The Sustainable Shipping Initiative (SSI) brings together leading companies from across the industry and around the world with two leading NGOs, Forum for the Future and WWF, to plan how shipping can contribute to — and thrive in — a sustainable future.

Forum for the Future is a non-profit organisation working globally with business and government to create a sustainable future. We aim to transform the critical systems that we all depend on, such as food, energy and finance, to make them fit for the challenges of the 21st century. We have 15 years’ experience inspiring new thinking, building creative partnerships and developing practical innovations to change our world.

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executive summary

The Sustainable Shipping Initiative (SSI) brings together leading companies from across the industry and around the world with two leading NGOs, Forum for the Future and WWF, to plan how shipping can contribute to – and thrive in – a sustainable future.

Our goal is to transform the global shipping industry and the wider maritime sector, establishing a new, sustainable approach as the norm. We want to help industry leaders to look beyond their immediate concerns by understanding the long-term challenges and opportunities that face them. We hope our initiative will energise and inspire members and non-members alike.

The world faces great challenges: recent decades have seen a huge growth in economic activity coupled with a massive rise in population. These developments have put the Earth’s finite resources under increasing strain. The UK Government’s Chief Scientist, John Beddington, has warned of a ‘perfect storm’ of climate change, insufficient energy resources, food shortages and scarce water, causing major upheavals to the global economy within the next 30 years.

This analysis is a call to action for the worldwide shipping industry. We believe that, with far-sighted leadership, businesses can weather the storm and emerge stronger and more sustainable. And we believe that the industry has a vital role to play in helping create a sustainable, low-carbon economy.

the case for action

This Case for Action paper looks ahead to 2040. It is based on interviews with experts across the maritime sector, from business, legislative and regulatory bodies and academia as well as the experience of our 14 members. It does not attempt to predict the future but is intended to raise awareness of how the whole environment in which the industry operates could change. Our intention is also to start a debate on how to respond.

We identify the global trends – such as new patterns of trade, shifting global powers, rising fuel costs and changing customer demands – that will profoundly affect the maritime sector over the next 30 years. We examine how they interact to present three key challenges for the industry, and the risks and opportunities that these present. Finally, we explore how change happens in the shipping industry, and the role of industry leaders in driving future change. Throughout the Case for Action, we pose questions designed to stimulate thought and discussion on what action businesses might take on their own and across the industry.

The Case for Action sets the agenda for the second phase of the SSI, which will produce a vision for an industry in 2040 that is resilient, socially and environmentally responsible, and profitable. In the third phase, members will develop an action plan to future-proof the shipping industry, and guide a series of specific, practical innovation projects. This will set out what key players need to do to achieve this vision. It may include technical and engineering initiatives, regulatory and policy proposals, and new models of finance and business.

Globalisation, climate change, and escalating energy costs are a strategic nightmare for shipping companies and they all have one thing in common – fossil fuels.

Martin Stopford, Clarksons
three key challenges

It is clear that the shipping industry's operating context will alter significantly over the next 30 years. Cargoes and markets are changing, and there are new challenges in global ocean governance. Fuel costs are rising, although technological advances offer the potential for radical improvements in efficiency. And commercial customers, particularly the global brands, are incorporating sustainability into their core business and coming under increased pressure to address sustainability concerns throughout their supply chains.

The changing context in which shipping must operate is summarised in seven global trends that we believe will profoundly affect the industry over the next 30 years (see diagram). Each of these will have direct impacts, but at least as important will be how they combine and interact to create significant, game-changing challenges.
The global economy: emerging giants?

Developing nations are growing in influence and economic activity. New demands will alter patterns of trade, changing which goods are transported and where. Most people assume that the global economy and global trade will continue to grow. However, there are several reasons why trade might decline: the growth of ‘closed-loop economies’ where resources are reused; greater virtualisation of trade based on information technology (eg sales of CDs being displaced by downloads); and a critical resource crunch such as ‘peak oil’ leading to instability, protectionism and reduced demand for transporting goods.

Freedom vs level playing field: ocean governance

National and international management of the oceans has increased significantly in scope, rigour and complexity over the past 30 years. How it develops in future will be critical to the industry. A robust International Maritime Organization with rebalanced voting powers could create a level playing field for all. But weak global governance – overlain by an ever more complex patchwork of local regimes, industry codes of conduct and voluntary standards – could create confusion and inertia, perhaps even leading to a two-tier industry split between high and low performers.

No secrets: demand for transparency

Businesses throughout the supply chains outside the shipping industry are already setting stretching social and environmental targets to respond to demands for better performance. They are also having to navigate the fast-paced, transparent, internet-enabled world of social media. Technological advances make real-time monitoring feasible and affordable, even in the open oceans. Businesses will have opportunities to demonstrate leadership by giving customers, regulators and NGOs the opportunity to monitor their performance. This could lead to extremes of transparency by 2040.

Moving on from oil: the future of energy

The massive expansion in global trade of the past 20 years has been powered by easily available fossil fuels. Major oil institutions are now cautioning that the age of easy oil is over, predicting higher and more volatile pricing and a peak in oil production. This, combined with concerns over energy security and climate change, may drive major changes in fuel types and efficiency. Will shipping respond to this threat with a planned transition, a last-minute scramble, or a disorderly decline?

Demanding higher standards: sustainability regulation

Increasing pressure on global resources is likely to lead to demands for higher sustainability standards. Shipping regulation has focused on ‘traditional’ issues such as emissions of sulphur and nitrogen oxides and ballast water. Expect a new focus on workers’ rights and more sophisticated regulatory approaches such as those in China, which promote ‘closed-loop’ economies based on reuse and recycling.

Advancing technology: making it pay

New materials, alternative energy technologies and more fuel-efficient ship designs have the potential to deliver radical improvements in the sustainability of shipping. As noted above, technology also makes businesses, their customers and consumers more transparent and networked.

Adapting to a changing climate

Climate change is likely to increase the frequency and severity of storms, and has the potential to influence ocean currents. Ports and other coastal facilities could be threatened by sea-level rises over the next 30 years. The wider impacts of climate change on food production and flooding of major population centres could have huge implications for global trade and shipping. There is a compelling case to take action to prepare for the possible impacts of climate change, as well as to mitigate those impacts by reducing carbon emissions.
challenge 1: navigating a changing economic context

Over the next 30 years there is likely to be rapid and significant changes in the direction of trade and the type of goods transported. An industry that is highly mobile by its very nature should be well equipped to deal with this. But the key questions will be whether global trade grows or declines and how the industry is governed.

Continued growth of free trade, clarity on the aims and influence of rapidly growing economies such as China, within the context of a strong, more directive ocean and maritime governance regime would provide regulatory and economic certainty. This would enable industry leaders to invest for the long-term and prepare for the more disruptive possible futures identified in this report.

However, there are several reasons why trade might decline. Economic contraction, leading to ferocious competition for trade, would further squeeze already tight margins and magnify any competitive advantage – or disadvantage. Against a backdrop of weak international ocean and maritime governance, and a patchwork of local and regional legislation, it would become harder to plan and invest for the long-term. Although the shipping industry might recognise the need to evolve, it would lack clear direction and resources for investment.

In describing the risks and opportunities below, we acknowledge that risk for one part of the industry may well be an opportunity for another. For example, rising workers’ expectations present an opportunity for organisations with good labour relations to secure skilled staff whose expectations cannot be met by less conscientious operators.

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**Risks**

- Insufficient preparation for rapid change in routes and markets.
- A patchwork of regulation that makes shipping overly complex and reduces margins.
- A contraction of trade or a preference for national manufacturing/service operators that reduces the overall demand for shipping and cuts out less efficient and flexible ship operators.
- Workers’ rising expectations in developing economies make it harder and more expensive to recruit.

**Opportunities**

- In a contracting market, competitive advantages could make the difference between success and failure. Fuel efficiency will lower operating costs, for example, so businesses that meet high standards could win preferential access to high-performing markets.
- A coordinated group of leaders could support the IMO to develop progressive new regulatory levers that anticipate future challenges.
- Shipping logistics could be at the centre of coordinating more closed-loop economies – either regionally or globally.
- The emergence of new routes and markets.
**challenge 2: increased scrutiny, higher expectations**

In a highly networked, social media-savvy world, the shipping industry is likely to come under increased scrutiny. Greater transparency will encourage customers and other stakeholders to favour strong performers.

Expect the shipping customer of the future to be interested in price, security and speed, but also in wider performance factors such as working conditions, vessel efficiency, emissions, biodiversity and environmental/labour rights prosecutions. This is a strong trend already seen in the land-side supply chain, with companies such as Walmart demanding that suppliers perform against a sustainability scorecard.

We anticipate rapid proliferation of voluntary standards and codes of conduct for shipping, together with raised expectations from ports, financiers, insurers and others. These demands are also likely to be accompanied by increasingly stringent international, national, regional and city-based regulations.

Sophisticated remote monitoring technology already enables unprecedented transparency, and we anticipate a huge expansion of its application within shipping.

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**Risks**

- A complex patchwork of standards creates a compliance burden.
- Ad hoc social media campaigns focus on the infrequent abuses of workers’ rights that tarnish the whole industry.
- Poor performers or those who fail to demonstrate improvements may be excluded from the more demanding markets.
- Technology enables a new ease of inspection and enforcement, forcing expensive, reactive improvements at the bottom of the market.
- Failure to work with parties developing standards can lead to poor standards that are overly expensive or bureaucratic.

**Opportunities**

- Leaders who embrace transparency to demonstrate good performance could gain preferential access to finance, insurance and markets.
- Improved transparency reduces opportunities for poor performers to undercut the market.
- Collaborating with other parts of the supply chain in the development of new standards offers the opportunity to shape them and respond ahead of the competition.
challenge 3: the future of energy and climate change

Leaders of the energy establishment are warning that the age of easy oil is over. Many believe we will reach ‘peak oil’ as early as 2020. Over the past two years we have already seen oil prices span almost the entire range that the US government projected for the next 15 years. Volatile prices and insecure supply are likely to present a significant challenge to shipping and the wider economy.

