



Decarbonising Shipping: **ALL HANDS ON DECK**

Industry Perspectives

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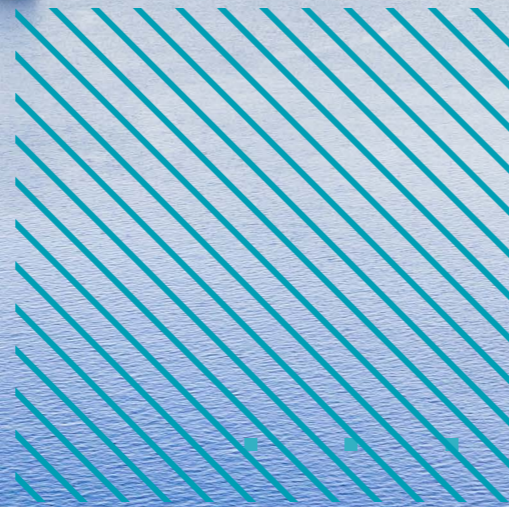
EXECUTIVE SUMMARY

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FOREWORD

The world today is going through extraordinary change. For the energy industry, there are great challenges, from the longer-term effects of climate change to the immediate shock and uncertainty of the global pandemic. But if there are risks, there are opportunities too – as long as industries work with wider society to take urgent action.



Huibert Vigeveno
Downstream Director

The shipping sector is vital to the global economy and never more so than in recent months, when it kept up the supply of essential goods. It accounts for about 80% of the volume of global trade. If the world is to achieve the goals of the Paris Agreement to tackle climate change, it is crucial that sectors such as shipping cut their carbon emissions and do so fast.

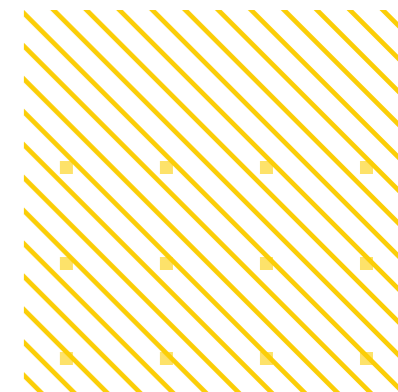
The International Maritime Organization has set the ambition of reducing the shipping industry's greenhouse-gas emissions by at least 50% by 2050, and reducing the carbon intensity of emissions by 40% by 2030 and 70% by 2050, compared to 2008 levels. The scale of the challenge means that any solution needs to be comprehensive and involve every aspect of shipping. As well as cleaner fuels, it should focus on factors such as regulation, government action and societal shifts. No sector can do this alone. This report is driven both by urgency and the need for collaboration.

Based on more than 80 interviews across the industry, from CEOs to financiers and ship builders, the report identifies practical measures to cut carbon emissions. It asks questions such as: what role will the world's major ports play? How do you adapt assets with a 20-year lifespan? How do you transform a sector so dependent on heavy fuels? The answers are pragmatic, they show a will to work together and they are optimistic.

The report identifies 12 possible solutions. Operational efficiency is crucial, while others include co-ordinating industry commitments, increasing research and development across sectors, and expanding the infrastructure to supply and store cleaner fuels.

As an operator of a large fleet of tankers and a supplier of marine fuels, lubricants and services, Shell has a stake in the future of shipping. We have announced our own ambition to be a net-zero emissions energy business by 2050 or sooner, in step with society, and our shipping operations must be part of this. We continue to work with our customers on alternate fuels such as biofuels, liquefied natural gas and hydrogen.

As the head of Downstream, which is responsible for shipping, I am buoyed by the optimism of this report and I relish the prospect of working with customers, partners, suppliers and wider society to achieve lasting change.





INTRODUCTION

Shipping has a dual challenge. It must meet the demand of the world's growing population, with more ships and more voyages, while radically reducing its emissions. Achieving both will require a transformation, but there are lessons we can take from experiences in the industry to help us.



