The shipping industry has great changes ahead going from pollution to solution. In Norway the upheaval starts with batteries.
Along with the change comes challenge. A growing population and higher living standard come with a bigger footprint. The shipping sector is the embodiment of global trade. It is totally dependent on fossil fuels that hurt the climate, the environment and human health. Problems like ballast water, sewage, chemicals and pollutants also follow in the wake of the shipping industry.

At the same time, shipping is crucial to achieve the majority of the UN’s Sustainable Development Goals. So how can we solve these problems and decarbonize the fleet? There is no one answer to that question.

The technology optimist’s approach

The Bellona Foundation focuses on new technology, smart logistics and green harbors. The battery revolution hastened by electric cars is now hitting the maritime industry. Evidence can be found in Norway, onboard an electric ferry, a hybrid-electric fishing boat, a fjord sightseeing-boat and even supply ships. New contracts to build huge passenger ships with battery packages show that the green technology is a reality today.

250 million tons of fossil fuels must be replaced and I believe we must look to the ocean to find the biomass needed. This is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.

Reasons for optimism

Recent breakthrough in the IMO has made me optimistic about the future. In 2016 the IMO set a global limit for sulfur content in fuel oil to 0.5% - one of the most comprehensive global regulations of air pollutants ever. Both the Polar Code and the Ballast Water Management Convention will enter into force this year. This tells me it is possible to regulate international shipping.

So what’s next?

Though it is a part of everyone’s footprint, international shipping was not included in the Paris climate agreement. Neither is The Polar Code strict enough; it does not state an absolute prohibition of heavy fuel oil in the Arctic. We also need a new convention for sustainable shipbreaking; The Hong Kong Convention has failed to improve the industry.

The regulations must be global and equal for all ships. Our challenge to the nations is to boost technology and make sustainable energy available.

We need to take the ocean into use - with care.

The technology optimist’s approach

The Bellona Foundation focuses on new technology, smart logistics and green harbors. The battery revolution hastened by electric cars is now hitting the maritime industry. Evidence can be found in Norway, onboard an electric ferry, a hybrid-electric fishing boat, a fjord sightseeing-boat and even supply ships. New contracts to build huge passenger ships with battery packages show that the green technology is a reality today.

250 million tons of fossil fuels must be replaced and I believe we must look to the ocean to find the biomass needed. This is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.

Reasons for optimism

Recent breakthrough in the IMO has made me optimistic about the future. In 2016 the IMO set a global limit for sulfur content in fuel oil to 0.5% - one of the most comprehensive global regulations of air pollutants ever. Both the Polar Code and the Ballast Water Management Convention will enter into force this year. This tells me it is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.

Reasons for optimism

Recent breakthrough in the IMO has made me optimistic about the future. In 2016 the IMO set a global limit for sulfur content in fuel oil to 0.5% - one of the most comprehensive global regulations of air pollutants ever. Both the Polar Code and the Ballast Water Management Convention will enter into force this year. This tells me it is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.

Reasons for optimism

Recent breakthrough in the IMO has made me optimistic about the future. In 2016 the IMO set a global limit for sulfur content in fuel oil to 0.5% - one of the most comprehensive global regulations of air pollutants ever. Both the Polar Code and the Ballast Water Management Convention will enter into force this year. This tells me it is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.

Reasons for optimism

Recent breakthrough in the IMO has made me optimistic about the future. In 2016 the IMO set a global limit for sulfur content in fuel oil to 0.5% - one of the most comprehensive global regulations of air pollutants ever. Both the Polar Code and the Ballast Water Management Convention will enter into force this year. This tells me it is not only a challenge - it also contains great opportunities!

Within the next two years we will see a combination of electric propulsion and autonomous operation for short sea shipping vessels.

