# Maritime Decarbonization: A Critical Component of the Global Climate Action Agenda

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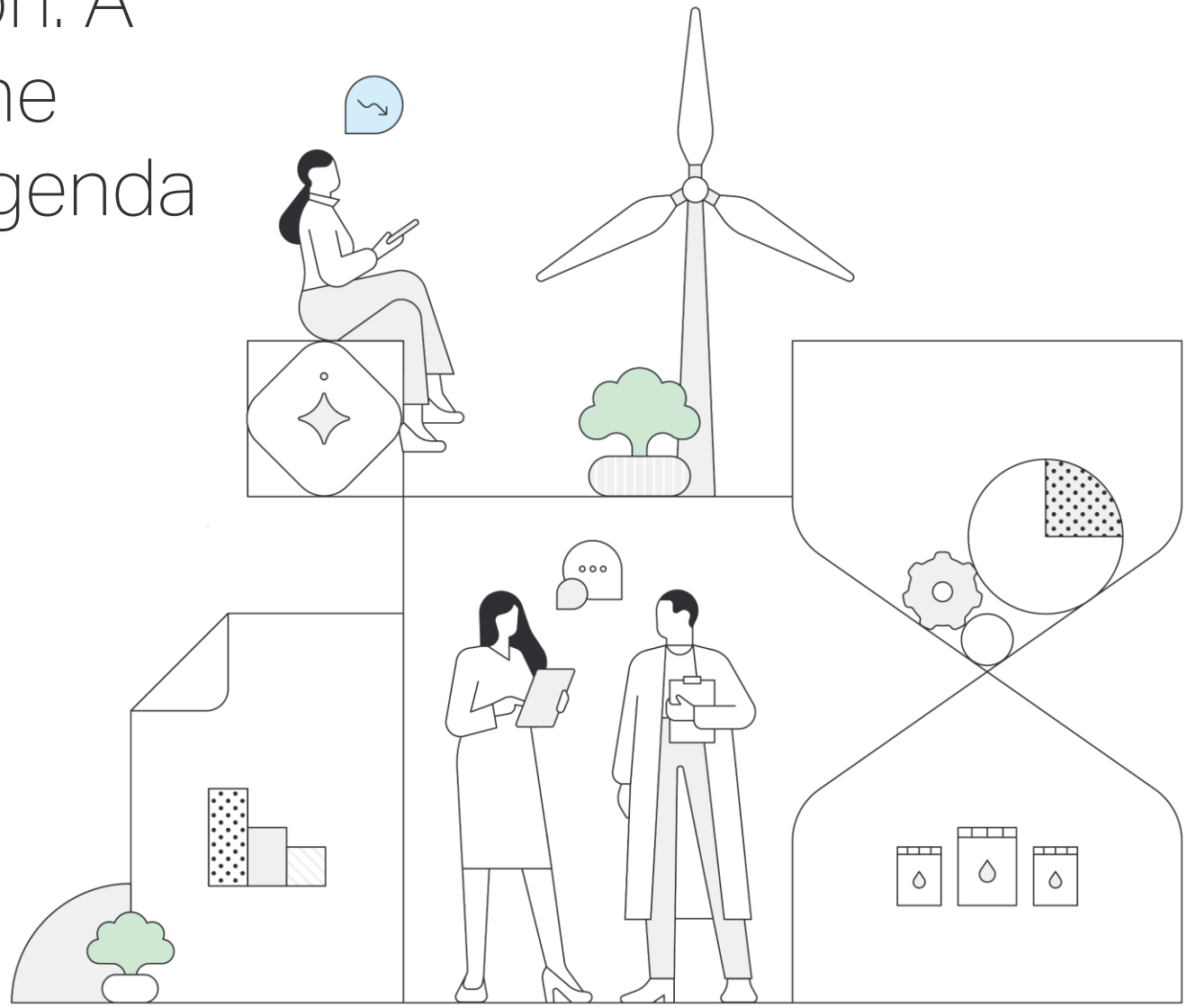
Sustainability Partner



# Agenda

01 What is Center for Zero Carbon Shipping?

02 The global climate challenge

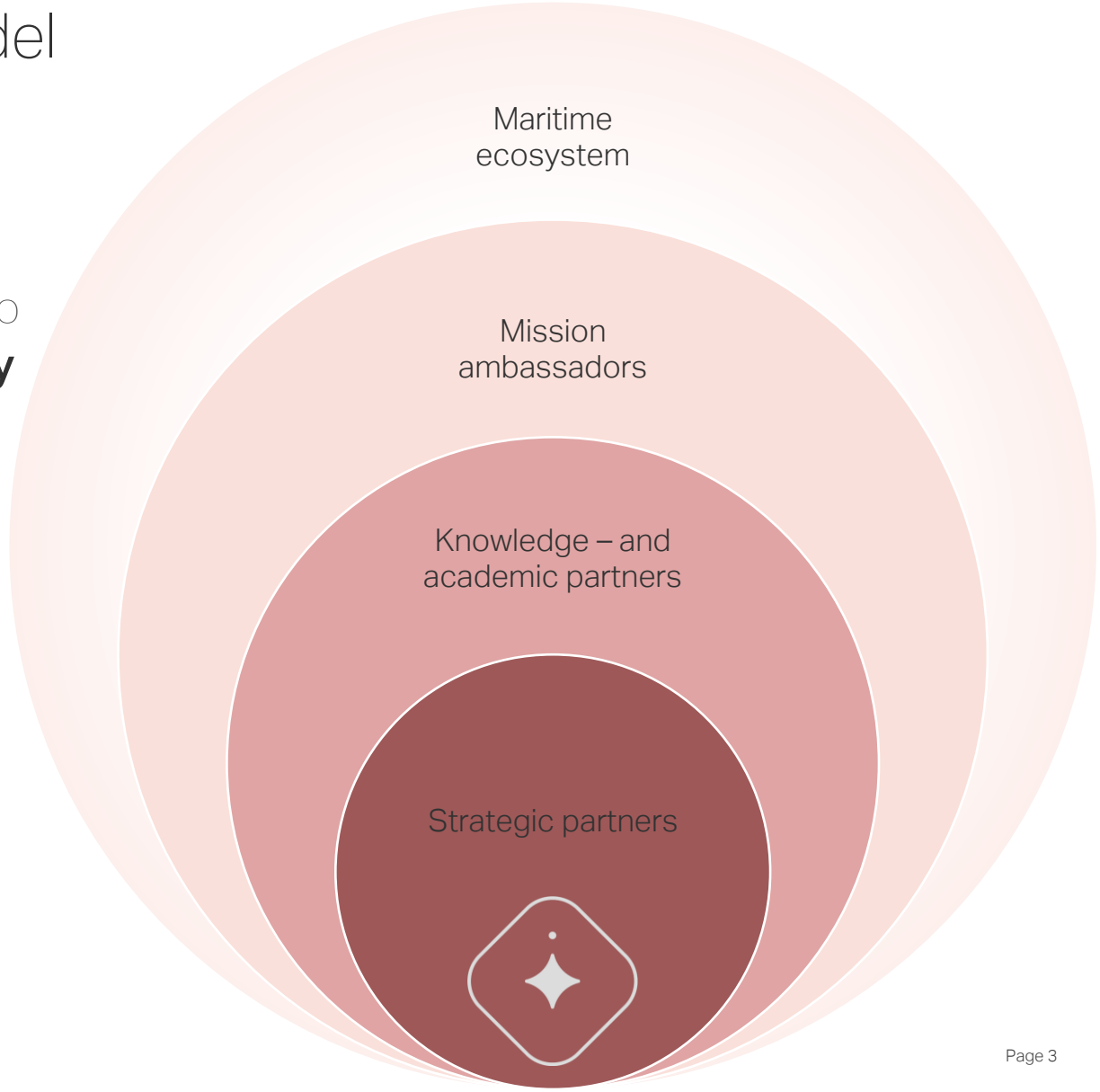
03 Why even talking about shipping?

