME SECTOR = CENTRAL TO OUR GLOBAL TRADING SUCCESS

Almost 50%  
of marine  
equipment  
from  
European  
companies



36%



total intra-EU trade



EU leads in  
Green Tech  
and complex  
ships



75%



EU's total  
external trade



32%



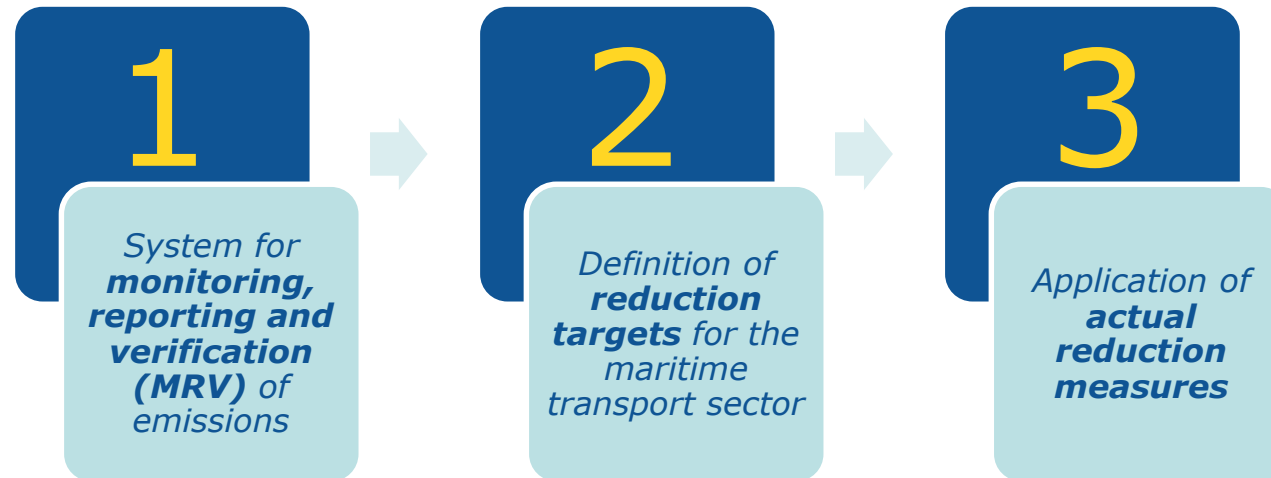
world fleet controlled  
by EU companies





## Context: Developments at the EU level

- 2013 – EC communication on integrating shipping emissions



- 2015 – Regulation (EU) 2015/757 & following implementing acts



## Climate change

Initial IMO GHG Strategy

EU MRV Regulation (2015/757)

Alternative Fuels Directive (2014/94)