Renewable energy prices are rapidly declining, and the ships of tomorrow will be using multiple sources of energy, like batteries, hydrogen fuel-cells, LNG and biofuel.
Contents

6 ELECTRIC SHIPS
The electric maritime revolution

11 NOR-SHIPPING
NorShipping’s green director

16 OCEAN PLASTIC
Oceans of plastic

23 SHIPBREAKING
The dark side of shipping

28 CRUISE TOURISM
How to save the fjords

36 FISH FARMING
Vessels go electric

38 SHORE POWER
Making the harbor a green juncture

41 HEAVY FUEL OIL
Say no to HFO in the Arctic

42 SALMON FREIGHT:
From wheel to keel
There has been a rapid development in the Norwegian battery industry that sends electrical impulses through the whole of the shipping industry.

**Battery beats**

_The decline, he says, was in the zeitgeist of greener technology and political will. It also forced the innovators and engineers from the oil sector into greener markets._

**FLEET** You might say that January 2015 marks the start. That’s when the world’s first full-electric ferry “Ampere” was set into business in the Sognefjord in western Norway. With 34 departures daily, “Ampere” can charge her batteries on each side of the fjord. The Norwegian Public Roads Administration has received a lot of credit for demanding “Ampere” to be a zero emission vessel. Not only did their demand give developers motivation, it also gave them a market.

In the aftermath of “Ampere”, the county authorities have followed the success and ordered no less than 20 electric ferries. The goal is 50 electrical ferries in operation by 2021. Jan Kjetil Paulsen believes that the maritime industry is ready for new solutions.

“Batteries are well suited for shorter distances, such as fjord cruising and in and out of the harbor. For longer journeys, we must find other energy carriers. Hydrogen can be one of the solutions”, Paulsen says.

**DEVELOPMENT** “Norway is the center of the world in terms of development in the market”, says Erik Lassen, owner of boat manufacturers company Sella AS.

He is also the initiator of bringing the Canadian battery factory PBES to Trondheim. The battery factory has gone from 4 to 40 employees in less than one year and has an estimated turnover of 200 million kroner’s. Another 30 people are being hired this year, the company can reveal.

With Rolls Roys, ABB, Siemens, Norwegian University of Science and Technology and PBES assembled in the same region, the battery industry not only boosts its own cells, but also local subcontractors. Examples of that are the companies Tromek and Noca, who deliver battery racks and circuit boards. They are, seeing a growing local market. “The Norwegian maritime sector has always been at the forefront of technology and development. Until now, ferries have been in focus, the next will be faster passenger boats”, says Lassen.

“Good news for the environment, but does it pay off economically?” “Yes! Not only is electricity much cheaper than diesel, there are also much lower maintenance costs on the boats. There are, among other things, less vibration and less soot. The quality of the product is therefore far better over time”, says Lassen.

**INDUSTRY** The latest battery news came in the beginning of May 2017, when Siemens revealed that they would develop and manufacture battery systems...
**VIGNETTE VIGNETTE**

**Electric ships**

Batteries are indeed the future.

Pioneer boats, such as Ampere, have proved that.

Moen believes that their products. So far, Siemens has delivery in the market will create better solutions for the industry.

This means that the Norwegian maritime cluster, as of today, is the most dynamic and most complete in the market”, says Odd Moen in Siemens.

He believes that more competition in the market will create better solutions for the industry and better products. So far, Siemens has delivered solutions to 30 boats. Moen believes that their pioneer boats, such as Ampere, have proved that batteries are indeed the future.

“At this point we have to make sure that the industry move further and that we take advantage of all of the opportunities we can get, so that the maritime sector of Norway keeps its position as competitive”, he says.

**Vision of the fjords**

**Hurtigruten’s hybrid ship**

- **Owner**: Hurtigruten AS, developed by Rolls Royce and Bellona
- **Construction yard**: Kleven yard
- **Timeframe**: Put into operation July 2018
- **Sail**: Hurtigruten’s new hybrid ships will sail in cool polar waters, and will switch to electrical operation as they sail through vulnerable areas.