04 What options does shipping have to reduce emissions?

05 What are the most imminent challenges and how do we solve them?

# Partnerships and collaborative climate action is the core of the Center operating model

The Center works with **dedicated partners** committed to collaborative climate action and a **motivated community** supporting the Center vision and mission

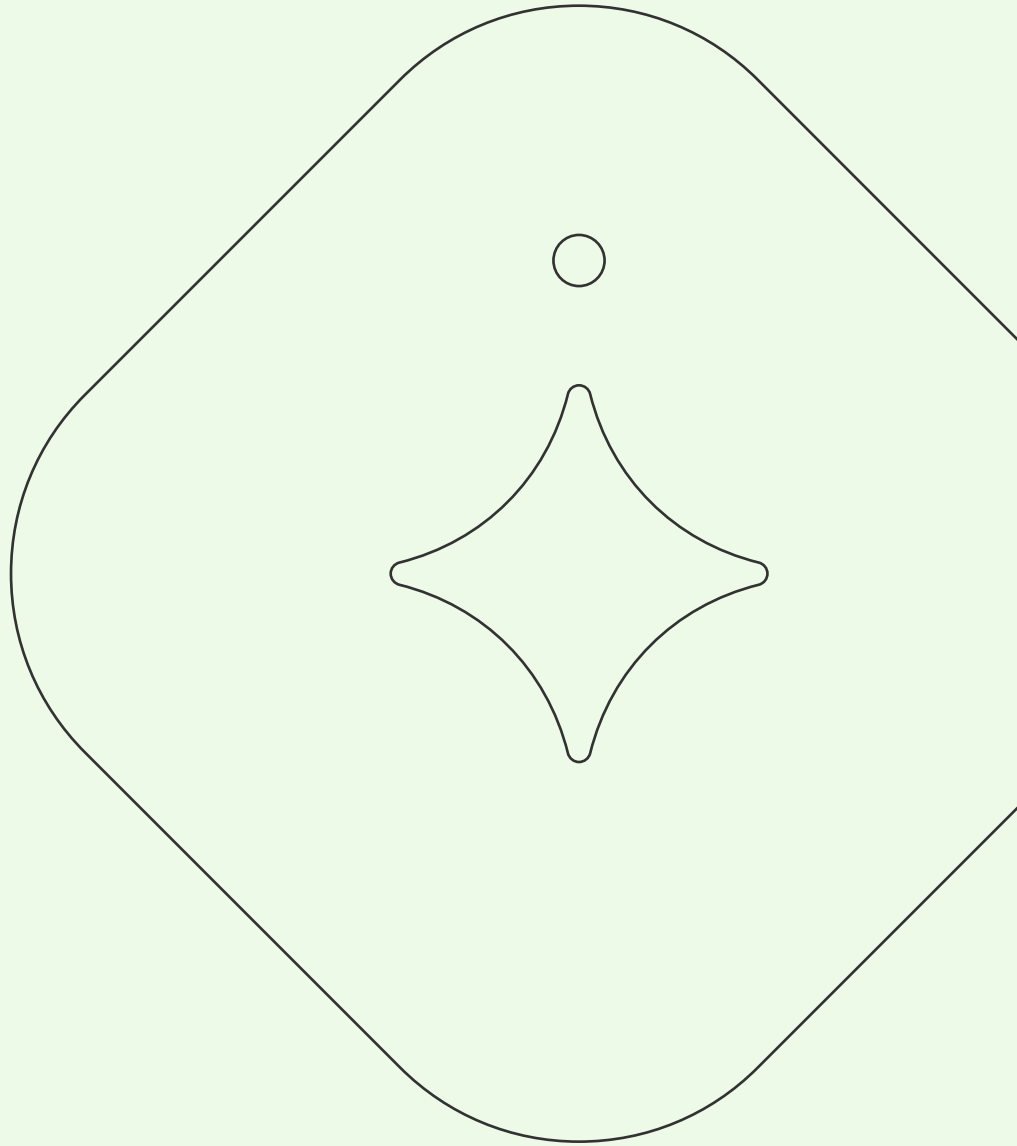



Our vision and mission

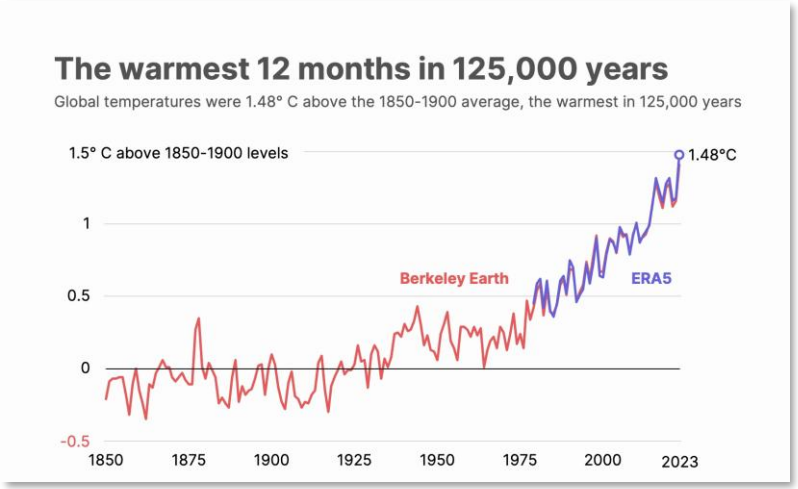
**Our vision** is to sustainably decarbonize the maritime industry by 2050

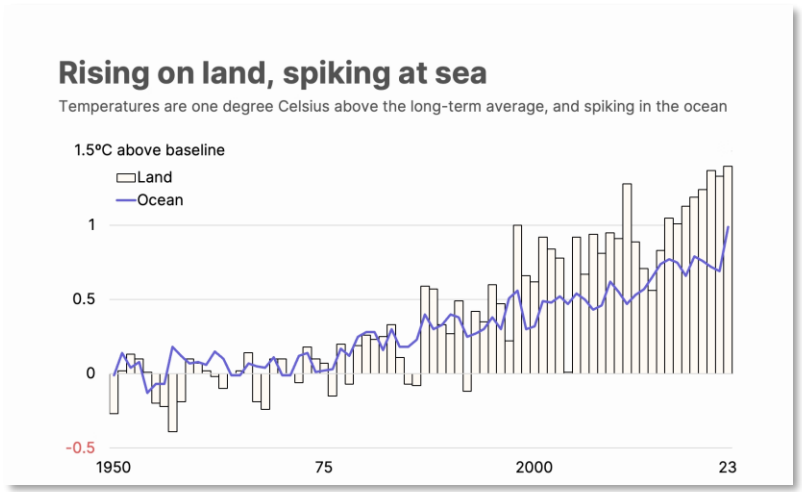
**Our mission** is to be an independent and significant driver of a sustainable maritime decarbonization