At the same time floods, heatwaves and other extreme weather events offer increasingly alarming evidence of global warming. This will increase pressure for shipping to be included in regional and global regimes to reduce greenhouse gas emissions.

Shipping companies and their partners recognise the need to invest in energy efficiency and in the transition to new fuels, exploring new financial models to enable this to happen. This is challenging but necessary: companies that fail to act will be vulnerable to competition in an increasingly uncertain market.

There is uncertainty, however, over how to invest. Short-term price fluctuations in different fuel types are a factor in this uncertainty, along with the need for coordinated action to develop supply infrastructure and the competing performance demands made by strictures such as the sulphur regulations. Strong leadership is required to prevent uncertainty resulting in inaction.
key questions

Throughout the Case for Action we have presented questions designed to stimulate thought and debate on how the industry needs to change. Here are nine key questions:

• Most long-term planning is based on assumptions of continued growth. What key decisions would be different under an assumption of reduced growth and tighter competition?

• How can industry leaders coordinate action and speak with one voice that influences the future of global governance and policy in a progressive way?

• Uptake of new technology is slow. How do we future-proof today’s new ships to prevent early obsolescence? How might we fund and deliver a massive programme to retrofit ships to achieve low emissions or even zero emissions?

• What are the commercial opportunities for shipping in supporting a closed-loop economy, in which materials are recycled and reused locally and regionally?

• What are the opportunities for competitive advantage if oil prices spiral upwards?

• How is the industry preparing for the combined impact of sulphur limits, oil shortages and climate regulation?

• What changes would the industry need to make if its emissions, pollution incidents, working conditions and other actions were completely open to scrutiny by customers, insurers, regulators and other stakeholders?

• Who would be the winners and losers?

• How can the industry ensure that training and working conditions keep pace with the changing social and technical needs of future employees in the shipping sector?

• How can the industry respond to the potential opportunities of climate change, such as the opening of the arctic, in a sustainable way?

• What are the risks of climate change, the economic implications of increased storm risk, rising sea level and a changing navigational environment?

Download the full report from: www.forumforthefuture.org/
next steps – a call to industry leaders

Our Case for Action looks at the global trends that will shape the future of the shipping industry. We also consider how the market and regulation force reactive change. But change can also come from within the industry, and there is a need for leaders to step forward and take the initiative in addressing the challenges it faces.

Leadership is not only about responding to the areas where there is a clear business case today but also anticipating and shaping the industry of tomorrow. Successful companies will be those that not only recognise the challenges and opportunities ahead but are also able to develop appropriate business models, practices and policies that will define the future operating environment.

The leaders who are signed up to the SSI understand this. They are pioneering new practice and creating a vision for the industry to work towards. This is because they understand the imperative for a sustainable industry and want to profit from it.

The second phase of the SSI will continue this process, producing a shared vision of an industry in 2040 that is resilient, socially and environmentally responsible, and profitable.

In responding to the Case for Action, we believe that industry leaders need to:

- Create a shared vision of how the industry should develop over the next 30 years.
- Develop innovative business models that encourage long-term investment, and take into account social and environmental obligations.
- Prepare for greater scrutiny and demands from customers and society with regard to social and environmental performance.
- Build and convert ships to the highest standards of energy efficiency in anticipation of high and volatile fuel prices and demands for low-carbon performance.
- Support the development of coordinated, progressive legislation that rewards sustainability.

For more information visit: www.forumforthefuture.org

Winners and losers

Differing attitudes to sustainability have helped to produce some clear winners and losers, both within and outside the shipping industry:

- General Electric anticipated customers’ demands for energy-efficient products, and developed more than 80 new products under the ‘ecomagination’ banner. These generated revenue of more than $17 billion in 2008.
- Maersk initiated ‘slow steaming’ in 2007, yielding cost savings of £300 million and a 7% reduction in CO₂ emissions. The experience gained allowed the company to define a new generation of vessels (see case study page 27), with 50% lower costs than the industry average.
- The US auto industry, already encumbered by pension debt, came close to collapse in 2008 when sales of the large, inefficient vehicles it produced plummeted in response to rising oil prices. A government bailout of $25 billion was approved on condition that the industry fast-tracked fuel economy standards of 35mpg.4
- In the 1990s, B&Q, part of the Kingfisher Group, went into partnership with WWF to deal with the emerging consumer concern over wood product sourcing. This led to B&Q becoming a founder member of the Forest Stewardship Council, which certifies sustainable timber. As an early mover, B&Q secured its reputation, protected its supply chain and helped define sustainable forestry.
- In 2008, airlines that had based their business model on historic fuel prices failed in large numbers. Companies went under at the rate of one a week in the US, and Europe lost premium services such as Silverjet and Maxjet. More established players were forced to merge, cut services and endure heavy losses. British Airways’ CEO stated that profits would be wiped out if oil remained above $120/barrel.
introduction

how we would like the industry to respond

When reading this report we would like you as leaders to ask yourselves what the most sustainable outcome of each trend, or scenario, would be. By sustainable, we mean delivering profit but also benefiting the environment and society, now and in the future. In other words, what are your aspirations for the future of shipping?

If you are not a leader but someone who wants to advocate change, then use the report to engage with those who can make a difference with regard to these issues.

We would also like readers to think about what they might do to make a better future happen. When reading the section on change, test and challenge the initial assumptions that we have made, and think about what role you or your organisation might play in doing things differently. Are you creating or adopting new technologies that will be game changing, or influencing your suppliers to do more sustainable things? How are you ensuring that the good things you do as a company or organisation have maximum impact not only for you and your employees but also for your industry?

This is a work in progress. The SSI aims to create change for the better. Throughout the report we will pose questions to get you engaged and encourage you to think through what happens next. And we hope that you will join us in a journey towards a good future for shipping.

the current operating context for shipping

Shipping plays a critical role in the global economy. Over 100,000 commercial ships transport 90% of global trade. This means that the vast majority of the goods and energy most of us use depend on shipping to get to us.

Shipping is a barometer of world trade, and it has seen unprecedented expansion in the past two decades. Tonne-miles of cargo doubled between 1990 and 2008. The industry’s impacts and responsibilities have grown along with its cargoes, from Safety on Board in the first convention of 1914 to an increasing realisation of its fundamental role in managing climate and energy resources a century later. The industry is heavily dependent on increasingly insecure oil supplies, and its CO₂ emissions are around 3% of the global total.

The spotlight has fallen on heavy industry, energy producers, automobiles and aviation in turn, as it now has on shipping, resulting in a cascade of social and environmental improvement. While earlier changes tended to be imposed by regulation, globalised businesses are now taking action independently. They know that if they do not work to achieve optimal change on their own terms, they are likely to be subject to piecemeal local and regional measures or left behind by a changing market (as with the US automobile industry).

“Without the shipping industry, half of the world would freeze and the other half would starve.”
Efthimios Mitropoulos, IMO Secretary-General
Changes in the shipping industry have been driven by a mixture of legislation (mainly through the IMO) and action by industry leaders. The industry has responded to global concern over oil spills, ballast water, anti-fouling systems and air pollution, creating new emission control areas and achieving a reduction in oil pollution incidents. There is now a raft of regulation in place, and this is mirrored by industry initiatives, some of which are presented as case studies throughout this Case for Action. While regulation emanating from the IMO is largely environmental in nature, there is often mutual benefit between safety and environmental protection. Nevertheless, an overt focus on workers’ rights has lagged behind the environmental agenda.

GHG controlling regulations on ships will send one of the largest ever shockwaves through the industry, with implications including early scrapping of aged vessels, growing demand for new ships due to slow steaming, and increasing technology competition amongst shipbuilders. Aviva Investors, 2010, Review of Shipping and Shipbuilding

Complexity and the need for leadership

Shipping is a complex business. Notorious ‘split incentives’ separate key decisions from their financial, environmental or social consequences. The owner may have decided on the design, and the manager on operational practices. When this occurs, the charterer may end up paying the fuel cost without any say in the investment or operational decisions that influence that cost.

The IMO has estimated that 10–50% cost-effective fuel savings may be available from vessel design alone. But changes are not implemented, partly because of structural barriers. There are even disincentives built in, such as demurrage which requires port arrival at a set time, regardless of whether this will enable earlier unloading.

The complexities of the industry undoubtedly present barriers to change. Overcoming or eliminating these barriers is as important to long-term competitiveness as developing new technical solutions, regulations and operational practices.

Unravelling this complexity requires cooperation and collaboration across the industry, with clear advantages for those who succeed. The SSI brings together leaders from across key parts of the industry to enable the development of effective solutions to these cross-sectoral challenges.
from safety to sustainability: a new global responsibility for shipping

The scope of sustainability concern has evolved from local factory and on-board safety, to the fundamental global issues of the 21st century.

Shipping’s responses have evolved too, from the SOLAS safety convention after the Titanic disaster to the sulphur and nitrogen control measures now being implemented by the IMO.

How will the industry respond to, or be affected by, the global climate and resource constraints now taking centre stage?

This graphic illustrates some key milestones in sustainability, together with some of the major actions taken by shipping so far.

**Incidents and action: key milestones**

**Maritime legal framework**

**Resources**

**Climate change**

**Air pollution**

**Marine pollution & waste**

**Safety**

Recent years have seen the rise of fundamental new global challenges, driven by the scale and growth of human economic activity against a background of increasing resource scarcity. Material and social expectations that were once limited to a rich minority are becoming universal. Economic and political power is shifting, and shipping cargoes are changing as consumption patterns change and as climate change affects crop production and water availability. Meanwhile, oil supplies are harder to find, forcing a potentially stark choice for the global economy: innovate for efficiency, or see consumption and growth constrained by high fuel prices perhaps well beyond those experienced in 2008.

Looking ahead, it is clear that the operating context for the industry will change dramatically over the next 30 years, bringing new challenges and opportunities. The industry has seen many ‘paradigm’ shifts before, and is well capable of managing future change successfully.

Planning ahead now, rehearsing strategies and considering medium and long-term options will allow industry leaders to navigate these challenges and opportunities and secure a successful future, while contributing to a sustainable world.

The cost of inaction?