National Plans and Strategies





# But... is this enough?

*IMO*



*EU Strategies*



*Industry*





*Long Distance Zero GHG shipping is not mainstream !*





# R&I ?

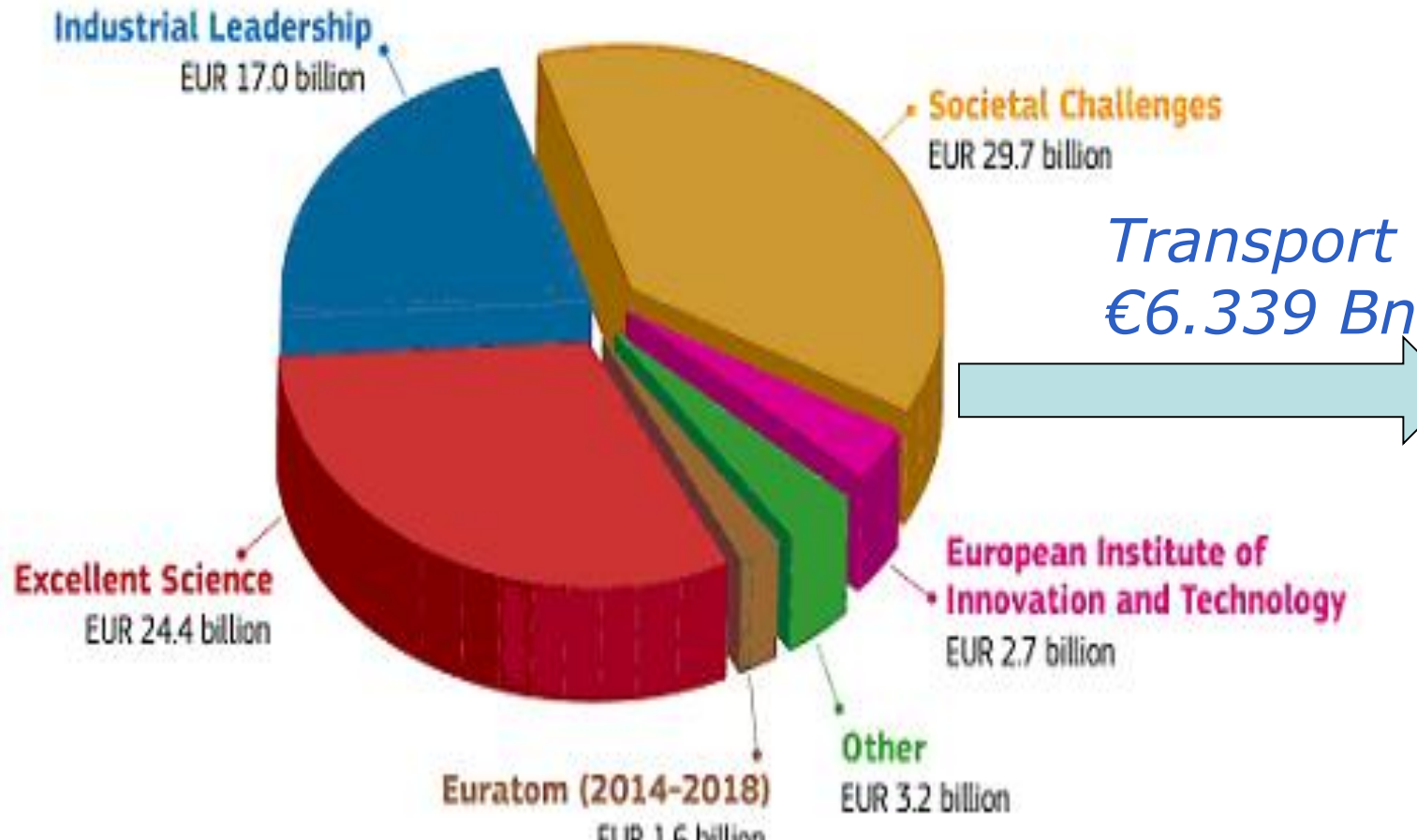




# Horizon 2020 (2014-2020)

HORIZON 2020 BUDGET (in current prices)

EUR 80 bn (total)



Transport  
€6.339 Bn

## Societal Challenges

Health and Wellbeing

Food Security, Sustainable  
Agriculture, Forestry,  
Marine, Maritime, Inland  
Water and Bio-economy

Secure, Clean & Efficient  
Energy

Smart, Green and Integrated  
Transport

Climate action,  
Environment, Resource  
efficiency and raw materials

Inclusive, Innovative and  
Reflective Societies

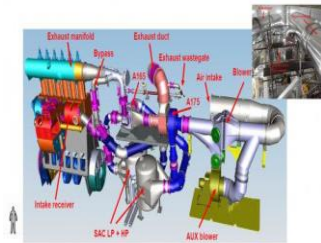
Secure Societies

Typically  
€50m/  
year to  
waterborne  
transport

(≈400 m in  
total)



# ENERGY EFFICIENT AND EMISSION FREE VESSEL – FROM COMPONENT TO VESSEL DEPLOYMENT + CEF



HERCULES-2

Fuel flexible, near-zero emission, adaptive performance marine engine



LEANSHIPS

Efficient, less polluting new/retrofitted vessels with end users' requirements



E-FERRY

The first mid-size 100% electric ferry



ZERO EMISSION FERRIES

A green link across Oresund by converting RoPax ships

## Technology readiness levels (TRL)





# EU R&I– how it works?



**Collaborative** R&I for consortia addressing **topics** defined in a published call (Multiannual work program revised annually) – Research, R&I, Innovation, Coordination and Support

**100%**

Up to **100% or 70%** of direct R&I costs.

**50%**

A typical **50% prepayment** at start of project



**International** cooperation (most less developed countries funded by EU same as an EU country, others at own cost )

**Can include demonstration** activities

Progress **beyond** the state of the art





# Horizon 2020 Call 2020 – published calls for proposals

(info day 7<sup>th</sup> October 2019 Brussels)

## **LC-MG-1-13-2020: Decarbonising long distance shipping**

### **Expected impact:**

- To meet the challenge of decarbonising long distance shipping beyond the 50% IMO 2050 target.
- Could address all aspect and a range of potential solutions (except fuels).
- Focus on the big GHG emitters;
- can include operation, technological and or combined measure.

## **LC-BAT-11-2020: Reducing the cost of large batteries for waterborne transport**

### **Expected impact:**

- to substantially reduce the lifetime cost of large waterborne battery systems which are now much more expensive than those within other applications such as road.
- To support Europe's competitiveness within the waterborne battery market.
- By cutting cost increase the viability and deployment of battery shipping (hybrid & full electric) to decarbonise waterborne transport.
- Towards most short range freight and ferry services becoming zero emission.