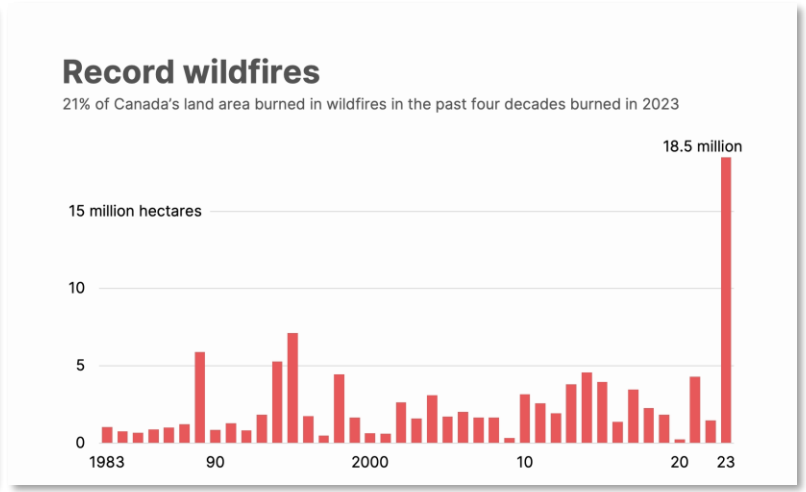
# The global climate challenge

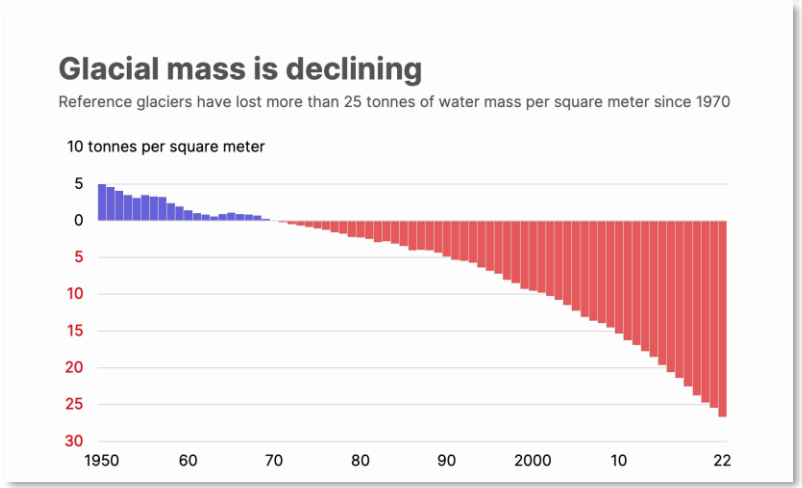


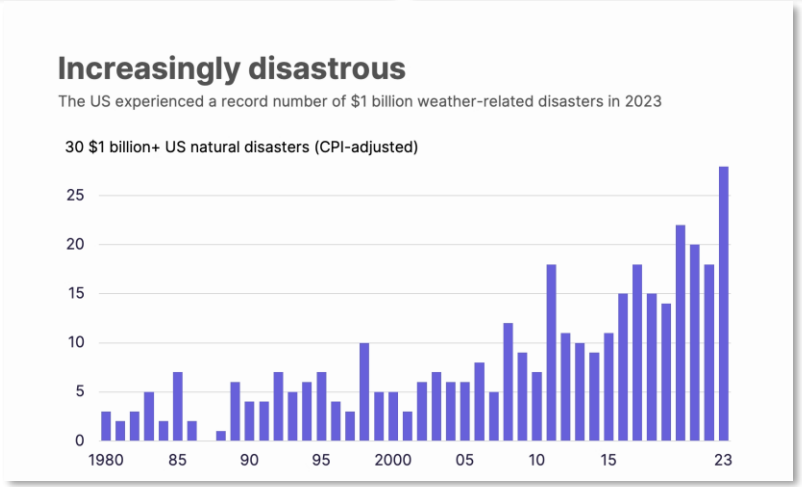
# Global temperatures have risen to unprecedented levels, leading to dangerous and widespread disruption in nature and affecting the lives of billions of people




Source: Presentations — Nat Bullard (nathanielbullard.com)

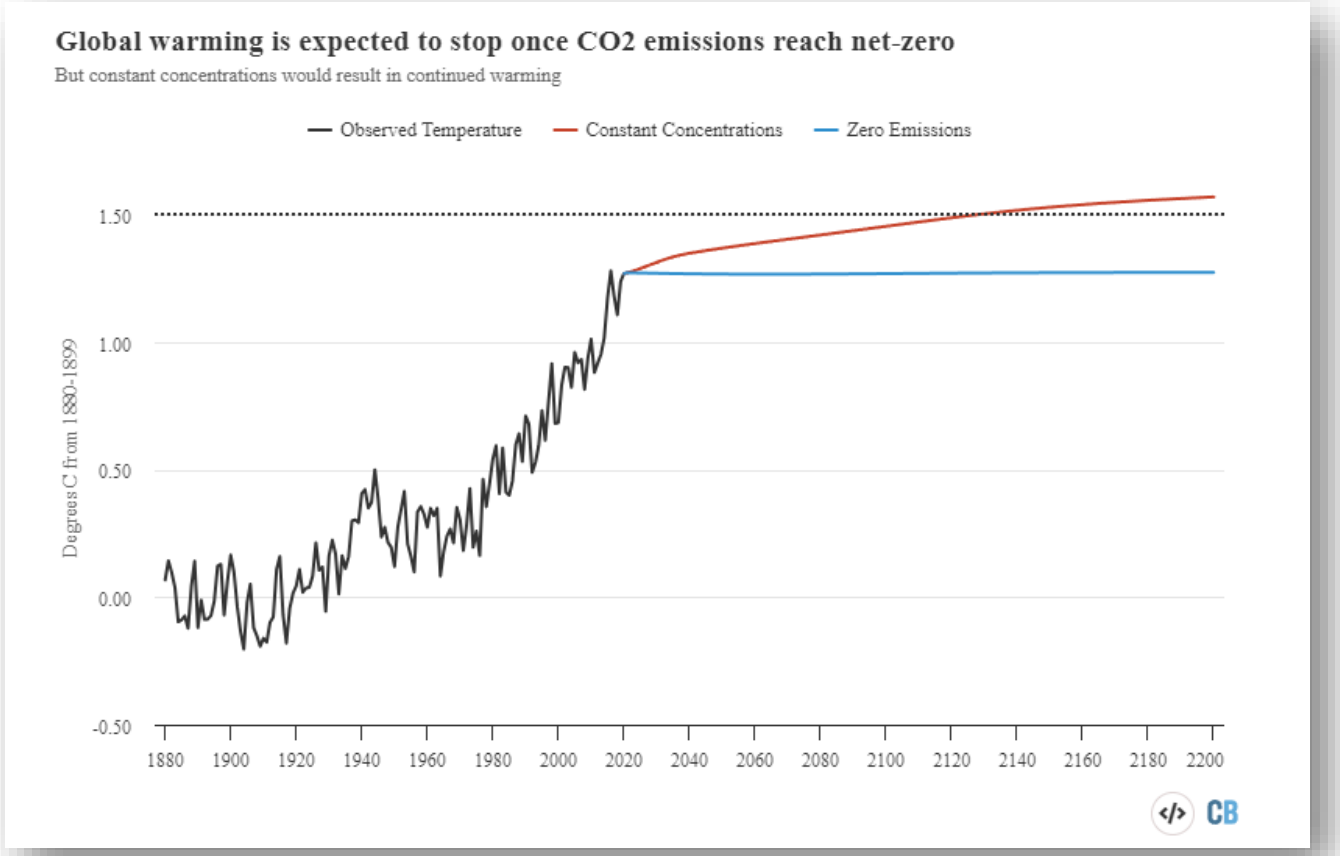
# Warming stops as soon as emissions hit Net Zero

Zero Emissions:

Temperatures stabilizes due to the ***cancel out effect*** of continuously heating of oceans and the carbon sink of land and ocean.

Constant Concentration:

Models tended to suggest 0.4C to 0.5C or so of **additional warming** would occur over the next few **centuries**.





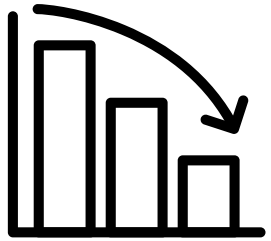

Source: https://www.carbonbrief.org/explainer-will-global-warming-stop-as-soon-as-net-zero-emissions-are-reached/

# The transition towards net zero $CO_2$ will most likely happen at different paces in different sectors

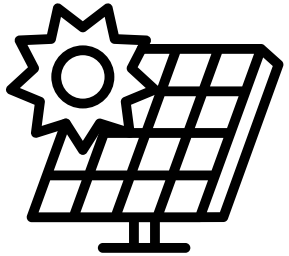
**"There are options in all sectors to at least halve emissions by 2030"** - *IPCC WG3*