In 2008, the US auto industry came close to collapse, partly because of a failure to adapt to a predicted rise in oil prices.

The US auto industry’s ‘big three’ have been notoriously resistant towards energy-efficient vehicles. Daimler Chrysler, Ford and GM were active lobbyists against climate change legislation, and famously sued the state of California in 2004 over the introduction of low-emissions standards.7

In 2008, emission standards in the US were stalled at 25mpg (compared with 40mpg in Japan and Europe).8 The US industry remained focused on profitable but fuel-hungry SUVs and large pickups.9 When petrol prices rose above $4 per gallon in 2008, sales plummeted as customers sought more cost-efficient vehicles – which the big three were unable to provide. Encumbered by huge pension and healthcare commitments, these companies were forced to negotiate a government bailout of $25 billion. In return, the industry was required to fast-track development of 35mpg vehicles by 201510,11 – a standard achieved in Europe, Japan and China well over a decade earlier.

While Asian manufacturers also suffered during the economic downturn, Korean companies escaped almost unscathed. Early investment in highly fuel-efficient, low-cost cars is cited as a key factor in this success. It is notable that one of the key challenges faced by Japan’s Toyota was a supply shortage of its fuel-efficient Prius and Yaris models, rather than a slump in demand.12
At the far end of the spectrum, labour rights abuses at sea and in the ship-breaking industry are as shocking as sweatshop revelations. At the extremes, abuses include beatings and bonded labour, with reports of seafarers 'imprisoned' aboard ships for up to two years. Newsworthy examples such as these could open the industry to reputational risk and increase the imposition of codes of conduct by customers, similar to the SA8000 standard adopted by Nike. Components in new ships are increasingly being labelled for end-of-life recycling. This not only facilitates more sustainable ‘closed-loop’ ship building but could bring much needed accountability and traceability to hidden parts of the shipping supply chains, such as the ship-breaking sector in developing economies, in which workers as young as 12 are employed in what is described as ‘the world’s most dangerous job’.13 

Managing labour rights is not just about risk, there are also opportunities, and companies, including Unilever and Marks & Spencer, are exploring what a living wage really means and how it might add value through increased productivity. As standards and technological complexity increases, investing in human capital will be vital for companies wishing to keep up. There is a third possible future, in which vessels could become unmanned for all or part of their journeys. In a world where unmanned Predator drones routinely undertake airborne combat and airliners land automatically, this is a feasible next step.
Based on research and interviews, we have identified seven global trends that we consider to represent the key sustainability challenges and opportunities facing the shipping industry over the next 30 years.

We explore these trends in a global context. We then take a closer look at how they might affect the shipping industry. There is inevitably cross-over and interaction between trends and their impacts. In section 4 we investigate how these trends combine to present three key challenges to the industry.

- the global economy: emerging giants?
- freedom vs level playing field: ocean governance
- no secrets: demand for transparency
- moving on from oil: the future of energy
- demanding higher standards: sustainability regulation
- advancing technology: making it pay
- adapting to a changing climate
the global economy: emerging giants?

Shifting trade patterns will change what is being transported and to where, as BRICs and other developing nations grow in influence and economic activity. Most predictions are based on assumptions of continued growth and expansion of global trade. But the possibility of contraction, re-localisation or virtual substitution should not be ignored.

Globalisation has transformed the way trade operates, and continued growth of free trade could be an unstoppable trend. The phenomenal growth of India, China and other fast-developing nations is changing the direction of global trade flows, and could herald a seismic shift in the balance of power.

Not surprisingly, most experts interviewed as part of our research believe that the locus of power will continue to shift towards China over the next 30 years – although other rapidly developing nations are also likely to increase their power and influence. At the same time, the economic might of the small, ageing-population countries of Europe and North America is predicted to decline. A multipolar world is envisaged, with power more evenly distributed between the continents, and emerging mega-cities playing a more significant role as the population becomes more urbanised.

There are also signs of some virtualisation of global commerce. The International Electrotechnical Commission is recommending a shift to trading electricity via long-distance transmission rather than shipping coal and oil. Emerging techniques for flexible, low-cost automated production could remove the cost advantages of locating for low-cost labour – in parallel with a growing middle class in fast-developing nations that is changing work expectations. This could have a significant effect on physical trade and global transportation needs in the long term, particularly if combined with moves towards ‘closed-loop’ economies such as China’s 2009 recycling economy promotion law.

The majority of projections sampled assume overall growth of the world economy. But the recent downturn has revealed the vulnerability of the global economy. Trade could be profoundly affected by challenges such as feeding a population of over eight billion, ‘peak oil’ (see trend, ‘Beyond oil – the future of energy’), climate change refugees and extreme events such as a major pandemic or terrorist attack. Political action – including protectionism by a declining West, or embargos (covering Russian gas supplies to the Ukraine and EU, for example) – could also challenge our assumptions of growth.

Major oil flows will still be from all the usual production points – but most boats will be pointing east. But as Chinese living standards rise and transport costs increase, we might see a levelling off of globalisation and a move towards more regional trade patterns.

Rob Day, BP Shipping
what are the possible futures?

BRIC blooms:
As predicted by the mainstream, China looks likely to become the world’s top economy by the mid 2020s, flanked by India, Brazil and Russia. The interests and priorities of China (and other newly empowered nations) will be increasingly felt in globalised systems of trade negotiations and policies.

Protectionist or locally focused world:
Resource constraints, climate change or energy security pressures send globalisation into reverse as countries resort to protectionism. Corporate supply chains would have to regionalise to minimise risks. In this case, China would probably dominate a stagnant and fragmented economy. Security issues then become important. Could failure to reach agreement at the WTO Doha round signal a return to bilateral agreements and trade restrictions?

Globally connected, locally focused:
A more planned, technology-led version of the protectionist world scenario. Virtualisation shifts global trade from physical goods to information. Resource pressures cause a retreat to a more local economy, with nationalistic demands for local products. Demand for raw materials could fall because of better closed-loop design and renewable energy.

Implications for shipping
Global economic changes will affect shipping in two main ways. One concerns the changing direction of trade, which is likely to create winners and losers in shipping, as in any other industry. The other concerns the amount of trade, which has more significant implications for the industry as a whole.

- If BRIC blooms in an open, free-trade future, industry winners will be those with the flexibility and the connections to exploit new routes and markets.
- In a protectionist or locally focused world, the growth of shipping could be challenged by import/export restrictions, or increasing local self-sufficiency through virtualisation or closed-loop economies. Stagnating demand for shipping could result in fierce competition within the industry, either regionally or globally, with tighter margins forcing further efficiency increases to maintain competitive advantage.

Most long-term planning is based on assumptions of growth. What key decisions would be different, under an assumption of reduced growth and tighter competition?

Growth is the primary measure for success of a country or city. But alternative measures are being given serious consideration. If countries measured success on ‘sustainability’ or ‘the overall wellbeing of the population’, what would that mean for the industry?
freedom vs level playing field: ocean governance

National and international management of the oceans has increased significantly in scope, rigour and complexity over the past 30 years. There is a high level of uncertainty over the direction in which this will develop. Can we expect a robust international regime, presenting a level playing field for all, or weak global governance and an increasingly complex tapestry of local regimes, industry codes of conduct and voluntary standards?

what’s happening now?

The development of systems of international governance through the World Trade Organization, UN and other bodies was potentially one of the most important developments of the late 20th century. For shipping, the development of the IMO was cited by many of our interviewees as having a profound impact on the industry. Progress at an international level is often slow – the climate change negotiations being a notable example. The UN may not be universally supported, but the emerging economies, including the BRIC states, have embraced the system of international governance.

The prospect of further changes in the balance of power and national/regional priorities as we approach 2040 means that tomorrow’s international governance is likely to look very different from today’s. The multipolar world envisaged in the first trend could erode the power of international institutions, as individual countries grapple with their own governance challenges. Conversely, it could lead to greater support for international frameworks, as more evenly balanced powers recognise the benefits of cooperation.

what are the possible futures?

Consolidation and reform:

A multipolar world may provide an opportunity for reform and revitalisation of international institutions, as more equally balanced nations recognise the value of coordinated action. India, Brazil and South Africa have already said they want to reform and democratise the UN. A major success for the UN – for example, a strong, binding climate agreement, or bold action to resolve a major conflict – would boost credibility and provide the impetus for much faster change in areas of shared interest. With increasing Asian dominance, we may see a very different style of governance that promotes Asian interests and values.

Regionalisation of governance:

Shifts in the balance of global power, together with changing rivalries and coalitions, could lead to a patchwork world where coordinated international action becomes difficult. Frustration at the slow pace of change at the IMO and UN Framework Convention on Climate Change could erode support for international institutions, resulting in greater focus on unilateral action. This would increase the already complex tapestry of national and regional governance. Extension of national ocean governance has the potential to magnify this trend – for example UNCLOS III extends EEZ (exclusive economic zone) national ocean floor boundaries from 12 miles to the edge of the continental shelf (or 200 nautical miles) and may be extended further, with potential indirect effects on shipping. Complexity could be compounded by a plethora of standards set by other corporate entities (see trend ‘No secrets: demand for transparency’).
The future today: The Triple-E ship

Triple-E ships, under construction for Maersk by DSME, demonstrate significantly improved energy efficiency and environmental performance compared with the current most efficient ship in the industry, the Emma Maersk. These new ships will consume 50% less fuel and CO\textsubscript{2} per container moved than the industry average.

The Triple-E ship is only a few metres longer and wider than the Emma Maersk class, but can carry 16% more containers. The hull of these vessels is designed for lower speeds, and the energy-efficient engine is combined with a waste-heat recovery system that uses exhaust gas to produce extra energy that contributes to the propulsion of the ship.

Closed-loop resources: cradle to cradle

The millions of dollars invested in buying ships is also an investment in materials, some of which are limited resources. The Triple-E ships will come with a ‘cradle-to-cradle passport’, a means of defining and locating all the materials used in the ship throughout its life. This greatly improves the value of materials and their reusability for future vessels. The cradle-to-cradle concept is expected to deliver 90% recyclability, and shows the potential for companies to meet their needs for raw materials by using their own products as material banks. Maersk Line has a vision that all ships built in the future should be 100% recyclable.