Grahaeme Henderson
Vice President
Shipping & Maritime

In Shell Shipping & Maritime, a key focus area has been on improving safety across the industry. The aim is a zero-incident industry where every seafarer returns home safely. This has not been easy and there is more work to do, but huge progress has been made.

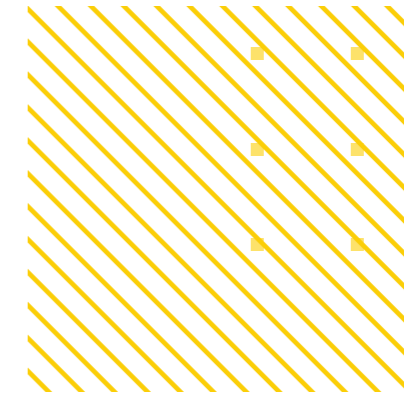
To improve shipping's safety performance, the industry had to first work together to understand the problem; what are the underlying factors that prevent us being safer? And then, armed with that information, take collective action.

Our objective with this report is to do the same for decarbonisation; we want to catalyse action by creating a common understanding of barriers the industry faces and the solutions that will be most effective.

I have been extraordinarily encouraged by the response. Despite being conducted between January and June 2020, a period that coincided with the COVID-19 pandemic across the world, leaders were keen to participate and were engaged in their responses. This is a testament to the industry's commitment to tackle the challenge, and I would like to thank them all for their time and contributions.

With this research, the industry has given its view, and now we must all get to work to move from deadlock to decarbonisation. At Shell, we will continue working with our customers as they adopt new fuels and technologies that help them reduce emissions. We will develop the business case for investment in solutions which reduce emissions today as quickly as possible, and we will continue to collaborate and contribute in research which accelerates progress to zero emission fuels.

What is evident is that, despite the complexity, the industry sees that viable net-zero carbon shipping is achievable. It cannot be just one company or sector, but with all hands on deck, we can make it happen together.





Report Objectives

This research reflects the perspectives of 82 senior shipping leaders that represent almost all segments of the shipping industry (see Exhibit 1). It was developed with the following objectives:

- **Take a Comprehensive View:** Most existing shipping decarbonisation studies focus on specific challenges in isolation, such as potential future fuels. Given the scale of the decarbonisation challenge, a more thorough framing is needed that also includes economic, regulatory and organisational factors.
- **Reflect the Voice of the Industry:** Ultimately, those within the industry will together play the most instrumental role in decarbonising shipping. Accordingly,

it is essential to collect, understand and build on their views as we seek to identify solutions that drive progress.

- **Clarify a Practical Way Forward:** Shipping leaders who participated in this research looked beyond the challenges of today to explore the solutions of tomorrow. Together they converged on a set of actions and a roadmap that can help overcome the inertia that many see in the sector.

The primary motive of publishing this research is to highlight those insights shared with us through interviews, workshops and desk research; not the views of Shell or Deloitte. All engagements with participants were conducted in a manner that respects competition law boundaries.

01 Research Participants

82 shipping leaders in 74 interviews and 10 hours of collaborative workshops (30 participants)