… but some measures are easier to start with than others

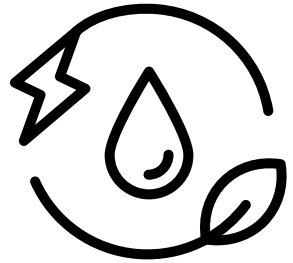
Easy to abate



Energy efficiency



Electrify when possible

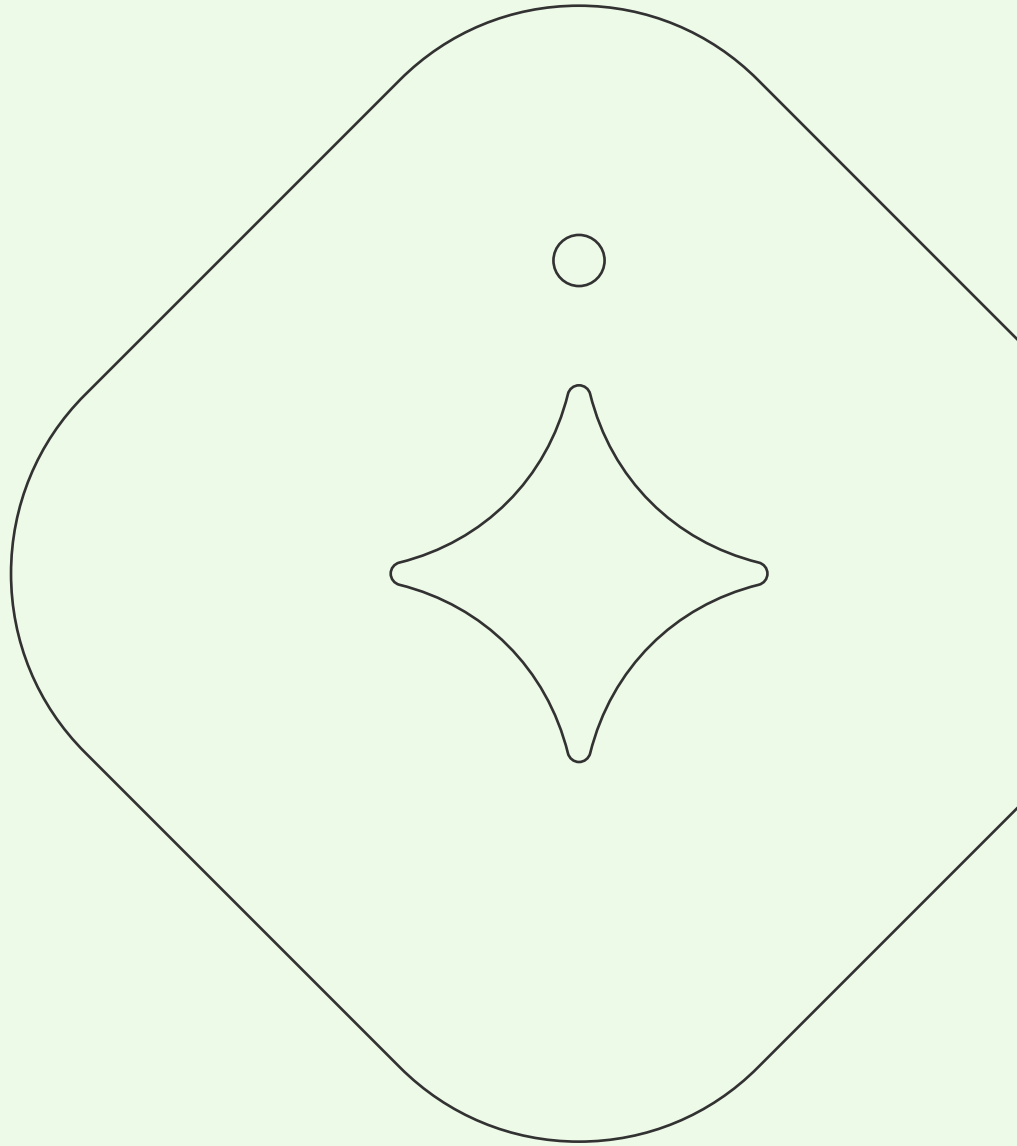


Alternative fuels

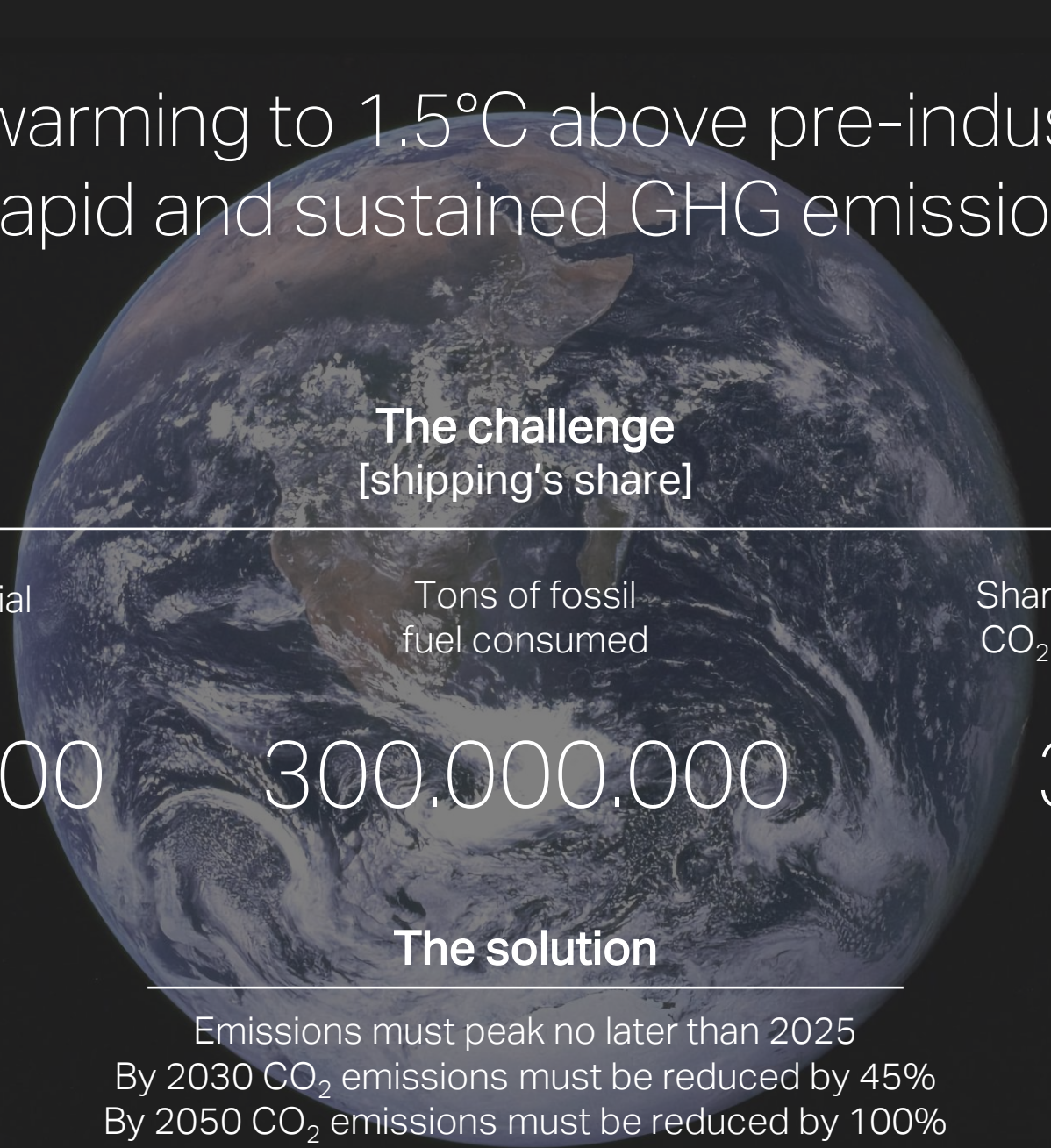
Hard to abate

Source: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf

# Why even talk about shipping?



# Limiting global warming to 1.5°C above pre-industrial levels requires deep, rapid and sustained GHG emissions reductions in all sectors