Will it catch on?

Seaspan CEO Gerry Wang emphasised ‘environmental friendliness’ as a driving force behind the design for ships to be delivered in a $5–10 billion ship financing deal by the Chinese Government.\textsuperscript{29} While it is not yet clear precisely how efficient the ships will be, the deal is accompanied by an agreement between Chinese Premier Wen Jiabao and Greek Prime Minister George Papandreou to set up a “research centre devoted to the reduction of greenhouse gas emissions in the merchant navy”.\textsuperscript{30}
We live in a society that expects transparency in social, environmental and financial performance across much of the retail supply chain. Technological advances have made real-time monitoring feasible and affordable. There is a growing social movement towards forced full disclosure that is having potentially disruptive effects in political and financial systems.

Technology is providing the means for ‘radical transparency’. The Wikileaks disclosures are a prominent example of this, and illustrate the challenge that networked groups can pose to some of the most powerful entities on Earth.

Consumer demand for ethical business practices has grown from a niche concern to a mainstream expectation in the West. Rapid growth in demand in BRIC nations suggests an enduring global trend. Exposures of sweatshop conditions in the 1990s forced the development of robust supply chain management systems in the fashion industry. As a result, Nike now leads the world on factory practices and social metrics – a growing trend across consumer-facing companies. This growth in accountability is likely to continue, with companies being held responsible for their whole value chain – including shipping – the so-called ‘Walmart effect’.

Sophisticated monitoring equipment allows stakeholders access to real-time data relating to sensitive topics such as industrial emissions. The retailer Asda shows real-time videos from factories and farms, opening new possibilities for inspection and enforcement. Meanwhile, information and communication technology (ICT) is tilting the communications advantage away from controlled corporate PR. Apps such as Stickybits and Barcoo provide the means for consumers to add and access at-a-glance information on products such as workers’ conditions and environmental impact.

Examples of commercial ‘ultra transparency’, such as Patagonia’s ‘footprint chronicles’, are putting pressure on previously invisible parts of the supply chain. This trend has been resilient in the face of the recent economic downturn; indeed, there is evidence that corporations with strong corporate responsibility management have been the most successful in riding the economic storm.

At government level, Wikileaks has had a disruptive effect on the traditional structures of politics. It is not only the US Government that has been affected – many commentators argue that Wikileaks revelations were a key spark for the Tunisian and Egyptian revolts that could reshape Middle East geopolitics. The networked nature of such pushes for radical transparency, combined with the enabling power of the internet, makes this trend potentially very powerful and difficult to contain.

Co-ordinated port-state controls on emissions and other impacts, backed up by effective monitoring – similar to an aircraft’s black box, or the tachograph in trucks – could have a profound impact on industry behaviour.

The Rt Hon. John Gummer, Lord Deben, Sancroft International
Tech-enabled transparency is a very difficult genie to put back into the bottle. But there is a degree of uncertainty as to what the long-term response of corporations, industry and governments will be. We could see:

**Ubiquitous transparency:**
After failed attempts to maintain secrecy, big institutions – including government – accept that it is simpler to plan for near-total, ubiquitous transparency. Business must be totally transparent and work with the grain of ‘people power’ to succeed. Free and open access to information creates huge opportunities but also huge potential for confusion and misinformation.

**Paranoid information wars:**
The world is mired in a swamp of deliberate misinformation, as many entities attempt to muddy the waters of transparency for their own ends with doctored videos and fake live feeds and documents. Politics has become known as the ‘participatory deception’; fiercely competitive corporations quadruple-check suppliers and transporters while trying to spread misinformation about their rivals.

**Draconian secrecy:**
A third alternative reflects the increasing willingness of some regimes to openly limit access to information. Examples include China’s censorship of Facebook, Google and other internet services, and the suppression of Twitter use in Libya. Could this lead to a polarised world, with the connected and informed operating under a different set of standards from those endured by the isolated uninformed?
**The future today: monitoring, transparency and labelling**

Monitoring and management of performance varies considerably in the maritime sector. While some ships are still operating without an automatic fuel gauge, increasingly sophisticated monitoring and management systems are presenting new opportunities in navigation and efficiency.

Sustainability performance is of increasing interest to charterers, and to shipping customers such as retailers who wish to drive sustainability down their supply chains. An emerging suite of ship labelling systems provides a means to select ships on the basis of predicted or actual environmental performance. This could impact on asset values if the market shows a preference for more efficient ships. We are already seeing the emergence of energy efficiency and other sustainability requirements within charter contracts, and investors are predicting that schemes such as the Energy Efficiency Operational Indicator (EEOI) “could set off fuel efficiency wars [between companies]”.

**Examples of vessel energy and environmental ‘labelling’ schemes include**

- The Energy Efficiency Design Index (EEDI) developed through the IMO and related to the design of a vessel.
- Operational schemes, such as the IMO Energy Efficiency Operational Indicator (EEOI), the ISO14064 – 2006 International Standard on GHG inventory, the Clean Shipping Index which covers the broader environmental issues, and the Clean Working Group had developed a CO₂ rating per container.

Increasingly sophisticated monitoring systems such as BMT’s SMARTPOWER, enable highly accurate, real time monitoring and reporting. Fleet managers can use these to verify the cost/benefit of energy-saving initiatives; to optimise routes; and to track and monitor a range of other factors. Satellite linkages facilitate direct, automated reporting and remote management.

Monitoring technology is also being used to build transparency and trust in performance data between owner and charterer. Future legislation such as ECAs (SOx and NOx), SEEMPs (Ship Energy Efficiency Management Plans) and customer demand are likely to stimulate greater uptake. Could we see this technology and its successors driving complete transparency in the shipping industry by 2040?

The potential impact of labelling schemes on industry behaviour is demonstrated by the success of the BREEAM and LEED building labelling systems, which are transforming the UK and US construction industry’s approach to energy-efficient and sustainable design.

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**Implications for shipping**

Shipping has historically been a relatively hidden industry, but new methods can hold it up to scrutiny. We anticipate:

- A proliferation of voluntary standards similar to SA8000 for workers’ rights, and equivalents for environmental performance, as customers increasingly expect the shipping industry to collaborate to achieve its corporate responsibility goals.

- Varying market demands creating divergence in the industry, with top performers accessing ‘elite’ markets while poor performers compete for less demanding trade. The split could also be seen over different sectors. Containers, associated with highly visible brands, are likely to drive higher standards than bulk/commodities sectors. A small number of consolidated reporting standards would create more of a level playing field and less bureaucracy than a proliferation of different standards. Tools such as the Energy Efficiency Design Index (EEDI) and the Carbon War Room/Rightship’s shipping efficiency initiative will enable customers to select ships and shipping lines on the basis of fuel efficiency, in line with their broader sustainability commitments. As they develop and mature, these systems open up the potential for preferential markets and port dues, and better access to insurance and finance for more sustainable ships.

- Increasing use of sophisticated monitoring equipment, leading to complete transparency, even on the open ocean. Technology is already available for on-board and remote tracking of a ship’s operations, from fuel use and emissions to forensic methods for tracing the source of oil spills and fuel stocks. Voluntary uptake is anticipated as industry leaders seek to manage risk and demonstrate performance. Those opting to remain under the radar could find it increasingly challenging to demonstrate the level of performance required to access leading ports and customers, or preferential finance and insurance rates.

Improved monitoring and tracking technology could also transform the efficiency and effectiveness of inspection and enforcement regimes, leading potentially to the mandatory fitting of monitoring equipment (rather like the tachographs required for European trucks).

**What changes would the industry need to make if its emissions, pollution incidents, working conditions and other actions were completely open to scrutiny?**

**Who would be the winners and losers?**

**How can we create a level playing field in voluntary standards?**

*To measure is to know. If you cannot measure it, you cannot improve it.*

Lord Kelvin, 1824–1907
moving on from oil: the future of energy

The massive expansion in global trade of the past 20 years has been powered by cheap, easily available fossil fuels. However, the triple challenges of stagnating supply, exploding demand and climate change, have the potential to force major changes in the way we use energy. Will shipping approach this as a planned transition, a last-minute scramble or a disorderly decline?

Fossil fuels have powered the global economy for 200 years, supporting enormous expansion in globalised trade. Apart from short-term spikes, they have been easy and cheap to obtain. But the continuing expansion in demand is no longer being matched by increased supplies. Crude oil prices have left their historic range of $10–30 per barrel, and rose to nearly $150 per barrel before the global downturn in 2008.

The US Government projects that oil will cost $50–210 per barrel in 2035, while some respected observers see oil exceeding $500. Price fluctuations over the past three years emphasise the unreliability of these projections. However, while we cannot plan for a particular price, we can plan for significant increases, volatility and uncertainty.

Major bastions of the energy establishment are now cautioning that the age of easy oil is over. The view that supplies may peak as early as 2020, followed by possibly catastrophic decline, is entering the mainstream. A recent report to the US military warned that “we cannot assume that oil will remain affordable or that supplies will be available to the United States reliably three decades hence.”

Reducing CO₂ will become mandatory one way or another.
David Balston, Director, Safety and Environment, The Chamber of Shipping

None of the interviewees for this report anticipated a return to the old model of cheap oil prices below $40. The question is shifting from whether we need to switch to a post-oil economy to when that shift will happen.

Efficient technologies and alternatives to oil are already available in the transport sector. They include hybrid and electric cars, more efficient aircraft, and renewable energy and efficiency measures in shipping. None is yet mainstream, however, and uncertainty remains over which of the many alternatives will prove successful.
what are the possible futures?

Energy revolution – a planned transition:
This scenario involves a positive outlook for global trade and growth based on clean technologies. This is only achievable if global transport systems (not just shipping) invest well in advance of any fuel crisis. In almost every application there are already technically viable alternatives to oil power. Bold investments and more rapid uptake are required across the board to enhance the prospects for an orderly transition within a 20–50 year timeframe.