33 CEOs

32 Vice Presidents, Unit Heads and Directors

17 General Managers, Managers and Specialists

4 of top 10 bulk and tanker

4 of top 10 container

3 of top 5 cruise

3 of top 5 ship financiers

2 of top 5 shipbuilders

8 ports, incl. 1 of top 10

52 Europe, Middle East & Africa

13 North & South America

17 Asia & Pacific

32 Ship owner and operators

15 Charterers and shipping customers

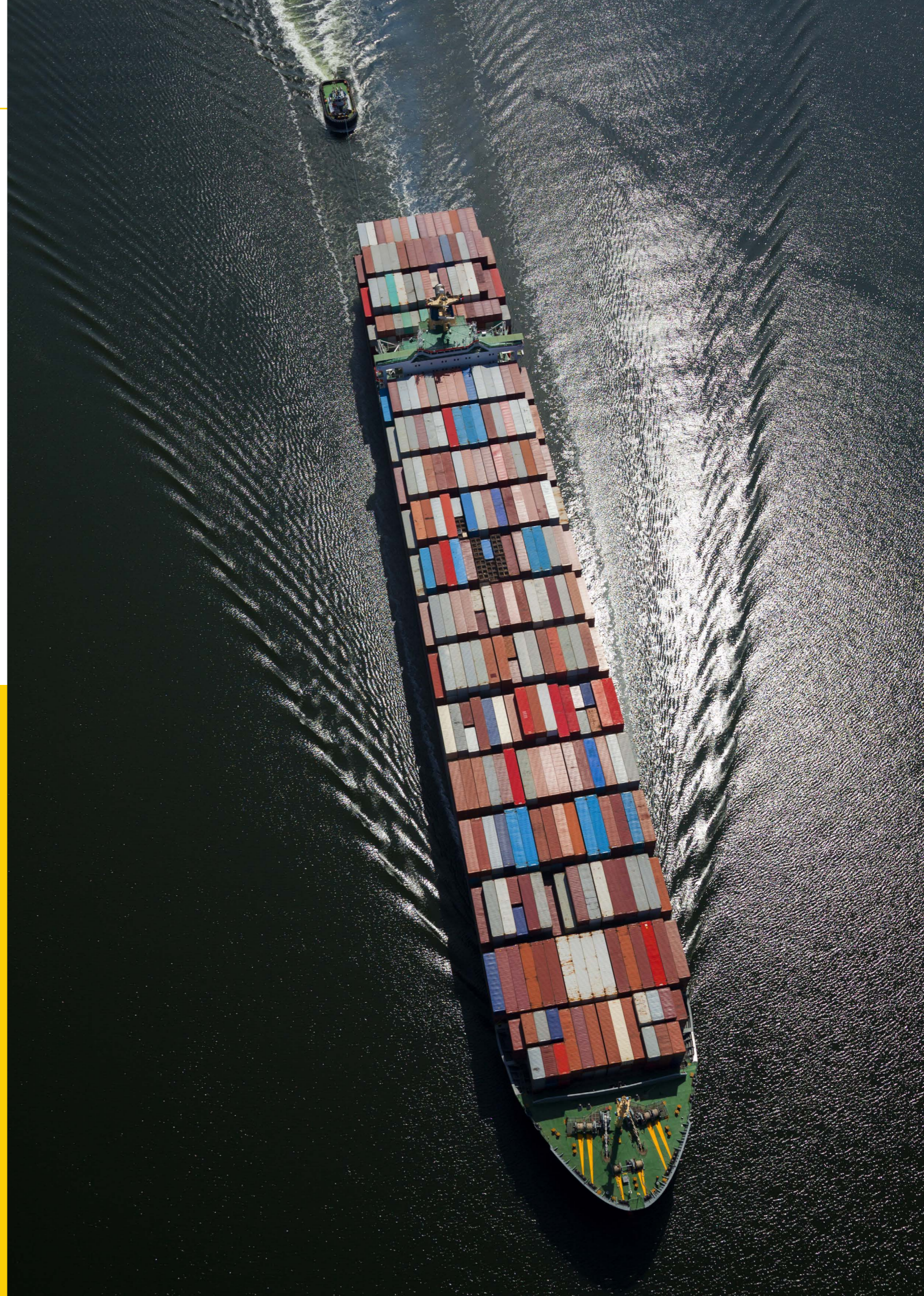
8 Port authorities and operators

10 Technology providers and shipbuilders

11 Regulators, classification societies and academia

6 Financiers and investors

Note: Regions indicate organisations' headquarters. Most organisations involved operate globally





EXECUTIVE SUMMARY

Shipping is the backbone of the global economy. It is by far the most efficient mode of freight transport¹ and moves approximately 80% of world trade volumes². Simply put, the scale of global development seen over the last century would not have been possible without shipping playing a key role. However, as the global economy grows, so too will carbon emissions from shipping.