In total, these ships will contribute to 20 percent less emission, and become a milestone regarding battery solutions on large ships. Overall, it is estimated that the two vessels reduce emissions by 6400 tons of CO₂ each year.

**Color Line’s new hybrid ship**

- **Owner**: Color Line
- **Construction yard**: Ulstein Shipyards
- **Timeframe**: Put into operation in the summer of 2019

The stretch between Sandefjord and Strömstad will never be the same after the summer of 2019. By then the world’s largest hybrid ships will be on route, ensuring 2000 passengers and 500 cars to go on an environmentally friendly holiday in their neighboring country. The ferry will be charged with renewable electricity from its own landing facility, including an on-board generator.

**Electric ships**

The ship will accommodate 530 passengers and it will take the shipping industry a great leap towards being sustainable and battery-powered.

“Sustainability is the core of every detail of the ship and the on board operation. The hybrid engines will reduce fuel consumption substantially and allow for periods of completely emission free sailing”, Skjeldam says.

**The guests care about sustainability and the Industry should too**

**Daniel Skjeldam**

CEO of Hurtigruten

“MS Roald Amundsen” will be a perfect match to the fast growing global demand for sustainable adventure travel. The guests care about sustainability and the industry should too, says Daniel Skjeldam, CEO of Hurtigruten.

**The future**

In other words: Things are moving fast. In 2015 Bellona and Siemens published a feasibility study showing that seven out of ten ferries along the Norwegian coastline would be profitable with electrical operation. Most of the ferries that were suggested built as hybrids two years ago, can now be made fully electric.

Big Norwegian yards such as Kleven, Ulstein, Fiskarstrand and Havyard are all building boats with battery solutions.

“The maritime sector enjoys benefits from the huge changes in the automotive industry, and will continue to develop in a rapid pace”, says Jan Kjetil Paulsen.

Modern battery solutions mean you can use renewable energy in a wide range of areas where it has not been possible before.

“But to get there, the authorities need to spend more money on infrastructure and make green requirements when granting concessions”. 
IN IT FOR THE CHANGE: Birgit Liodden set sustainability work as a term when becoming Director of Nor-Shipping.

“The rapid change of shipping requires us all to think differently”

Director of Nor-Shipping, Birgit Liodden, is entering the board of the Bellona Foundation.

BY: ANNE FOUGNER HELSETH

A high school dropout who stumbled into shipping by chance, Nor-Shipping Director Birgit Liodden has always stood out in the industry.

When awarded the Wista Leadership Award, she was named “A spokesperson for the new shipping generation”. This new shipping generation, in Liodden’s view, should be nothing but green.

“I’m in it for creating change towards a sustainable maritime industry that people can be proud of,” Liodden says, explaining why she negotiated a sustainability mandate when offered the position as Director of Nor-Shipping.

Cluster potential
Liodden believes that the maritime industry can draw from its entrepreneurial mindset.

“A number of interesting alliances and initiatives are now being formed around our industry,” she says.

In the Disruptive Sustainability Hall at Nor-Shipping you’ll find anything from a cleantech cluster to LNG alliances and a digital transformation platform.

“It’s of key importance to realize the potentials held by digital transformation. Any established corporation needs to appreciate the supplements from new entrepreneurial actors, as the rapid change of shipping requires us all to think differently”,

Sustainability as business
Liodden is a firm believer in sustainability as hard core business.

“I believe that we need to optimize the silo-crushing cooperation between NGOs and business,” she says.

With that viewpoint, she should fit right in when now entering the board of Bellona, with its track record of developing financially viable environmental solutions in conjunction with the industry.

“Bellona has been a frontrunner on understanding that you can create change through partnerships, and that guiding corporations in pragmatic ways built on a business mindset works better than just pointing fingers at them,” Liodden says.

Walking not talking
She strongly believes in the potential and will of the maritime industry, yet is not afraid to point out how “greenwashing” and hype terms make the work harder for the actual pioneers.