Peak oil crisis:
Many models predict a real decline in oil production from as early as 2020.7 If this occurred, it would happen faster than most transport systems could adapt, and would be likely to provoke an economic crisis that destroys market confidence. It is also possible that there could be a scramble to develop alternatives ‘at any cost’ – coal, coal-to-liquids and tar sands, for example. Finally, there is clearly the potential for diplomatic or military conflict over remaining resources, further destabilising prices.8 This could be exacerbated by emergency measures to reduce CO₂ emissions in the face of increasingly severe climate change impacts, with countries that fail to sign up possibly threatened with sanctions.9

Strained stagnation:
In the absence of strong policy drive or other leadership, an oil supply plateau could send confusing and volatile price signals. This could constrain growth and undermine market confidence in investing in low-carbon alternatives. Prices could ratchet higher while technology uptake lags behind, leading to higher fuel bills and constrained economic activity. The least fuel-efficient companies, airlines and shipping firms could be driven out of business.

Implications for shipping
Over the next 30 years the industry will be faced with the combined effects of volatile fossil fuel costs, and new air emissions limitations (especially for SOx). This will challenge bunker fuel use, and drive ships into competition with other sectors for supply of low-sulphur distillates. There will also be cargo changes – biomass rather than oil, for example – and wider impacts on global trade10 that could affect the quantities of materials shipped. In this discussion, we have assumed that by 2040 the world economy will remain intact, having managed a post-oil transition. However, it is possible that expensive oil will reduce volumes of trade (primarily through wider economic impact rather than through direct transport costs), leading to fierce competition within the shipping industry (see trend ‘The global economy: emerging giants?’).

• The winners in the next 30 years are likely to be leaders engaged in a planned transition to an efficient, non-fossil-fuelled fleet. Shipping replacement rates are slow compared with the one to three-decade timescale of an oil supply peak or plateau. Achieving a planned transition would require a radical programme of investment now. Market signals are not yet adequate to drive this shift, requiring leaders to pre-empt this.

• Slow-moving competitors risk strained stagnation. A huge surplus of ships is already on order today, built to current assumptions of oil price. High oil costs (see projections above) plus a carbon price at over $275 per tonne of fuel oil11 may make these obsolete long before 2040.12 This presents a risk for operators and investors facing accelerated depreciation and locked in by long asset life. The option to pass escalating operating costs on to customers will be limited by competition from more efficient fleets and from those who invested early in alternative fuels. On the other hand, retrofit of a global fleet of over 100,000 ships is a huge market opportunity for ship yards.

• Finally, there is the possibility of a ‘special circumstances’ reprieve for the industry: shipping is the most energy-efficient freight mode, and could become one of the ‘residual users’ of oil, with prices actually declining due to reduced land-based demand. It would be very risky to bank on this outcome, however, delaying moves towards efficiency and making it more challenging to catch up if lower oil prices do not materialise.

After 2020 you will not be able to use traditional bunker fuel with high sulphur content, unless you have scrubbers installed.

Jacob Sterling, Maersk Line

How is the industry prepared for the combined impact of sulphur limits, oil crunches and climate action which are likely to hit it in the 2020s?

What are the opportunities for competitive advantage if oil prices spiral upwards?
The future today: Slow steaming

How slow steaming became the new industry standard in container shipping – saving cost and CO2 and improving on-time delivery

First initiated in 2007, slow steaming is an operational strategy that has enabled Maersk Line to deliver greater schedule reliability and environmental performance. Industry wisdom was that engines could not cope with the low loads, but Maersk has demonstrated how engines can be run safely at very low loads (down to 10% engine load, known as super slow steaming).

Today, most of the Maersk Line fleet is slow steaming, yielding an annual cost saving of around $300 million – with potential for further savings. It has also reduced CO2 emissions per container moved by approximately 7%, contributing to Maersk Line’s target to reduce CO2 emissions by 25% by 2020.

Slow steaming is now becoming the new industry standard. A recent study showed that, today, around half of the global container fleet is slow steaming, and Maersk Line estimates that across the liner shipping industry the introduction of slow steaming will result in an annual CO2 reduction of the order of 10 million tonnes of CO2.

The future today: Virtual arrival

Applying accurate technology and enhanced communication to update outdated shipping laws and increase efficiency

The standard shipping approach is ‘hurry up and wait’: vessels steam to meet a pre-agreed schedule, regardless of known delays at port. ‘Full-ahead’ steaming burns excessive fuel. But then vessels idle at port awaiting berthing slots or tank space, and this pollutes the area, contributes to port congestion and exacerbates crew fatigue.

Virtual arrival changes this approach. If, at the contractual speed, it is clear that the vessel will be kept waiting at the discharge port, the voyage counterparties can trigger the ‘virtual arrival clause’. The ship then steams at a slower speed to arrive ‘just in time’. This radically reduces bunker consumption and emissions, and it also eases congestion and enhances safety. Virtual arrival then calculates the time at which the vessel would have arrived without intervention, and calculates the resulting waiting time compensation, or ‘demurrage’, as if the vessel had arrived at this time. Post-voyage, any savings in bunker costs (and potentially carbon credits) are split between the counterparties. This financial alignment is critical to success and adoption.

As a result of BP’s initiation and promotion of virtual arrival, industry bodies including the Oil Companies International Marine Forum (OCIMF) and Intertanko, are now lending their support. It is thought that applying virtual arrival to the tanker and bulk-carrier sectors could reduce greenhouse gas emissions by 5%, or 25 million tonnes, of CO2 annually.
In the 2020s shipping will take a major step forward in environmental protection, as IMO regulations reduce the allowable fuel sulphur level from the current 4.5% to 0.5% – and less in designated Emissions Control Areas (ECAs). This vital measure means shipping will follow equivalent action already widely taken on land, and address a major cause of criticism. But the change will have major consequences for the wider global fuels market which should not be underestimated. Shipping is generally considered to have two main options in meeting sulphur limits: switch to low sulphur fuel (normally diesel type distillates), or install exhaust gas scrubbers on ships. Due to the complexity and capital expense of scrubbers, fuel switching is widely seen to be the most straightforward option, with many smaller vessels already powered by distillate.

But a wholesale switch of fuel type over a relatively short time period raises fundamental energy supply challenges. The Residual Fuel Oil (RFO) currently used by shipping has become what must be regarded as a refinery by-product which amounts to some 5% of global fuel production. RFO processing cannot simply be switched over to low sulphur distillate fuels – and has few other uses. Global refinery capacity for distillate production is already fully engaged in meeting new road and industrial distillate demand worldwide. Refineries cannot just increase throughput to deliver the required distillate, they would overproduce other products including RFO, crashing prices and profits – and require 12mbpd of additional crude demand which would far exceed global spare capacity (both refining and oil production).

The only way of meeting such a massive new demand for distillates (a 13% increase on current production), is for refineries to make major investments in new upgrading facilities to crack the increasingly unwanted RFO into distillates. Refiners could be incentivised to invest in upgrading units that could crack about half of the fuel oil into middle distillates, the rest into gasoline (12.5%), LPG (11%) and coke (28.5%). But this would still leave a shortfall of over 2mbpd of distillate which could not be supplied without substantially increasing crude demand and therefore price, while oversupplying the market with other fuel grades. Upgrading units are also very expensive to build and use a lot of energy, especially the most efficient ones in cracking fuel oil into middle distillate. Refineries have not seen marine fuel as a profitable business, and their investments could be stranded if shipping were to turn to scrubbers instead (taking advantage of an RFO price which could collapse as soon as shipping began a move to distillate). Finally, the upgrading units use a lot of energy, adding to CO₂ emissions. Refineries will need major incentives and clear legislation if they are to invest in the face of these risks.

Given the above a wholesale switch by shipping to low sulphur distillate fuels is not a viable option. Scrubbers will in some cases be a possible alternative, but require significant investment which may be hard to justify, especially for older vessels – and they increase fuel use and CO₂ emissions which will also be under pressure.

Consequently, in achieving sulphur reduction therefore, the market will have to find a balance between fuel switching and scrubbing or find new innovative solutions to propulsion and efficiency which can deliver on both sulphur and CO₂.
demanding higher standards: sustainability regulation

The increasing pressure for higher sustainability standards and regulation has many drivers, from resource constraints to valuing ecosystem services, as well as stakeholder demands for better social and environmental practices.

what is happening now?

As countries develop, they demand higher standards of environmental care and worker welfare. While cutting CO₂ remains a challenge, well-established legal and technological approaches have enabled and enforced cuts in key pollutants and wastes and improvements in working conditions.

Public awareness, and demand for tougher laws, is likely to increase over the next 30 years, particularly in fast-developing nations, as populations experience tightening constraints in freshwater supply, and understanding of the value of good labour conditions, biodiversity and ecosystem services increases.

what are the possible futures?

Clean is the new dream:

Globalised businesses find themselves operating within a more stringent but more even regulatory framework, and are able to extend the way they do things in “developed” countries to other parts of the world.

Resource constraints could drive a global movement towards ‘industrial symbiosis’. We could see more legislation that supports closed-loop recycling of materials (along the lines of China’s 2009 recycling economy promotion law) and a complementary global system that tracks the use and reuse of key minerals, water and energy – with punitive fines for waste and pollution. Enforcement would also be assisted by the kind of greater transparency described in trend ‘No secrets: demand for transparency’. It is notable that China’s political system enables change to be ‘dictated’ more readily than in most other places. Could we see this approach spilling over internationally as the balance of power continues to shift?

Divided and dirty:

If there are serious reverses in economic growth, then these aspirational drivers may falter. This could leave populations divided: the least fortunate could be forced to live with the waste and pollution generated by production for the better off. Some industries may evade new controls, but all will face the external costs that result, such as poorer worker health, damaged fisheries and ghetto areas. While legislative standards may vary globally, resource shortages may still encourage a greater prevalence of closed-loop manufacture/use/reuse processes.

Piracy provides a stark example of how poverty and resource depletion can have direct impacts on the shipping industry. Somali fishermen, hit by depleted fish stocks caused by overfishing by foreign vessels, have turned to piracy as an alternative – and lucrative – source of income. At the time of writing, 750 seafarers on over 30 vessels are being held hostage by pirates. The estimated total cost of piracy to the international community is between $7 and $12 billion, with the potential for major impacts on ship routing.