The shipping industry recognises the importance of decarbonising to help reach the goals of the Paris Agreement, and it has already started to mobilise. The International Maritime Organization (IMO) has announced an ambition to at least halve international shipping greenhouse gas (GHG) emissions by 2050, while reducing CO₂ emissions intensity by at least 40% by 2030, and pursuing efforts towards 70% by 2050, relative to a 2008 baseline³. These ambitions send a signal to the industry that change is coming, and all parties involved need to prepare.

Conversations with over 80 leaders across the shipping industry highlight the daunting challenge of shipping decarbonisation. It will be difficult, and shipping leaders feel that uncertainty about where to begin has created what one interviewee described as a “*deadlock*”. At the same time, many of those interviewed have a positive outlook. As one CEO stated, “*decarbonisation is one of the biggest challenges we face as an industry. However, we have never been more united around a problem, and there is optimism that we can make it happen.*”

Growing pressure to reduce carbon emissions across the global economy has opened new opportunities. The industry has already started uniting, forming coalitions, launching pilot projects and exploring new ways to lower shipping emissions. A new paradigm is emerging and there is an opportunity to accelerate change through a set of manageable, practical solutions that will break the deadlock and unlock progress. Making this happen requires collaboration within the shipping industry itself, across the broader shipping ecosystem and with other sectors.

The Deadlock

Shipping is a capital-intensive industry characterised by large, long-life assets, thin margins and a high-dependence on a global supply of energy-dense fuels. These characteristics make decarbonisation complex and expensive, with one study estimating the total cost at \$1.65 trillion by 2050⁴. Consequently, decarbonising the industry needs sufficient regulatory and market incentives and an abundant supply of low or zero-emission fuels.

“Too many alternatives and not one viable solution”

Shipping Operator

The lack of a global regulatory framework and limited customer demand for lower-emission shipping are significant barriers to activate much needed industry investment. Electric vessels may be an option for inland and short-sea routes,



but for deep-sea shipping – which accounts for around 85% of emissions⁵ – there is currently no viable alternative fuel that makes it possible to reach the IMO’s 2050 ambition. The industry is currently exploring several alternative fuels – including hydrogen, ammonia, methanol and biofuels – but shipping leaders say that they all have commercial and technical limitations. Costs are significantly higher than today’s dominant shipping fuel and most potential alternatives have lower energy density, extensive storage and safety requirements and limited infrastructure. New technologies such as propulsion systems and storage tanks need to be developed to resolve these barriers and enough fuel production capacity is needed to meet the 3.3 petawatt hours (12 exajoules⁶) annual energy demand from shipping. To put that figure in perspective, energy required to power shipping for one year would be enough to power New York City for over 60 years⁷.

This is the “deadlock”. However, there is a growing view that now is the time to act if the industry is to meet the IMO’s ambition. To reach

it, many shipping leaders believe that the first net-zero ships will need to start entering the global fleet by around 2030 – and that creates a real sense of urgency.

“2030 is tomorrow, 2050 is one ship lifetime away”

Shipping Technology Provider

A New Paradigm

Perspectives regarding decarbonisation are evolving and opening opportunities that were not available a few years ago. Social pressure to reduce emissions is intensifying. Governments, investors and businesses are making commitments and starting to act. Notably, extensive levels of sustainable investments are included in stimulus packages announced in relation to the COVID-19 global pandemic⁸. Technologies are continually evolving and creating new potential avenues to lower emissions. As one CEO told us, “*the situation is not all doom and gloom.*”



The leaders of the shipping industry acknowledge this new paradigm. Over 90% of interviewees involved in this research highlighted decarbonisation as important or a top priority for their organisations, noting its importance has increased significantly over the past 18 months. This sentiment reflects increasing action as new coalitions and pilot projects have been established to address barriers to decarbonisation. Even with the impacts of the COVID-19 pandemic in the first half of 2020, almost all shipping leaders that we interviewed saw the resulting economic disruption as an opportunity to accelerate progress.