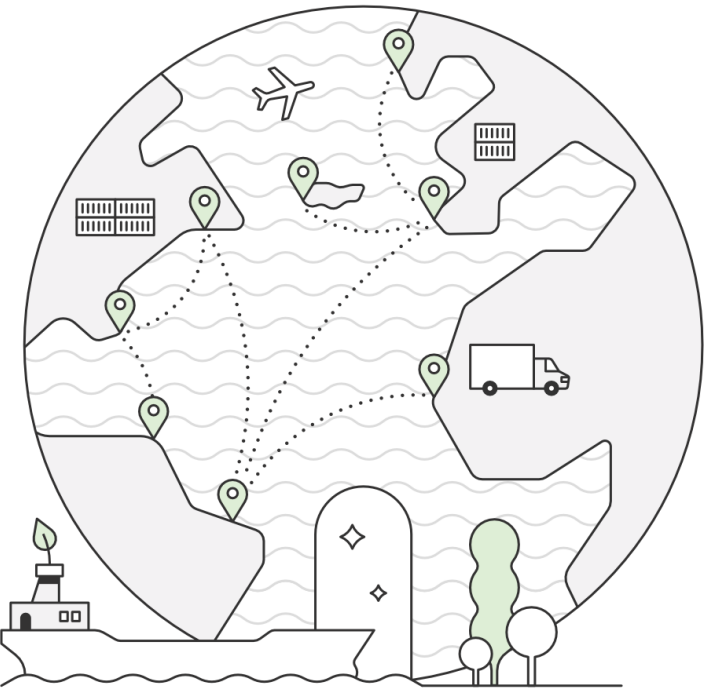
## The challenge
[shipping's share]

| Commercial vessels | Tons of fossil fuel consumed | Share of Global $CO_2$ emissions |
|---|---|---|
| 100.000 | 300.000.000 | 3% |

## The solution

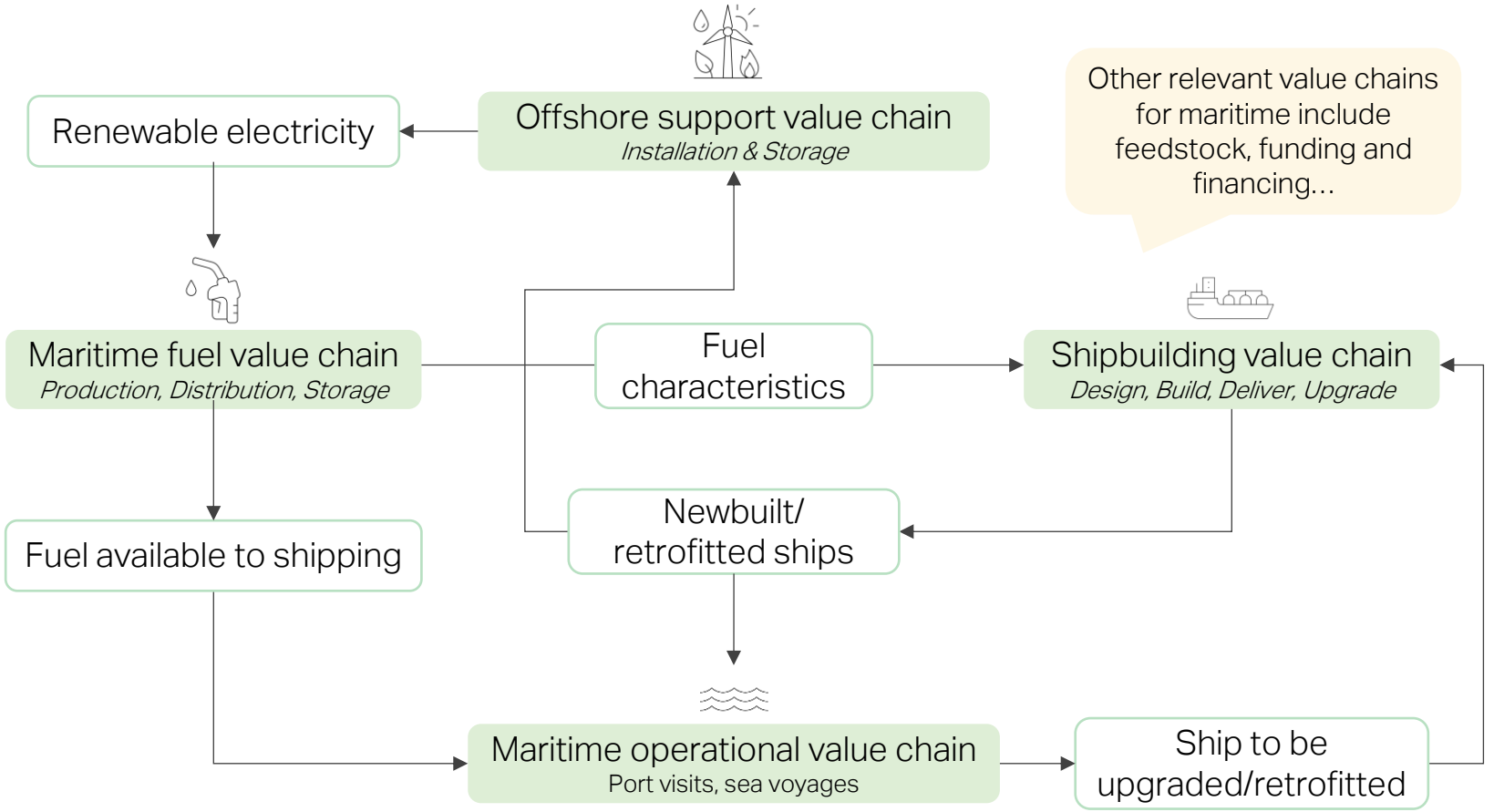
Emissions must peak no later than 2025
By 2030 $CO_2$ emissions must be reduced by 45%
By 2050 $CO_2$ emissions must be reduced by 100%

# The global nature of shipping and the many interconnected value chains make shipping a hard-to-abate sectors when it comes to emissions



## Maritime value chain interconnections

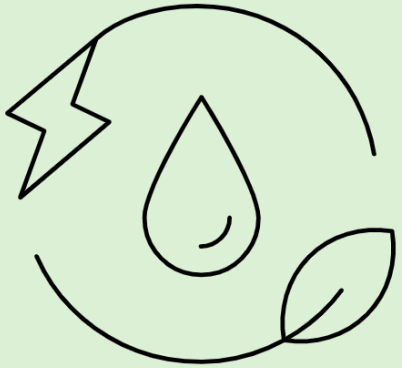
/ ILLUSTRATIVE




Source: Søfartsstyrelsen; Verschuur et al, 2023.

# For shipping to abate emissions in the long term, there are three main challenges to tackle

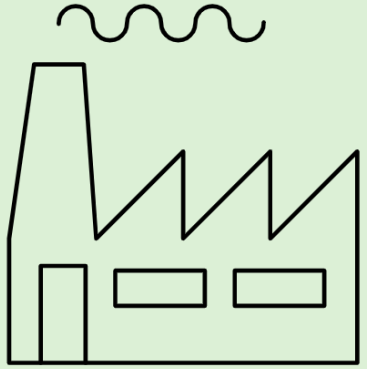
1



## Alternative Fuels and Infrastructure

Current marine fuel supply will be replaced by multiple fuel types. Enabling these new, alternative fuel pathways require new technical solutions, supply chains and infrastructure

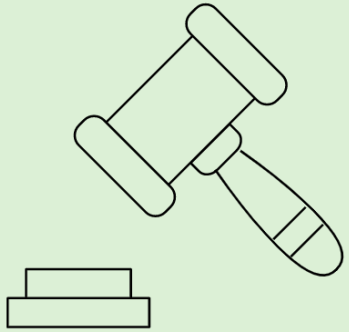
2



## Commercial Scale

There is no existing commercial market for zero carbon shipping,
and too few shipping companies have made firm commitments or started invested in their decarbonization strategies

3



## Regulation

Efficient global regulation is needed to level the playing field and incentivize zero carbon shipping by creating certainty among investors and shipowners.