This does not mean that the SSI condones piracy but shows its potential impact.
The future today: environmental accounting

Shipping must be proactive in taking responsibility for its emissions and managing remedial actions, but we can only manage what we can measure

Current legislation regulating the disposal of vessel waste streams does not encompass all categories, nor does it require detailed cumulative records. Gearbulk has created a more comprehensive in-house environmental accounting system to accurately track waste streams from its fleets.

Existing procedures for measuring and recording waste quantities were expanded and improved to ensure accuracy. Waste streams were also categorised and incorporated into the Gearbulk Vessel Reporting System. The system has automatic alarms to indicate non-receipt of regular reports and to signal when parameters deviate from preset values. It includes all major air emissions and waste streams, including CO₂, NOx, SOx, sludge, bilge water, garbage, cargo residues, tank washings, lube oil consumption, accidental oil leakage and refrigerant gases.

The system provides trend analysis and comparison between vessels, voyages and trades. It also raises the profile of environmental stewardship both onboard and ashore. It is considered an indispensable tool to gauge the success of emission/waste-reducing initiatives being implemented in Gearbulk, and a potentially important template for the wider industry too.

What might stakeholders demand from shipping?

The overall message from land based experience is that environmental regulation is a ratchet which gets ever tighter, and ever cleaner. Shipping will be a priority target for cleanup in regions that have already cleaned up on land – illustrated by the implementation of SECAs in the North Sea, Baltic and California.

Current issues are likely to remain on the agenda – the 2020 IMO sulphur limit of 0.5% is still 100 times the current European limit for road diesel. By 2040, large scale decarbonisation of power plants and transport is likely to be in progress in many regions of the world. Unless shipping has moved decisively in the same direction, the industry will become by far the most prominent source of local air pollutants like SOx, NOx and particulate matter in many regions.

While enforcement remains a problem, the Maritime Labour Convention (MLC) indicates a move towards more stringent, enforceable global regulation of labour standards. It is feasible we will also see the emergence of voluntary standards, equivalent to the SA8000 standard used to manage workers rights in the textiles supply chain.

Increasing awareness of the value of biodiversity and pressure on fish stocks will build pressure for more action on ballast water and biofouling, and increasing focus on issues such as shipping noise impacts on marine life, and loss of cargoes beyond the oil and chemicals (e.g. the impacts of container cargoes lost at sea).

• Following trends in terrestrial legislation, regulatory pressure is highly likely to increase for both existing and new issues see box ‘What might stakeholders demand from shipping?’. Linking with trend, ‘No secrets: demand for transparency’, it is foreseeable that this will be accompanied by increasing levels of scrutiny and enforcement, leaving no place to hide for poor performers.

• A more radical move towards closed-loop systems would have implications not only for volumes of trade but also for how ships are built and rebuilt. Ship breakers will need to be more connected to shipbuilders and find ways for materials to be used and recycled in the most sustainable way possible. This is a real opportunity for shipping to showcase and facilitate an approach in which reuse is central, by ensuring that materials are in the right place at the right time.

• In a divided and dirty future, where progress on sustainability legislation stagnates or reverses in some regions, it is unlikely that standards would drop globally. Local and regional regulations might proliferate in areas that are keen to maintain high standards, creating a complex patchwork of legislation. Shipping would turn into a two-tier industry unable to plan ahead effectively.

Implications for shipping

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advancing technology: making it pay

Technological advances have dealt with many of society’s sustainability challenges in the past, from intensive agriculture growing enough food for a burgeoning population to scrubbers and catalytic converters cleaning up urban air pollution from transport. Now, technology is focused on challenges such as energy insecurity and climate change. Can new materials, ICT-based efficiency and renewable energy technologies deliver what we need?

what is happening now?

The phenomenal growth in ICT-based applications, such as internet and mobile communications, has brought high technology to the poorest villages. It has also delivered unexpected benefits, such as satellite guidance of farm machinery, and the social media that support transparency (see trend ‘No secrets: demand for transparency’). ICT can change or replace travel and transport, with telepresence reducing business flights, for example (see trend ‘The global economy: emerging giants?’). More sustainable technologies such as cleaner production techniques and renewable and efficient-energy systems are now a common sight in many parts of the world.

The key uncertainty with technologies is uptake, rather than the viability of the technology itself. Research on the automotive sector shows some technologies taking decades to reach 50% penetration, while those mandated by law become universal in just a dozen years. This is clearly a challenge when considered against the possible timescales of ‘peak oil’ or climate change. Uptake, or the lack of it, is affected by numerous factors – market signals, availability of information, costs (it gets cheaper as demand increases), barriers such as split incentives, and aversion to perceived risk. All of these barriers can be overcome by regulatory requirements – or by leaders demonstrating the viability of a new method or technology.

We believe the shift in the shipbuilding industry’s competitive focus from cost reduction to technological capability has already begun.

Aviva Investors, 2010 Review of the shipping and ship building industries
what are the possible futures?

There are four main ways in which uptake of technology proceeds:

Stagnating vulnerability: minimal change that ignores technological alternatives or uses them poorly. This results in vulnerability to competitors or external change, as with the coal-fired power sector and US car manufacturers in the late 20th century.

Incremental change reaching a tipping point: a technology has strong enough credentials to be implemented on a piecemeal basis, until the level of use reaches a point where economies of scale and compatibility make it the leading choice over competing approaches (the timeline can be variable). Examples include containerisation, mobile phones and car fuel injection.

Dreadnought moment: a leader puts a package of technologies together that makes everything else obsolete, defines a new standard and sets major change in motion, eg the Dreadnought battleship, the Toyota Prius hybrid, the Apple iPod.

Forced change: faster change driven by reaction to an event or market or regulatory change (although the regulatory change could be the result of a tipping point among regulators), eg catalytic converters, double-hull tankers, the decline of oil-fired power plants.

Implications for shipping

- For shipping, technology is both a trend-driving change in its own right and a solution to the other challenges presented in this report. Technology solutions likely to be of most critical importance for shipping include energy/carbon efficiency, ICT-based operational efficiency measures, and environmental emissions treatment. There are already many options available in these areas that have yet to see wide uptake. An example of technology itself driving change is the ICT-based monitoring and reporting opportunities outlined in ‘No secrets: demand for transparency’. Stagnating vulnerability is arguably the default position of a conservative industry, characterised by reluctance to be ‘first to invest’ unless forced by legislation. Coupled with inertia caused by long asset life-spans, this leaves large parts of the industry vulnerable both to the changes precipitated by our six other trends and to competition from early adaptors or a ‘Dreadnought moment’.

- A Dreadnought moment occurs where a market leader or new entrant to the industry is able to demonstrate a step change in performance, after which regulators and customers treat this as the new standard to be met. This has occurred in the automotive sector following the emergence of hybrids, in aviation around aircraft noise, and, of course, in the containerisation of shipping.

In each of these cases, change creates winners and losers, depending on how far a market player gets ahead of new technological trends or falls behind its rivals. Those taking a proactive, coordinated approach to innovation and uptake of technology set themselves in a position of leadership.

Will shipping be subject to the kind of step change in sustainable technology that has been seen in the automotive and aviation sectors? Who would lead this step change?

How can industry leaders overcome split incentives and realise the benefits of adopting new, sustainable technologies?

How do we future-proof today’s new ships to prevent early obsolescence?

How might we fund and deliver a massive programme to retrofit ships to achieve low or even zero emissions?
The future today: Existing energy efficiency measures

Tried and tested energy efficiency measures are available for both new ships and retrofit of existing ships. Below are examples from Wärtsilä and DSME which can be applied today.

**Container vessels**
- Designed for speed, manoeuvrability and loading efficiency:
  - Waste heat recovery (for electric power): 4–10%
  - Autopilot adjustments (self-tuning, adaptive autopilots): 4%
  - Ship speed reduction: 23%
  - Efficiencies of scale (per 10% increase in container capacity): 4%
  - Hull surface coatings: 5%
  - Bow thruster scallops/grids location: 5%
  - Propeller blade design: 2%
  - Lightweight construction: 7%

**Tankers and bulkers**
- Designed for slow speed, long voyages and high-density cargoes:
  - Energopac (rudder and propeller design to reduce drag): 4%
  - Delta tuning (using rail technology to tune the engine): 1%
  - Air lubrication (an air carpet beneath the hull to reduce drag): 5%
  - Voyage planning for weather and sea conditions: 10%
  - Wind power (sails, skysails or Flettner rotors): 20%
  - Hull cleaning (to reduce resistance): 3%
  - Optimum main dimensions (e.g. slender hulls): 9%

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The future today: Cargill’s wind-powered bulk carrier

Cargill’s Ocean Transportation business, one of the world’s largest charterers of dry bulk freight, believes that driving environmental best practices makes good business sense and is important for business growth.

Cargill has partnered with SkySails, developer of an innovative technology that uses a kite flying ahead of a vessel to generate enough propulsion to reduce consumption of bunker fuel by up to 35% in ideal sailing conditions. An IMO study has estimated that up to 100 million tonnes of CO₂ could be saved every year by the broad application of this kind of technology to the global merchant fleet.

While the technology has already been used for smaller vessels, Cargill wanted to install the kite on a handy-size vessel between of between 25,000 and 30,000dwt. In early 2011 Cargill and SkySails signed an agreement to install a 320m² kite on a handy-size vessel on long-term charter to Cargill. The ship owner is also very supportive of environmental innovation and excited about the project.

SkySails and Cargill aim to have the technology installed and fully operational in early 2012. Cargill estimates fuel reduction of 10–20%. Based on the operating pattern of the vessel, this should deliver a saving of 500–1000 million tonnes of fuel per year, and eliminate the emission of 1600–3200 tonnes of CO₂ per year.

© Cargill SkySails
adapting to a changing climate

Climate change is happening. Events occurring now equal or exceed the worst-case projections from the Intergovernmental Panel on Climate Change (IPCC). Within the 2040 timeframe of this Case for Action we can expect increases in the frequency and severity of storms, changing ocean currents, and the possibility of sea-level rises affecting ports. As these trends gather pace, adaptation will be unavoidable.

what is happening now?