“The discussion has finally become serious”

Shipping Owner

Most shipping leaders believe that a novel decarbonisation approach is needed and should be based on three main principles:

- Adopt an ecosystem perspective
- Think big, start small, scale fast
- Focus on behaviours and triggers

The first, “*adopt an ecosystem perspective*” recognises that the challenge is too large for any one organisation alone. It calls for a holistic and integrated perspective, with each industry stakeholder having a role to play and a set of activities to focus on. The second, “*think big, start small, scale fast,*” is based on the premise that small, incremental steps are the best way to solve a challenge of such magnitude. The third principle, “*focus on behaviours and triggers,*” underscores the importance of supporting solutions with the right incentives. Incentives should be based on an understanding of what will motivate stakeholders across the value chain to take a long-term perspective.

“Real commitment from customers would go a long way to unlock investment”

Shipping Owner & Operator

Based on these three principles, this report focuses on 12 solutions, or recommendations for action, that emerged from research, interviews and workshops. These solutions streamline what some view as an insurmountable problem into several manageable phases that address specific barriers and enable the industry to have the first net-zero ships in the water by around 2030. The first five solutions aim to “*unlock*” progress in the next two to three years.

1. **Scale-up Customer Demand:** Create scale in demand for low or zero-emission shipping through charterers’ and customers’ commitments that include long-term contracts and green procurement criteria. Natural candidates to lead this solution are state-owned and publicly listed companies with proximity to end consumers (e.g. containers, food bulk), and others with ambitious scope 2 and 3 net carbon footprint commitments⁹.
2. **Global Regulatory Alignment:** Create a level playing field globally and reduce uncertainty regarding regulations and timeframes. New IMO guidelines due in 2023 should provide clarity and should be aligned with leading local and regional regulatory bodies (eg. EU, China and US). Short-term regulatory incentives should also be considered.
3. **Cross-sector Research and Development:** Intensify partnerships to develop zero or low-emission fuels through joint research and development

(R&D) across shipping, other harder-to-abate sectors and the energy industry. Create a much larger pool of capital and expertise to evolve new technologies and increase the likelihood that production and transportation infrastructure will be available once future fuels are commercially viable.

4. **Scale-up Controlled Pilot Projects:** Increase R&D effectiveness by running end-to-end green pilot projects involving customers, charterers, operators, owners and ports on specific routes and vessel types. Operators that follow a predetermined schedule, such as container ships especially on shorter and busier routes, are likely candidates for pilot projects.
5. **Coordinated Industry Commitments:** Increase the reach of existing initiatives – such as the Getting to Zero Coalition, the Clean Cargo Working Group and others – by consolidating objectives and strengthening the coordination of various concurrent workstreams. A body with a specific mandate, formed with dues from the industry, could accelerate the shift from ideas to action and help break the deadlock.

These five solutions make up the first phase of the decarbonisation roadmap (see Exhibit O2). The industry will then need to “*accelerate*” progress by further de-risking early investments through flexible ship design, new port coalitions, greater investor pressure and new financing schemes that encourage low-carbon shipping. Next, the reduced risk and expanded incentives resulting from previous phases will help attract the investment needed to “*scale*” green fuel

production and bunkering infrastructure. Finally, operational efficiency must remain the “*foundation*” of all these phases and is crucial to reducing emissions of both existing and future vessels. Energy efficient technologies, such as hull streamlining, air lubrication, wind technology, weather routing, port optimisation, and high quality fuels and lubricants are some of the measures the industry can implement immediately and throughout the decarbonisation journey.

“We can build rockets that come back from the moon but not make ships green? No way. We can do it”