# To push solutions to these challenges, IMO revised its GHG strategy for shipping to include an overall target of net-zero WTW emissions by 2050…

## IMO levels of ambition

1. Target net-zero around 2050 on a WTW basis
2. Uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to increase and represent at least 5% (striving for 10%) of energy used by 2030
3. 40% carbon intensity reduction by 2030 with respect to 2008

## IMO indicative checkpoints for absolute emissions reduction

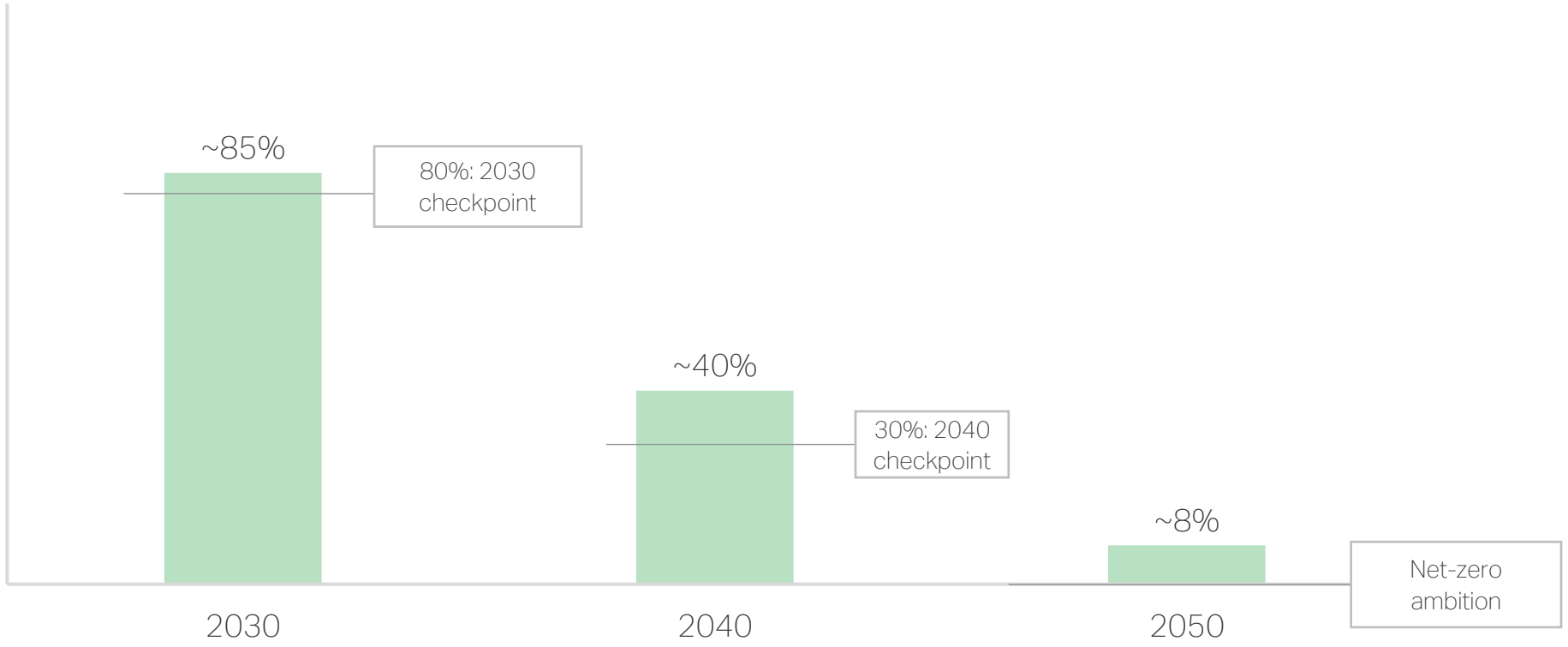
1. 2030: 20% reduction with respect to 2008 (striving for 30%)
2. 2040: 70% reduction with respect to 2008 (striving for 80%)

… And the IMO also introduced ambitions and indicative checkpoints, also called mid-term targets, **for 2030**

Note: The scope of the Center's vision and work is all of shipping. IMO 2023 revised GHG strategy and related ambitions only relate to international shipping, which is assumed to make up around 70% of the energy demand from total shipping in 2021 based on data from IMO Data Collection System.

# MMMCZCS analysis shows the IMO Framework can achieve significant reductions compared to 2008, with more to be done to meet the 2023 IMO Strategy

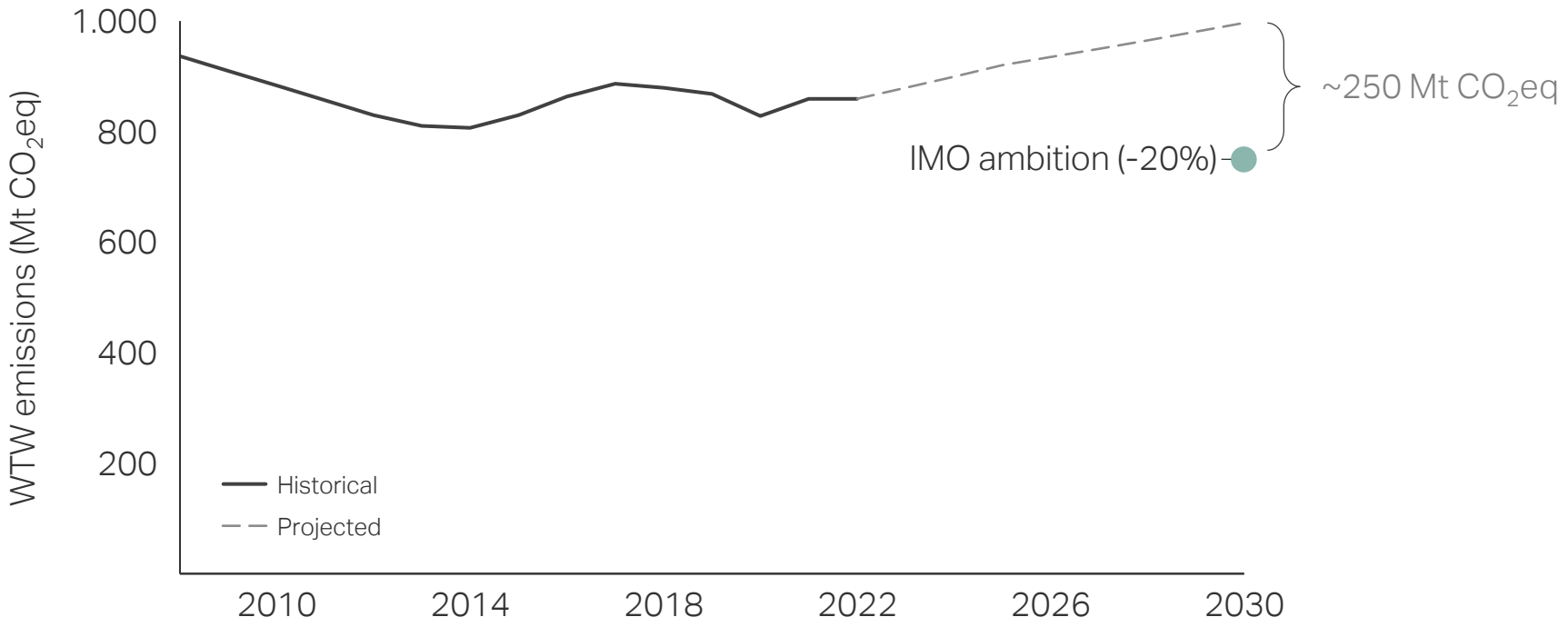
Well-to-wake absolute emissions for median cases (compared to 2008)

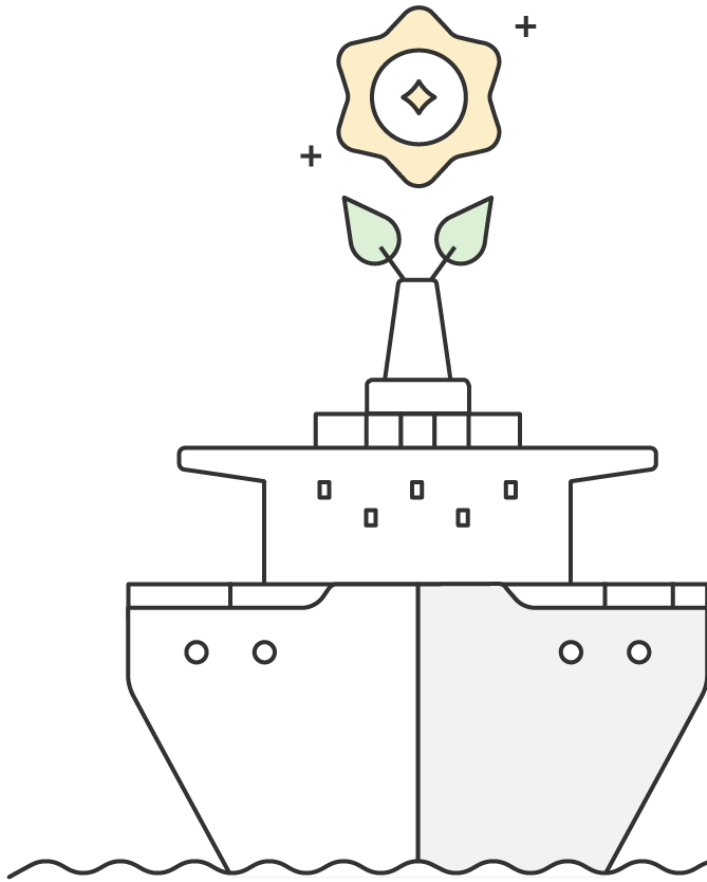



**Note**: Results are based on a high fuel availability scenario. Proposals may be less effective if sufficient fuel availability is not achieved.