“The rapid change of shipping requires us all to think differently”

IN IT FOR THE CHANGE: Birgit Liodden set sustainability work as a term when becoming Director of Nor-Shipping.
Trillions of tiny plastic particles have become unwelcome ingredients in the marine food chain. Bellona joins scientists in three countries to study the effects of micro plastics on cod in Norwegian coastal waters.

Text: Marianne Alfsen/Felix Media
The four-year PlastiCod project – “plastic-in-cod” – will study what happens when cod in Norwegian coastal waters digest micro plastics.

HAZARDOUS SUBSTANCES: “Micro plastics in itself is not necessarily a hazard to cod health, or human health for that matter. We use plastics in tooth fillings, for instance. However, micro plastics are highly fat-soluble and are known to absorb hazardous substances, such as PCB and dioxins,” explains Karlsson-Drangsholt.

In 2016, the PlastiCod partners placed small bags of micro plastics in nine locations along the entire Norwegian coastline, to find out which and how much hazardous contaminants it absorbs.

This year, the scientists will mix the naturally contaminated micro plastics into feed pellets, and feed it to farmed brood stock cod – to study how micro plastics and contaminants affect digestion, health, reproduction and also roe and larvae development, and ultimately if it can cause decreasing stocks.

The project will also study cod larvae and their food, zooplankton, to find how micro plastics affect the cod food chain.

OF INTERNATIONAL IMPORTANCE: “This project will provide new knowledge about how micro plastics affect food quality, which is an important word in this context,” adds Andre Sture Bogevik, researcher at Nofima and head of the PlastiCod project. The results may also provide valuable insight into how micro plastics affect other marine species, that are dependant on similar food chains.

“In order to fix a problem, we need to find out if there is one, and how big it potentially can become. Only then, will we be able to invest our resources in the right place”, adds Anders Karlsson-Drangsholt in Bellona.
Captain Climate

“It gives me much pleasure to be in areas where the sea is clean. It’s a reminder of what we are fighting for,” says Bellona manager Frederic Hauge.

Do I find peace at sea? Yes, especially in a storm from hell,” the 51-year-old Frederic Hauge laughs.

Sipping a cup of coffee, he looks out toward the dock at Bygdøy in Oslo, where the Bellona’s Kallinika is moored. It smells of the sea and engine oil in the hot spring sun.

“No, at the sea I find the extremes. It’s the world’s most harmonious place when it’s calm, but when it breaks out, it’s total chaos,” he smiles.

The glance reveals an experienced sailor: Even at port in the Oslo Fjord, Bellona’s leader sees the horizon far ahead. He sees opportunities for cooperation. He games out politics and detects environmental crime. He can smell a storm from afar, and truth be told, it’s often he who sets them off. And he uses his sailor’s wits to navigate the swells of the media like the swells of the sea.

Foundation and victory
Frederic was 12 years when he decided to fight for nature. Aboard his uncle’s fishing boat in Lofoten, he was overwhelmed. Nature. Birdlife, colors, the precipitous mountains. The abundance of life in the air, on land and at sea. Lofoten made an indelible impression. But the breathtaking panorama also inspired uneasiness. The battle for the Alta waterways has been lost and the Ekofisk field was about to shackle Norway to the fortunes of the oil industry.

Frederic enrolled in Nature and Youth as a teenager, and not long after found himself in Jøssingfjord standing off against the Titania mining company, which was fouling the Fjord, in only a rubber dingy. The activists were worried mining chemicals would drift out of the fjord and lead to wider contamination. They fought for 11 years, and Titania’s waste was finally put in landfills. Halfway through the battle, Hauge founded Bellona in 1986.

“Having a boat allowed us to be in the field, and very often things look very different in the field than they do in reports,” says Frederic.

All through the Titania case, researchers claimed there was no current in the fjord strong enough to carry mining waste further afield. But local fishermen said that, often enough, they would lose nets to the currents. As it turned out, the researchers’ measuring instruments were clogged with sludge.