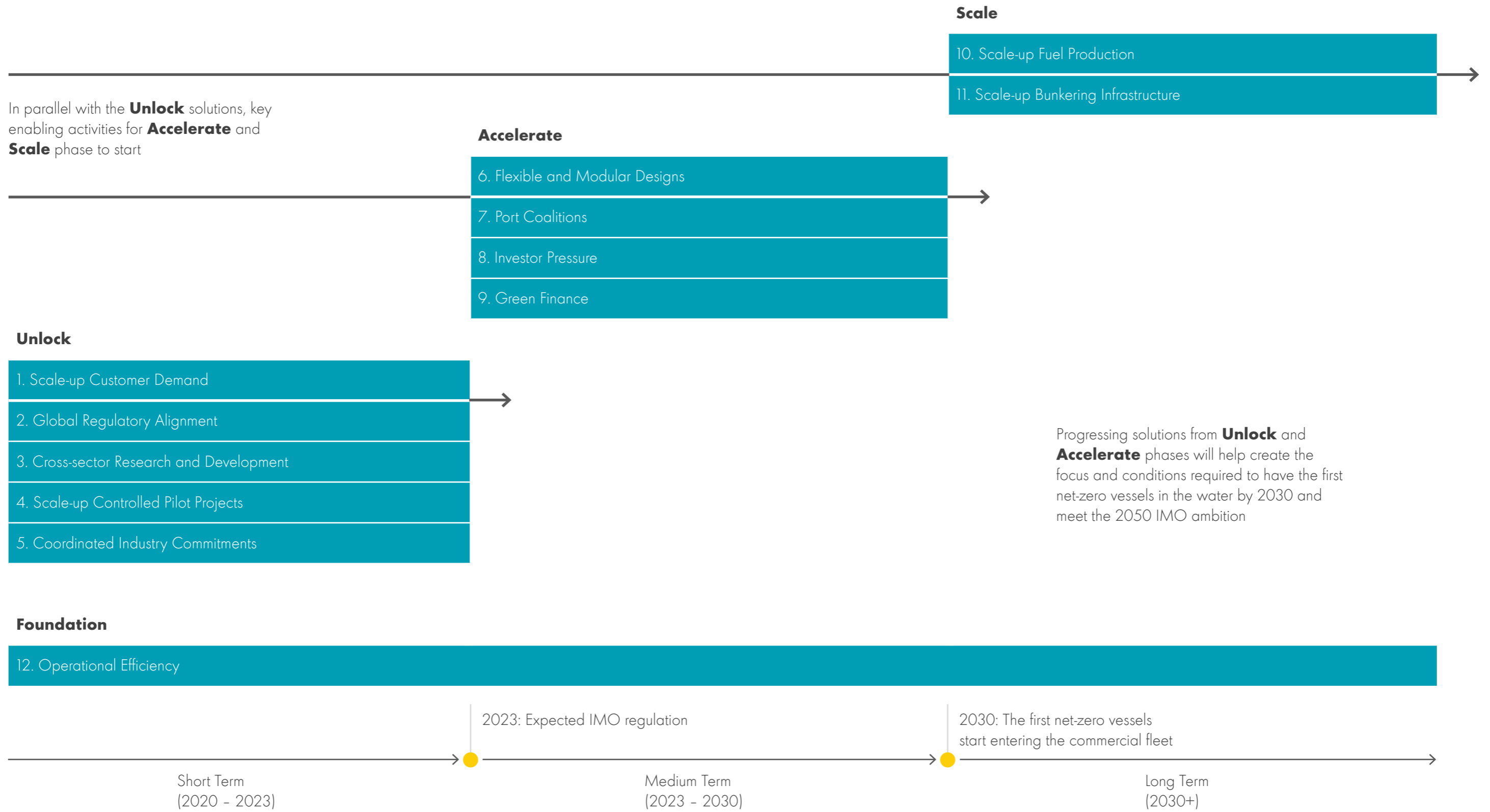
Shipping Owner & Operator CEO

The Roadmap

The opportunity for the industry to break the deadlock is clear, and there is little time to lose if it is to meet the IMO 2050 ambition. The solutions outlined in this report offer a roadmap to build on progress already happening within the sector and to drive further change. Momentum is building, and there is a sense of optimism that it can be done. Those who take the lead are in a better position to influence the outcomes, but every operator and stakeholder in the industry has a role to play. As one CEO said, it’s “*all hands on deck.*”



02 Roadmap to 2030





CREDITS

We wish to thank all those who were involved in the development of this research. We appreciate your time, energy and enthusiasm, particularly during the period of disruption caused by the COVID-19 global pandemic.