## **MG-BG-03-2020: Underwater noise mitigation and environmental impact**

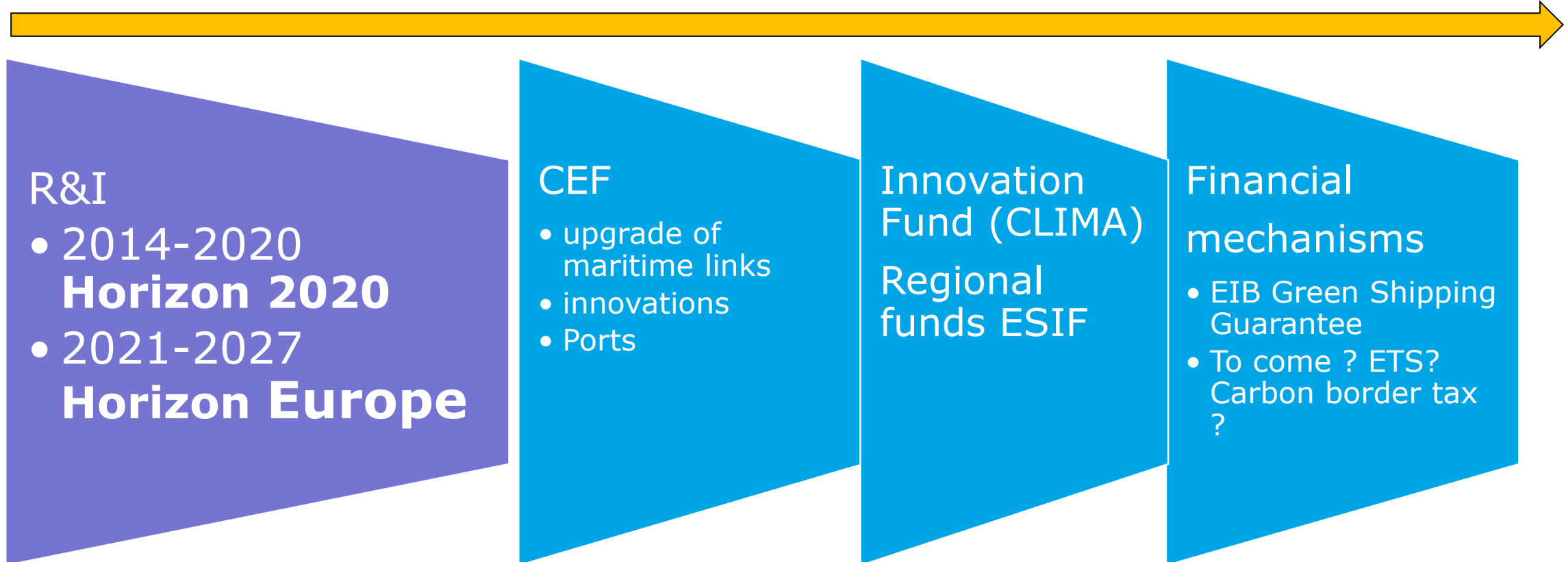
**Expected impact:** To support potential mitigation measures, increase understanding of the short and long term environmental impacts of underwater noise from shipping.



# EU financial support for green shipping

Concept

Market





# Horizon Europe

*'With growing international competition, Europe needs to act urgently on research and innovation.'*

*The proposed € 100 billion for the next EU research and innovation programme would be a huge boost.'*

Carlos Moedas, Commissioner, 15/05/2018

<b>Clusters</b> implemented through usual calls, <b>missions &amp; partnerships</b>	Budget (€ billion)
Health	€ 7.7
Inclusive and Secure Societies	€ 2.8
Digital and Industry	€ 15
Climate, Energy and Mobility	€ 15
Food and Natural Resources	€ 10
<b>Joint Research Centre</b> supports European policies with independent scientific evidence & technical support throughout the policy cycle	€ 2.2

Waterborne R&I



# To Consider ?



Sooner

Later

Measures to motivate deployment

Autonomous ships

IWT battery propulsion in urban regions

Standards for new technology

Global Hydrogen bunkering

Fuel flexible

Battery propulsion

Cost/operationally effective Carbon Capture

100% electric

Speed reduction

200 KM range battery electric

Route optimisation

Battery cost

Ammonia fuel zero carbon production

Efficiency improvements

Fuel

Infrastructure

All ferries battery electric

Shore side power

Zero carbon fuel blends

Duea Fuel, retrofit ammonia fuel solutions

Zero carbon synthesised fuels

Zero Carbon Hydrogen Fuel cell

Battery hybrid

Multi MW efficient

LNG Fuel cells

Hydrogen zero carbon production

Multi MW Ammonia Fuel

Hybridised multi zero emission energy sources and storage

Hybridised electric propulsion

Wind assist

Solar assist

Hydrogen storage Scalability/cost of other alternate zero carbon fuels

Ship operation and fuel production is integral

Exhaust treatment-zero discharge

Zero emission cruise ships (IWT+marine)

Retrofit hydrodynamics

Very high efficiency



# Thank you!

## Useful links:

- Research – Waterborne website:  
<http://ec.europa.eu/research/transport/index.cfm?pg=transport&lib=water>
- Funding and Tender portal:  
<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/h2020>  
<https://ec.europa.eu/inea/en/news-events/events/horizon-2020-transport-info-day-0>