“To have a boat is to be able to be present. It has given us a unique way to build networks. Kallinika is a floating district office,” smiles Frederic.

Today, Bellona has a staff of 48 throughout offices in Oslo, Brussels, Murmansk and St. Petersburg. In addition, Bellona is co-owner of several companies working for environmental solutions.

The power of the example
Frederic learned early that you couldn’t solve the world’s environmental problems by railing against...
"Having a boat allowed us to be in the field, and very often things look very different in the field than they do in reports."

FREDERIC HAUGE
DIRECTOR OF BELLONA

BELLONA’S BOATS

M/S BELLONA
The first Bellona boat M/S Bellona joined the journey from Moss to Kristiansand to drive relationship building and to research the environmental situation along the coast. This was in 1986, and onboard were both divers and sampling equipment. When she arrived at Kristiansand, the engine quit, and the environmentalists received support from the business community to repair her.

M/S GENIUS
Boat number two, M/S Genius, was put into operation in 1990 and immediately sailed to the Novaja Semlja, where the Soviet Union carried out nuclear testing only 90 km from Norway. Bellona’s protest drew attention to the problem.

M/S KALLINIKA
The ink was hardly dry on the M/S Kallinika, before she was sailed up to Røst in Lofoten. This was in 2001 and Bellona protested against Hydro’s exploration drilling in the northern areas. As a result, all activities were postponed pending the management plan for Lofoten and the Barents Sea. There has been no drilling in the Lofoten area ever since.

growth and development. Instead, Bellona found that working with businesses led to better solutions. Soon, companies like Statoil, Shell and Lerøy were contacting Bellona to ask for help. It is extremely motivating and, not the least, cool to see that it is no longer just the big companies that invent new things. Access to knowledge means that many more can participate and innovate. There is a lot of competence to be found in Norway.

"Would you say that you are optimistic that Norway will be a low-carbon society?"

"Yes, in many areas. But today we do not have the political understanding of what measures will be taken. There is a reason why we spend more time with business than with politicians. But at the same time we depend on politicians who dare to declare the extent of the challenge – and who take the time to get into the fact sheets when making solutions," says Hauge.

"Why does Bellona work so much with the maritime and marine sectors?"

"Because it is one of the places where we can, by the power of example, create a precedent that matters. If Norway is very good at organic carrot cultivation, it may not be the world’s hottest trend. But what Norway does on maritime industry, it sets a trend," says Hauge.

"It’s also an area where there is an opportunity for great value creation. It’s 12 years to 2030. There may be 20,000-25,000 boats that need to be rebuilt to reduce their carbon footprint, and that represents a huge opportunity for the Norwegian shipbuilding industry. This sector has the capacity to do great things."

An ongoing struggle

At seventy-nine-feet, and with two masts and a hull of rolled and welded carbon steel, Bellona’s boat, the Kallinika, is built on an idea that she will always return home. On her maiden voyage in 2001, she helped to stop exploration drilling outside Røst in Lofoten. This gives Hauge something to be proud of.

"When Frederic is at sea, he changes character and lowers his shoulders in a completely different way than he does elsewhere," says the Kallinika’s second in command, Sigurd Enge.

Perhaps it’s the isolation of being at sea. Maybe it’s the lack of cell phone coverage. Or maybe its the golden opportunity to fish. Probably a combination.

"I usually have a schedule when I get on the boat, and I like to stick to that schedule," says Sigurd.

"Frederic, on the other hand, would rather fish. It is his golden opportunity to fish. Probably a combination."

When Frederic is at sea, he changes character and lowers his shoulders in a completely different way than he does elsewhere, says Sigurd.

"I’m a little afraid it has already started. You do not mess with the Gulf Stream. Just that, I really want to say to Prime Minister Erna: You do not mess with the Gulf Stream."

"And then there’s the whole debate about the Gulf Stream and what happens if we actually endanger it. I’m a little afraid it has already started. You do not mess with it, but so incredibly devastating if we manage to live in balance with it."