# Reducing 20% of absolute emissions to meet IMO's mid-term checkpoint requires replacing or removing energy consumption equivalent to ~250 Mt $CO_2$eq

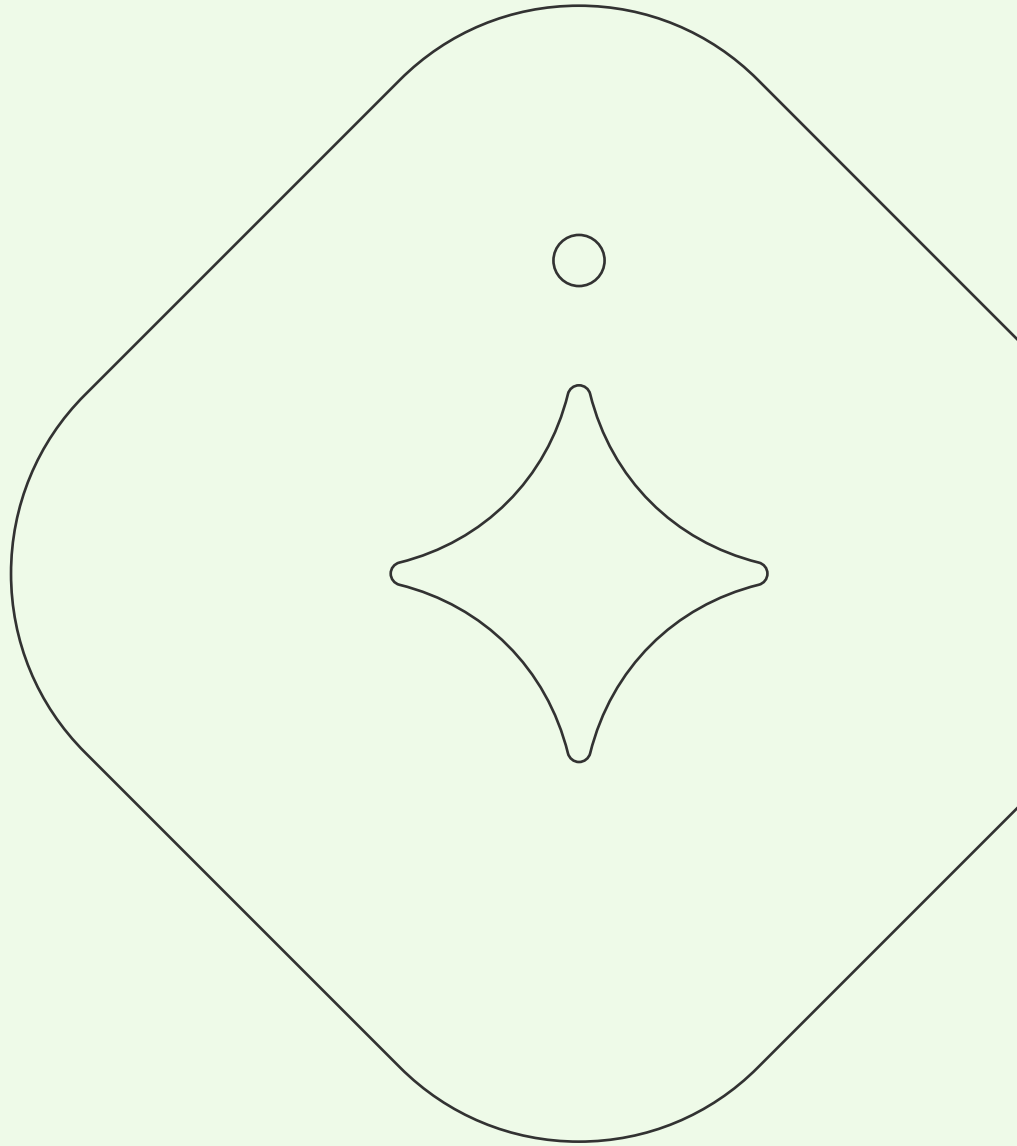
## Est. historical and projected emission from international shipping



The estimated historical and projected development of emissions from international shipping and the IMO 2030 indicative checkpoint of 20% emission reduction. The targets have been related to the equivalent energy reduction needed to meet the emission reduction targets. Sources: IMO (2023), IMO (2020a), IMO (2019), IMO (2020b), IMO (2021), NavigaTE, MMMCZCS analysis

# What options does shipping have to reduce emissions?



# 2030 is fast approaching and transitioning to a net-zero future will require both reduction of energy demand and transformation of the energy system

**20% absolute emission reduction in 2030** with respect to 2008 (striving for 30%)

## Reduce fleet energy demand

Reducing the size of the task ahead of us by a combination of available and new technological and operational energy efficiency.

**Sustainable fuel[1] to represent at least 5% of energy used by 2030** (striving for 10%)

## Transform the energy system

Tackling the remainder of the task by transitioning from fossil fuels to sustainable fuels.

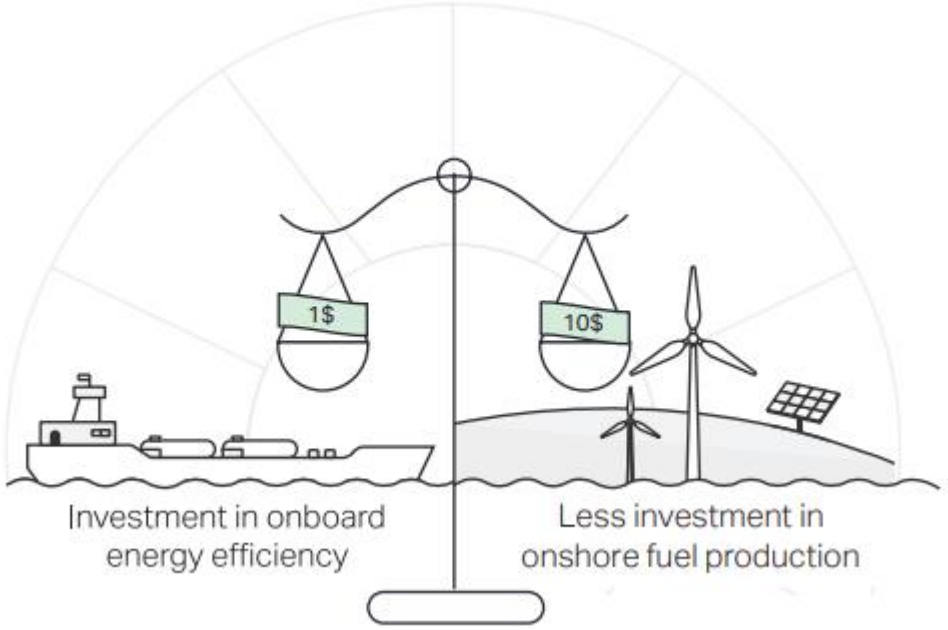
1) Described as zero or near-zero GHG emission technologies, fuels and/or energy sources by the IMO

# The best (and cheapest) energy is the energy that we don't use - and addressing IMO's 20% target in 2030 requires increases in energy efficiency

**1 EJ saved** on the propeller escalates to **~4 EJ less energy needed** to be generated upstream

**To meet IMO target for absolute emission reductions of at least 20% in 2030,** there is a need for energy efficiency to reduce what otherwise would need to be addressed by expensive and time-consuming onshore fuel production