Recent global temperature rises are consistent with the predictions of climate models. While short-term fluctuations are occurring as usual, there have been no significant departures from the underlying warming trend. Many current indicators of climate change are already currently tracking near or above the worst-case projections of the IPCC.

what are the possible futures?

Global temperatures are expected to warm by 2–7°C above pre-industrial levels by 2100. The IPCC’s 4th Assessment Report, agreed by all major nations, assesses as likely:

- Drought affecting hundreds of millions in Africa, Central and South East Asia and Australia.
- Agricultural yields decreasing by up to 50% in many parts of the world.
- Increasing frequency of extreme weather, including heatwaves, tropical cyclone intensity and flooding.
- Sea-level rise with catastrophic impacts on low-lying regions, coastal aquifers and infrastructure.
- Biodiversity loss, especially in highly sensitive areas such as the Amazon rainforest and coral reefs.
- An ice-free Arctic in summer by 2040, following a transition that might well be sudden rather than gradual.

It is just as vital to consider the political and trade implications of climate change as to appraise the likely physical outcomes. Forum for the Future’s Climate Futures project identified potential scenarios for 2030, summarised below:

- **Efficiency first**, where planned innovation in energy efficiency enables a low-carbon economy with little need for changes in lifestyle or reduction in trade.
- **Tough measures**, where the global economy struggles to cope with the scale of environmental change. Globalisation retreats, and countries focus on security and protectionism to access resources at any cost.
Climate change could affect the shipping industry directly, through increased risk from storms and a changing navigational environment, or indirectly through tough CO₂ emission controls or wider economic impacts.

- **Trade growth** could be severely curtailed as the sheer scale of physical impacts challenges the resilience of the global economy. Growth could be further restricted by protectionism, and competition for trade could be intense.

- **New cargo movements** will be required to compensate for changing production patterns. Water could become a major new cargo. Increasing migration/environmental refugees could present security challenges for the industry.

- **Weather and climate challenges**—including increased frequency, unpredictability and intensity of storms, changes to ocean currents and melting ice—are likely to change shipping routes. Meteorological models may become less accurate. Risk will also be affected, with potential adverse insurance implications.

  Expensive, short-notice port closures could occur because of increased flooding from storms and sea-level rises. Changes are already being seen—with the North East Passage anticipated to open sooner than expected, providing a real alternative to the Suez canal, for fleets with established Arctic equipment and experience.

  - **Tough CO₂ emissions controls:** The first wave of compulsory carbon taxes and trading is underway in the EU, California and China. Cars have long been subject to emissions limits, and the EU is bringing aviation into its emissions trading scheme from 2012. It is hard to imagine shipping being omitted from the next wave of climate policy actions. The International Monetary Fund has estimated the cost of carbon required to make the necessary reductions at $86 per tonne, several times the current price and equivalent to $275/tonne of fuel oil. Future regulation in the face of increasing evidence of catastrophic climate change could be drastic and draconian.

The future today: The B9 low-carbonfreighter

B9 shipping is set to release the world’s first low-carbon, fossil-fuel-free freighter, to meet an anticipated increase in demand for low-carbon shipping. The B9 will draw 60% thrust from sails, and the remaining 40% from a bio-methane engine. The sails will automatically adjust to wind conditions and use kite sails where appropriate. Methane for the engine comes from anaerobic digestion of food waste, and will be primarily used either in calm conditions or when manoeuvring into port. This fuel is to be sourced from municipal waste.

The first B9 vessel has the potential to accommodate 9,000 tonnes of cargo on board—about five times the capacity of traditional sail-powered cargo vessels. It will be able to travel a thousand miles, operating around European waters—particularly in the North Sea. As demand increases, B9 in the future hopes to produce larger ships capable of longer voyages. In addition, B9 is currently working to develop a products tanker and a chemical tanker to transport biofuels such as bioethanol and biodiesel.
What challenges do these megatrends and scenarios pose for the industry?

There are implications for the shipping industry in all the trends described above. But it is where the effects of these various trends overlap that significant change occurs. We have brought together a set of three key challenges that the SSI believes industry leaders need to respond to if they are to be the leaders of the future.

Shipping is likely to remain the dominant transport mode for global freight. However, there will be winners and losers as different industry players adapt – or fail to adapt – to a changing world.

An international agreement regulating CO₂ emissions from shipping will increase the cost of using fossil fuels.

Jacob Sterling, Maersk Line
challenge 1: navigating a changing economic context

Over the next 30 years there is likely to be rapid and significant changes in the direction of trade and the type of goods transported. An industry that is highly mobile by its very nature should be well equipped to deal with this. But the key questions will be whether global trade grows or declines and how the industry is governed.

Continued growth of free trade, clarity on the aims and influence of rapidly growing economies such as China, within the context of a strong, more directive ocean and maritime governance regime would provide regulatory and economic certainty. This would enable industry leaders to invest for the long-term and prepare for the more disruptive possible futures identified in this report.

However, there are several reasons why trade might decline. Economic contraction, leading to ferocious competition for trade, would further squeeze already tight margins and magnify any competitive advantage – or disadvantage. Against a backdrop of weak international ocean and maritime governance, and a patchwork of local and regional legislation, it would become harder to plan and invest for the long-term. Although the shipping industry might recognise the need to evolve, it would lack clear direction and resources for investment.

In describing the risks and opportunities below, we acknowledge that risk for one part of the industry may well be an opportunity for another. For example, rising workers’ expectations present an opportunity for organisations with good labour relations to secure skilled staff whose expectations cannot be met by less conscientious operators.

**Risks**
- Insufficient preparation for rapid change in routes and markets.
- A patchwork of regulation that makes shipping overly complex and reduces margins.
- A contraction of trade or a preference for national manufacturing/service operators that reduces the overall demand for shipping and cuts out less efficient and flexible ship operators.
- Workers’ rising expectations in developing economies make it harder and more expensive to recruit.

**Opportunities**
- In a contracting market, competitive advantages could make the difference between success and failure. Fuel efficiency will lower operating costs, for example, so businesses that meet high standards could win preferential access to high-performing markets.
- A coordinated group of leaders could support the IMO to develop progressive new regulatory levers that anticipate future challenges.
- Shipping logistics could be at the centre of coordinating more closed-loop economies – either regionally or globally.
- The emergence of new routes and markets.
challenge 2: increased scrutiny, higher expectations

In a highly networked, social media-savvy world, the shipping industry is likely to come under increased scrutiny. Greater transparency will encourage customers and other stakeholders to favour strong performers.

Expect the shipping customer of the future to be interested in price, security and speed, but also in wider performance factors such as working conditions, vessel efficiency, emissions, biodiversity and environmental/labour rights prosecutions. This is a strong trend already seen in the land-side supply chain, with companies such as Walmart demanding that suppliers perform against a sustainability scorecard.

We anticipate rapid proliferation of voluntary standards and codes of conduct for shipping, together with raised expectations from ports, financiers, insurers and others. These demands are also likely to be accompanied by increasingly stringent international, national, regional and city-based regulations.

Sophisticated remote monitoring technology already enables unprecedented transparency, and we anticipate a huge expansion of its application within shipping.

**Risks**
- A complex patchwork of standards creates a compliance burden.
- Ad hoc social media campaigns focus on the infrequent abuses of workers’ rights that tarnish the whole industry.
- Poor performers or those who fail to demonstrate improvements may be excluded from the more demanding markets.
- Technology enables a new ease of inspection and enforcement, forcing expensive, reactive improvements at the bottom of the market.
- Failure to work with parties developing standards can lead to poor standards that are overly expensive or bureaucratic.

**Opportunities**
- Leaders who embrace transparency to demonstrate good performance could gain preferential access to finance, insurance and markets.
- Improved transparency reduces opportunities for poor performers to undercut the market.
- Collaborating with other parts of the supply chain in the development of new standards offers the opportunity to shape them and respond ahead of the competition.
Risks

• Ships built today could swiftly become obsolete because of significant changes in the type and price of fuels, in shipping regulations, or in customer expectations.
• Oversupply of available vessels is already a concern. Future innovation could be stifled in a market flooded with obsolete designs sold at knock-down prices.
• Investment in new technology is constrained by ‘split incentives’, which separate key decisions from their financial consequences, and by short investment horizons. This presents an opportunity for new entrants to shipping to out-manoeuvre incumbents.

Opportunities

• Shipping is the most efficient mode of transport, and rising oil prices could see it benefit from a shift away from competing transport providers.
• Rising oil prices could give a competitive advantage to operators who have already invested in energy efficiency.
• Shipyards may have an opportunity to retrofit the >100,000 commercial ships currently in operation.
• State support for adopting new technology at scale could create a paradigm shift in the market. Chinese ship builders already benefit from subsidised steel: what might happen if states subsidise highly efficient ships or a new fuel infrastructure, as parts of a wider energy security strategy?

Leaders of the energy establishment are warning that the age of easy oil is over. Many believe we will reach ‘peak oil’ as early as 2020. Over the past two years we have already seen oil prices span almost the entire range that the US government projected for the next 15 years. Volatile prices and insecure supply are likely to present a significant challenge to shipping and the wider economy.

At the same time floods, heatwaves and other extreme weather events offer increasingly alarming evidence of global warming. This will increase pressure for shipping to be included in regional and global regimes to reduce greenhouse gas emissions.

Shipping companies and their partners recognise the need to invest in energy efficiency and in the transition to new fuels, exploring new financial models to enable this to happen. This is challenging but necessary: companies that fail to act will be vulnerable to competition in an increasingly uncertain market.