At seventy-nine-feet, and with two masts and a hull of rolled and welded carbon steel, Bellona’s boat, the Kallinika, is built on an idea that she will always return home. On her maiden voyage in 2001, she helped to stop exploration drilling outside Røst in Lofoten. This gives Hauge something to be proud of.

"When Frederic is at sea, he changes character and lowers his shoulders in a completely different way than he does elsewhere," says Sigurd.

"I usually have a schedule when I get on the boat, and I like to stick to that schedule," says Sigurd.

"Frederic, on the other hand, would rather fish. It is his golden opportunity to fish. Probably a combination."

When Frederic is at sea, he changes character and lowers his shoulders in a completely different way than he does elsewhere, says Sigurd.

"I’m a little afraid it has already started. You do not mess with the Gulf Stream. Just that, I really want to say to Prime Minister Erna: You do not mess with the Gulf Stream."

This comes extremely clear at sea. The world is beautiful and harmonious if we manage to live in balance with it, but so incredibly devastating if we mess with it. Heaven and hell. Frederic steers towards the first.

- It just has to work. Failure is no option.
128 ships were scrapped on South Asian beaches during the first quarter of 2017. Norwegian shipping and investment companies are taking the lead to change the dangerous and environmentally hazardous practice.

**THE IMAGE IS WELL KNOWN:** workers, some of them just children, with minimal protection and only pennies on their pay check, rip massive ships apart with their bare hands on Asian beaches.

The shipbreaking beach yards in Alang in India, Gadani in Pakistan and Chittagong in Bangladesh have earned the title of the world’s most dangerous working places. In the first quarter of 2017 alone, at least 11 workers paid with their lives. Five of them died in a fire at the Gadani shipbreaking yard. Others were crushed by falling equipment and steel plates, according to NGO Shipbreaking Platform.

In addition the lack of adequate recycling and waste handling practices causes massive environmental and health damage.

“Beaching of ships for scrapping is the ugly and dark side of the shipping industry,” says shipping adviser Sigurd Enge in Bellona.

A common practice among ship owners is to conceal the identity of the vessel and sell it to ship breaking yards via middlemen, known as “cash buyers” – in an attempt to protect their reputation.

**BLIND ALLEY**  » Most ships destined for scrapping are beached – 668 of a total of 862 in 2016 – as efforts to create international regulations have failed miserably.

Only six countries have ratified the 2009 IMO Hong Kong Convention that set standards for safe and environmentally sound ship recycling. To be implemented, 15 countries holding 40% of the world fleet and the major shipbreaking countries must ratify, which is not expected to happen any time soon.

“The Convention is nothing but a blind alley. It does not address down stream waste management, labour rights or environmental justice. It does not even ban beaching, overlooking the obvious, that a beach is not suitable for hazardous, high-risk industrial activity,” says Sigurd Enge.

**DUBIOUS COMPLIANCE**  » Danish investigative journalists have revealed precarious conditions at a yard that has received a Statement of Compliance with the Hong Kong Convention. “That should prompt serious questions as to whether the Convention is equipped to ensure safe and environmentally sound ship recycling,” agrees Ingvild Jenssen, Director and Founder of the NGO Shipbreaking Platform in Brussels, where Bellona is one of the members.

“The fact that scrap dealers specialized in trafficking waste ships to the worst yards are the strongest proponents of the Convention, should also prompt concerns,” she continues.

Cash buyers use flags such as Comoros, Niue and Palau, known for their anonymous post-box companies and poor implementation of international maritime law, to avoid accountability.

“Who believes that the worst performing flags and cash buyers benefitting from the worst shipbreaking conditions will ensure improvements?” asks Jenssen.