## The investment opportunity for onboard energy efficiency towards 2030

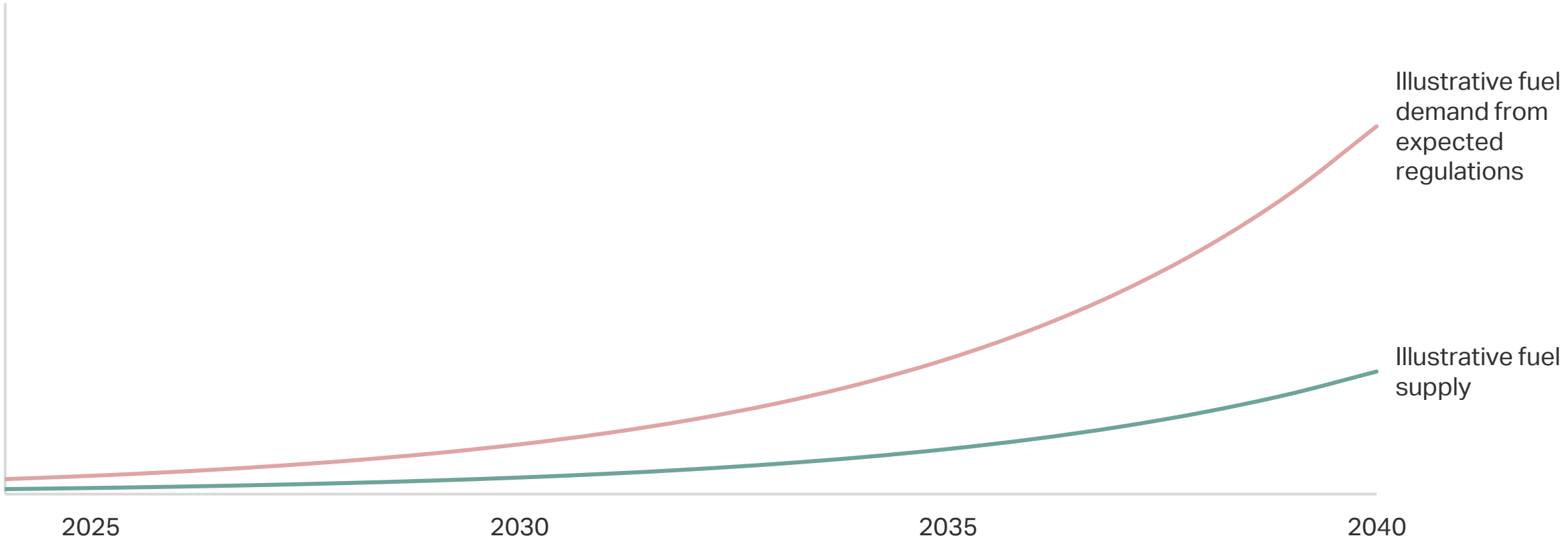



Note: In the long term, the ratio reduces but should still remain above a minimum threshold of 1 to 4, i.e.,1 USD invested in Energy Efficiency would yield 4 USD less invested in fuel production.
Source: Implications of the 2023 IMO GHG Strategy for the Shipping Industry, MMMCZCS

Illustrative

# The availability of sustainable fuels will be a key limitation to the transition towards maritime decarbonization, especially within the next 10-15 years

**Sustainable energy demand and supply**



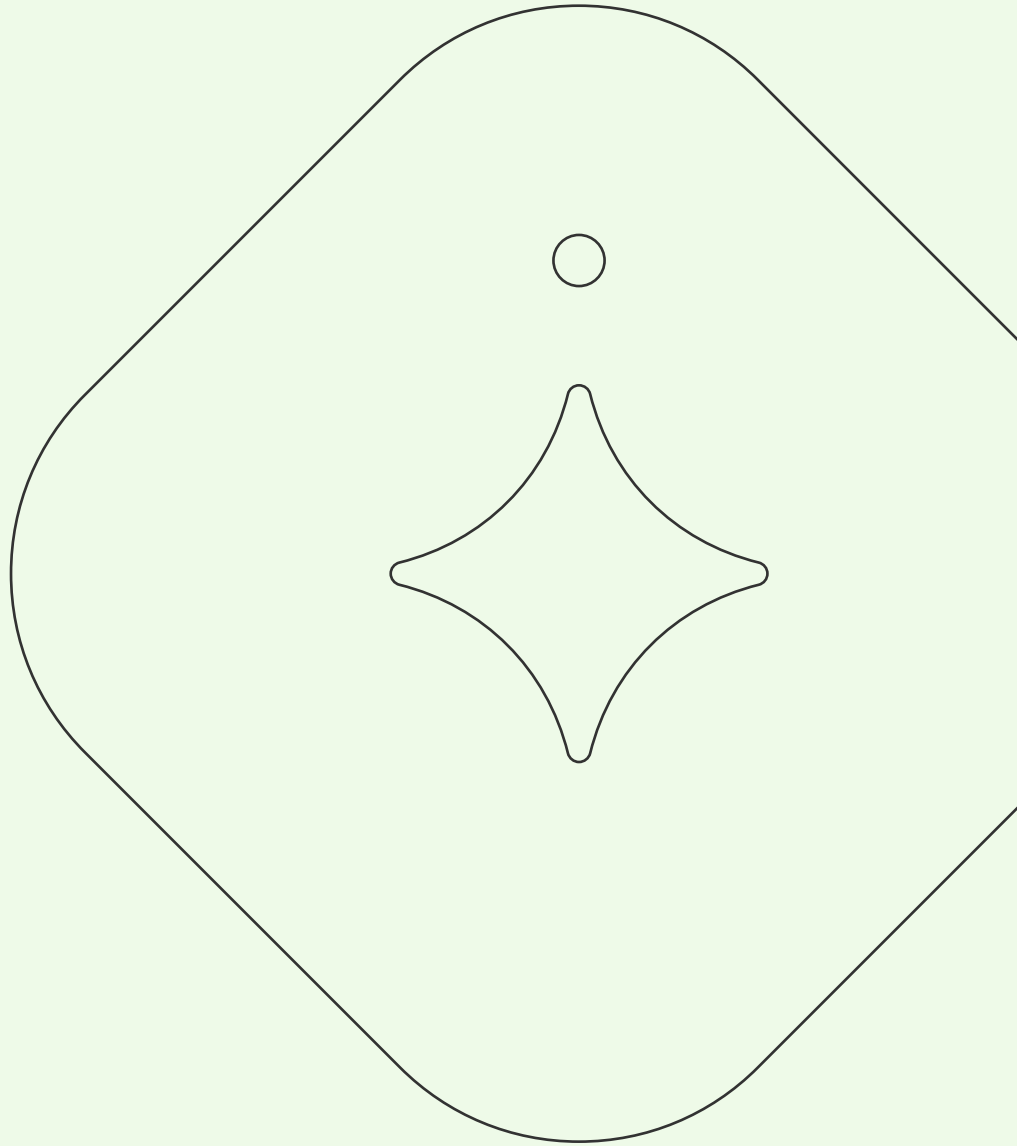
# Shipping has a multitude of alternative fuel pathways, but maturation lead time vary and each fuel has its own challenges

## Fuel Pathway Maturity Map


The fuel pathways available to maritime will **mature and scale at different points** in time but while focusing on the short-term potential of certain bio-fuels,

**there is a need to look ahead and activate all pathways** for shipping to realise net-zero emission by 2050

# What are the most imminent challenges and how do we solve them?



# Shipping and maritime are challenged by the hard-to-abate nature and the lack of clear line of sight of the effect of upcoming regulation on demand

## Challenges for shipping

1. Lack of cross-value chain collaboration and alignment of incentives
2. Need for long-term offtake commitment to unlock investments in fuel production
3. Disconnect between supply, infrastructure and demand in early years of transition

# But all is not lost and to many of these challenges we are already working on a wide variety of solutions that can advance green fuels in shipping

| Challenges for shipping | Solutions that the Center is working on |
| --- | --- |
| 1 Lack of cross-value chain collaboration and alignment of incentives | Connecting main players from the full maritime value chain through projects to ensure alignment and engagement across. |
| 2 Need for long-term offtake commitment to unlock investments in fuel production | Supporting firm regulation that can provide more certainty for demand while developing risk sharing mechanisms for demand aggregation and collective procurement |
| 3 Disconnect between supply, infrastructure and demand in early years of transition | Decoupling the geographical element of supply and demand through Book & Claim and Green Corridors to unlock localized supply |

# Thank you

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