SOURCES

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- 2 UNCTAD (2018), Review of Maritime Transport
- 3 IMO (2018), IMO Action to Reduce Greenhouse Gas Emissions from International Shipping
- 4 UMAS (2020), Aggregate investment for the decarbonisation of the shipping industry
- 5 IMO (2014), Third IMO Greenhouse Gas Study
- 6 Shell (2018), Sky Scenario
- 7 Energy Committee of the New York Building Congress (2017), Electricity Outlook
- 8 European Commission (2020), A European roadmap to lifting coronavirus containment measures; International Energy Agency (2020), Sustainable Recovery; German Federal Government (2020), Emerging stronger from the crisis
- 9 Scope 2 emissions come from the facilities that provide energy to a company. Scope 3 emissions are those that come from the use of a company's products



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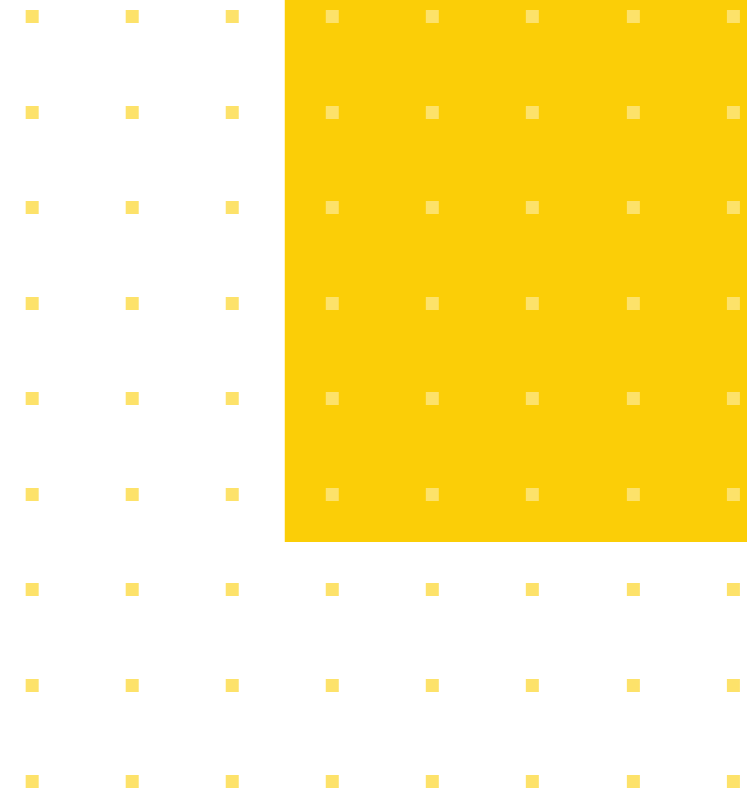
This Decarbonising Shipping: All Hands on Deck report contains data and analysis from Shell's Sky scenario. Unlike Shell's previously published Mountains and Oceans exploratory scenarios, the Sky scenario is based on the assumption that society reaches the Paris Agreement's goal of holding the rise in global average temperatures this century to well below two degrees Celsius (2°C) above pre-industrial levels. Unlike Shell's Mountains and Oceans scenarios, which unfolded in an open-ended way based upon plausible assumptions and quantifications, the Sky scenario was specifically designed to reach the Paris Agreement's goal in a technically possible manner. These scenarios are a part of an ongoing process used in Shell for over 40 years to challenge executives' perspectives on the future business environment. They are designed to stretch management to consider even events that may only be remotely possible. Scenarios, therefore, are not intended to be predictions of likely future events or outcomes.

Additionally, it is important to note that as of July 7, 2020, Shell's operating plans and budgets do not reflect Shell's Net-Zero Emissions ambition. Shell's aim is that, in the future, its operating plans and budgets will change to reflect this movement towards its new Net-Zero Emissions ambition. However, these plans and budgets need to be in step with the movement towards a Net-Zero Emissions economy within society and among Shell's customers.

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