128 ships were scrapped on South Asian beaches during the first quarter of 2017. Norwegian shipping and investment companies are taking the lead to change the dangerous and environmentally hazardous practice.
“Ship owners have been aware of the detrimental effects of breaking ships on tidal beaches for more than 20 years. Yet the ease, with which existing environmental laws can be circumvented for the sake of the extra profit, allows the worst practices to persist,” continues the Director of NGO Shipbreaking Platform.

The EU has banned beaching of all EU–flagged ships and is currently making a list of approved ship recycling yards globally. China, the United States and Japan have also banned beaching as a method. But local and regional rules are easily flagged around, particularly as the industry has fallen on hard times.

European companies accounted for half of the vessels beached in South Asia the first quarter of 2017 and where involved in many of the fatal accidents.

For many years, the company has had strict policies on ship recycling that go far beyond the Hong Kong Convention. However, Grieg Star has bigger ambitions than just tending to their own backyard.

The shipping industry is facing a tough market, so “we simply want to be a responsible business,” says Eli K. Vassenden, COO for Ship Management in Grieg Star.

Grieg Star established Grieg Green, a subsidiary designed to help clean up the industry’s shady shipbreaking practices. Grieg Green acts as a green middleman, buying ships destined for scrapping at competitive prices, reselling them to yards with sound recycling practices.

Grieg Green has contributed enormously by proving their methods and standards,” says Vassenden.

The easiest would be to simply remove the companies that beach ships for recycling from our portfolio, but we want to do more. We want to contribute to change,” says Bersagel, who agrees that the industry must take the lead, as the international community fails to agree on common regulations.

“The shipping industry is facing a tough market, but Vassenden does not fear a backlash to the proactive business, we need international regulations that are impossible to flag around.”

To change the entire business, we need international regulations that are impossible to flag around.

“Tide Carrier” (now named “Harriet”) formerly owned by the Norwegian company Eide Marine Eiendom AS, was arrested in April as it attempted to leave the country for beaching and scrapping at the Gadani yard in Pakistan. The ship was sold to Julia Shipping Inc and Nabeel Ship Management LTD is the current operator.

“The operator claimed that the ship was on its way to Oman for repair, but the authorities uncovered that the ship has a one-way “Break Up Voyage” insurance policy,” says the Norwegian Environment Agency.

“The operator claimed that the ship was on its way to Oman for repair, but the authorities uncovered that the ship has a one-way “Break Up Voyage” insurance policy.”

Ship arrested in Norway

A tipoff from Bellona and NGO Shipbreaking Platform led to the first ever arrest by Norwegian authorities of a ship destined for beaching.

“Grieg Star. To change the entire business, we need international regulations that are impossible to flag around.

To change the entire business, we need international regulations that are impossible to flag around.

The easiest would be to simply remove the companies that beach ships for recycling from our portfolio, but we want to do more. We want to contribute to change,” says Bersagel, who agrees that the industry must take the lead, as the international community fails to agree on common regulations.

“Grieg Star will continue to climb the barricades as often as we can,” she continues.

The shipping industry is facing a tough market, but Vassenden does not fear a backlash to the progress that – after all – has been made.

There is an unprecedented focus and will, a result of increasing pressure from for instance NGOs. We are not the only ones who want to act responsibly,” says Vassenden.

The basis for the arrest is the 1992 Basel Convention, controlling the movement of hazardous waste across international borders.

This ship is waste and has also has waste on board. It will not be allowed to sail until we are sure the ship will not be scrapped illegally, and that all waste will be treated properly,” states the Agency’s Director General, Ellen Hambro.
EXPLORE NEW FRONTIERS

With 125 years as Polar Pioneers, exploring is part of our DNA. Honoring our strong Norwegian explorer heritage, our new ships will be named MS Roald Amundsen and MS Fridtjof Nansen. We are building the safest, greenest and most advanced cruise ships the world has ever seen. Because our Planet deserves nothing less.