There is uncertainty, however, over how to invest. Short-term price fluctuations in different fuel types are a factor in this uncertainty, along with the need for coordinated action to develop supply infrastructure and the competing performance demands made by strictures such as the sulphur regulations. Strong leadership is required to prevent uncertainty resulting in inaction.
driving change – a call to industry leaders

We need leadership to drive the kind of change in the industry that is needed to meet the scale of the challenges we face. In some cases this will be incremental change – such as growing a better skills base to organise the ships of the future. But in others it will be more radical – the uptake of new technologies and financing models to dramatically reduce carbon, for example. Either way, it is important for leaders to understand how change can happen in the industry and what the most effective routes to change are likely to be.

how change happens

Forum for the Future has been exploring this sort of change for the past 15 years. It has learned that there are a series of things that need to happen to change an industry or sector. These are captured in its ‘six steps to significant change’ – a framework that combines change theory with what has been seen in practice.

Put simply, change starts with understanding. The first two steps (understanding the need for change and diagnosing the system) are about raising awareness of the challenges an industry faces, then working out what needs to change and how it might happen – as this Case for Action is starting to do. Innovation and practical action then become key. The third step – creating pioneering practice – is about developing and showcasing new and better ways to do things. Up until this point you are normally working with a relatively small group of leaders to find new approaches, but it is with innovation that new approaches really take off.

In the next step, enabling the tipping, experiments are taken up more widely by the industry once leading industry players see how effective they are. The final two stages (sustain the transition and set new rules for the mainstream) are about maintaining the change that has been created, often through widespread sign-up to voluntary commitments, new consumer standards or regulation.

In shipping there have been a number of changes over the years. On the following page we have explored how the six steps can be seen strongly in the journey towards containerisation.

6 steps to significant change

1. Experience the need for change.
2. Diagnose the system.
3. Create pioneering practices.
4. Enable the tipping.
5. Sustain the transition.
6. Set the rules of the new mainstream.
Containerisation – reflecting the six steps to significant change

Prior to containerisation, ports were a chaotic and dangerous bottleneck in the shipping process. The practice of packing fragile goods with heavy and bulk materials meant that goods were frequently damaged or ‘lost’, and manual loading presented a physically demanding logistical nightmare.

While there was an understanding of the need for change, at first the solutions didn’t work very well. The idea of putting goods in large boxes to protect and standardise loads had been around for years, but the variety of different-sized heavy boxes simply added to the danger and complexity of manually getting goods into tightly packed holds.

This all changed when industry outsider McLean Trucking (later Sea-Land) looked afresh at shipping as part of the wider logistics system. McLean Trucking’s diagnosis of the system led the company to see that it was the loading and packing of the containers that would make the difference. Containers needed to be loaded onto a ship easily and efficiently, and offloaded straightforwardly onto trucks and rail at each end of the journey.

So, McLean went ahead and created pioneering practice. It put together a new model by:

- Designing a standard container that would fit a truck trailer and rail flat-loader.
- Investing in specialised ships, designed to take the standard container (originally retrofitted tankers).
- Making arrangements with ports, and facilitating joint investment in specialised loading and unloading systems.
- Developing and promoting the McLean’s standard for containers, through the logistics chain, to ensure standardisation of equipment.

This new approach was adopted by a small number of players, notably from outside the industry, during the 1950s and 1960s. Despite challenges involving unions and protectionism, containerisation proved itself at small scale, offering much lower rates to shippers on routes where the infrastructure was in place. But it wasn’t until the adoption of containerisation by the US armed forces during the Vietnam War that the concept was proved at scale.

The increased speed and reduced cost made it a case of ‘adapt or die’ for operators competing on ‘containerised’ routes in the 1970s. It was at this point that Maersk adopted containerisation, and the size and commitment of the company led to a massive expansion of the infrastructure. In effect, Maersk enabled the tipping, and from there containerisation went on to be mainstream practice.
the levers for change in shipping

If our industry leaders are to shape a more sustainable industry, then lessons can be learned from past changes. Containerisation is just one example of this, and others such as double hulls and ballast-water treatment have been driven by very different pressures. Some changes may be faster and driven more by individual entrepreneurship, while others are slower and consolidated by government regulation, but in the main they will reflect the six steps. Having said this, they often have very different trigger points. Our desk research, interviews with industry experts and group discussions with the SSI have highlighted that big changes in shipping tend to be driven mainly in the following ways:

**Technological innovation and replacement:**

While technology alone cannot drive change, the major changes in the industry (eg the shift from sail to steam and containerisation) have been enabled by the arrival of a new and better technology. This requires early adopters to show that a new (pioneering) approach works, followed by a build-up to a critical mass of users so that the whole industry starts to shift (and hence follows the six steps). This can result in massive shifts such as sail to steam, and coal to oil. Other technological approaches, such as those around ICT and logistics, have arguably had just as significant an effect: they have changed the operations, behaviours and social elements of the industry as well as the ships. While the technology is the driver for this change, it often requires individual company leadership (see below) to really consolidate – as was the case with McLean Trucking and Maersk in containerisation.

**Market prices:**

Changes in the price of carbon and key commodities such as bunker fuel are outside the control of the shipping industry, but they clearly have a fundamental effect on operational and investment decisions, as well as on customer demand. Current prices have the most direct impact on the industry, but perceptions about future price trends can also be highly influential in precipitating change. While recent oil price spikes have resulted in operational changes such as slow steaming, they have not yet driven a significant enough shift in future price expectations to move the industry towards a tipping point around hull, propulsion and renewable energy technologies. In this respect the industry has yet to really experience the need for change – the first of the six steps.

**Regulatory change:**

Clearly, regulation has a significant part to play in the development of shipping. There is a strong regulatory environment, overseen by the IMO. The key question to consider is how regulatory change comes about. Governments do not simply decide to change the rules – they are persuaded by market forces, lobbying and campaigns, crises and the showcasing of new and better approaches. This can be a long process – the hard-won regulation on ballast-water treatment, for example, is yet to be ratified. More rapid change can result from crises, such as the Exxon Valdez spill, which led to global regulation on double-hulled tankers. The megatrends highlight that it is uncertain how regulation will influence the shipping industry in future. Its influence is still likely to be significant, but there is a risk that there will be a less coherent set of rules because...
of different regional approaches. The trends also highlight that climate change may result in more major weather incidents that could lead to crisis-driven regulation which may impact on shipping.

**Changes in customer demands:**

Large consumer-facing companies such as Walmart, Unilever and Toyota have made significant sustainability commitments that are now being driven down the supply chain. As customers demand higher standards, industry must respond. This is much more significant for container shipping, as the products are more visible, but is likely to filter down the supply chain.

**Individual company leadership:**

There are a number of current changes in the industry that have yet to reach a tipping point. Some of these are captured in our case studies. Our examples often showcase leadership from a company or group of organisations. This kind of leadership is critically important for developing a sustainable future. B9 Shipping [see case study page 35] is an example of leadership pioneering practice. It is currently niche, which means that it may not be relevant to or scalable across the rest of the industry, but it shows how things can be done differently. BP Shipping's virtual arrival is more ripe for mainstream practice. What the merchant shipping industry has yet to experience is a new ‘Dreadnought’ – a revolutionary leading ship or shipping approach which, like the 1904 battleship, constitutes a giant leap forward that leaves the rest of the industry with no option but to follow.

As the six steps show, it is often a combination of these factors that really results in change. Containerisation happened because it was a better approach, but it still took time to become mainstream and required infrastructure development and company leadership to come to fruition.

It is impossible to create a perfect list of change drivers for an organisation, let alone for a large and complex industry. Our aim with this list is to start a more sophisticated discussion about how to ensure that the industry is fit for a different future. We would welcome further discussion and development of the arguments in this report over the course of the SSI.

To lead the industry towards a better future, our group of leaders in the SSI need to first show that change is necessary (the purpose of this Case for Action). They then need to understand what needs to change, starting with the questions in section 5 (Conclusions). From there, and this is where the business opportunities really start to emerge, they need to show what the future could look like through better standards, new technological innovations and new business models. In shipping, it will be important to reflect the complexity of the industry by trying a number of different ‘pioneering practices’ at once, seeing how they relate to one another, and thinking about the cultural, political, technical and economic factors that can support them all at the same time.

Ultimately, though, leaders need followers. If the industry is really going to be future-proofed, the pioneering practice that works needs to become the norm. Leadership is about creating a future that you can profit from, so it is in the leaders’ interest to enable tipping points through communicating what works, encouraging wider adoption of standards and building strong alliances among those involved in successful practice. In the SSI we are developing our vision as a means to kickstart the transition. Visions inspire people with what’s possible and provide a clear sense of direction. While we will create the vision early on in the project, the commitments that come from it aim to secure longer-term accountability and impact.
It is clear that the operating context for the shipping industry will change dramatically over the next 30 years, as illustrated by the global trends and three key challenges that will shape the future of the industry and challenge business as usual.

Planning ahead, and considering medium and long-term options, will enable industry leaders to secure a successful future while contributing to a sustainable world. Members of the SSI recognise that we need collaborative leadership to drive change that is commensurate with the scale of the challenges ahead.

To prompt thinking on how to respond to global trends and challenges, we raised some key questions through the Case for Action, which we have captured here.
Leadership is about creating a future that you can profit from. It is in the interests of leaders to identify the business opportunities emerging from a progressive response to the questions, risks and opportunities raised in this Case for Action.

To make this happen we need better standards, new technological innovations and new business models. Shipping is a complex industry with long investment horizons, so a number of different ‘pioneering practices’ will need to be tested now to ensure resilience.

We believe that industry leaders need to:

- Create a shared vision of how the industry should develop over the next 30 years.
- Develop innovative business models that encourage long-term investment, and take into account social and environmental obligations.
- Prepare for greater scrutiny and demands from customers and society with regard to social and environmental performance.
- Build and convert ships to the highest standards of energy efficiency in anticipation of high and volatile fuel prices and demands for low-carbon performance.
- Support the development of coordinated, progressive legislation that rewards sustainability.

The second phase of the SSI will continue this process, producing a shared vision of an industry in 2040 that is resilient, socially and environmentally responsible, and profitable.

In the third phase, members will develop an action plan to future-proof the industry and guide a series of specific, practical innovation projects. This will set out what key players in every aspect of shipping need to do to achieve this vision. It may include technical and engineering initiatives, regulatory and policy proposals, and new models of finance and business.

Find out more:
www.forumforthefuture.org/projects/sustainable-shipping-initiative

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