LEAN PROPULSION DESIGN

The Schooner Opal may look old, but she uses groundbreaking technology for propulsion. A fully charged battery provides enough power for a full day of operation. The regenerative system is designed so that in certain conditions when sailing, the propeller blades can be adjusted and used to generate energy for the batteries. The electric driveline is silent and allows for close encounters with nature, without unnecessary disturbance. Welcome aboard!
The future of the fjords

This summer, more cruise tourists than ever will visit Norwegian fjords. To make the World Heritage fjords zero-emission, is not only a necessity, it is a business opportunity.

TEXT: MARITANNE ALFSEN, FELIX MEDIA

IT IS A CLEAR SUMMER DAY, the skies are deep blue, but in the World Heritage listed Geirangerfjord, the fumes from the cruise ships, sightseeing boats, ferries and other fossil-powered vessels visibly cloud the spectacular views; steep and snow capped mountains, shooting straight up from the dark, deep waters of the narrow fjord – described by UNESCO as “among the most scenically outstanding landscapes in the world”.

However, there is a fly in the ointment: “Smog filled fjords has become an all too common scenario. It is time we make our World Heritage fjords zero-emission, and recognize that it is a business opportunity,” says senior shipping adviser Jan Kjetil Paulsen in Bellona.

WHEN IT ALL BEGAN • There are hundreds of fjords along the coast of Norway. Two fjords of particularly pristine beauty and natural importance, including the surrounding mountain landscapes, were awarded World Heritage status in 2005: The West Norwegian Fjords of Nærøyfjord north of Bergen, and the Geirangerfjord a bit further north. Since, tourism has soared.

This summer, record breaking numbers of cruise tourists will head for Norway – more than 3 million in total, a 13 % increase since last year. In Geiranger alone, where the population numbers a mere 238 souls, the number of cruise passengers has increased from 140,000 in 2006, to an estimated 310,000 in 2017. On the busiest days, more than 10,000 people come ashore. About 200 cruise ships are expected to pass through the Geirangerfjord this summer.

“Gold mine in the fjords” and similar enthusiastic headlines have dominated the news the past decade. “Almost everyone has cheered the development, turning a blind eye to the fact that the financial upside has an environmental downside,” says Paulsen.

FREE-FOR-ALL • Today, there are no restrictions on the number of cruise ships that can enter the World Heritage fjords, nor any particular environmental requirements – be it cruise ships or local vessels – apart from general IMO and EU regulations.

At the beginning of May 2017, The Norwegian Maritime Authority presented a new report on the impact of cruise ships visiting World Heritage fjords. “Surprisingly, hardly any cruise ships discharged sewage into the fjord, even though they can. NOx emissions, however, represent a real challenge,” confirms Bjørn Pedersen, Head of the Department of Legislation and International.

The report states that NOx emissions in the World Heritage fjords at times reach levels that are hazardous to health, and that the combination of NOx, soot particles and water vapour often cause clouds of smoke.

The report also shows that more than half of the cruise ships visiting Geirangerfjord and Nærøyfjord discharge NOx emissions at levels far above the WHO guidelines.

SILENT TOURISM: The hybrid plug-in catamaran “Vision of The Fjords” mimics the winding mountain roads in the area. When going electric, it is silent and emission-free.

PHOTO: THE FJORDS ELSE
are more than 20 years old, and thus not even bound by the latest international NOx emissions limits from 2000.

“We can absolutely control what type of vessels we want in our fjords, and it is fair to expect that it will be done,” says Pedersen, suggesting that the cruise report might prove a step in the right direction.

The report suggests several measures, such as regulating the number of ship calls, cruise ship size, and NOx emission levels allowed.

PROFITS FIRST - “So far, however, local business and labour interests seem to have trumped any other concerns,” comments Jan Kjetil Paulsen in Bellona. “Since we don’t make any requirements, we get what we get. If we continue in this way the ones who do, such as California and Alaska, will get the greenest cruise ships in the market, while we are stuck with the rest.”

However, local zero-emission believers have begun to raise their voices – and see the business potential in going green.

One of them is Arne Sandnes, Mayor of the municipality of Norddal, one of two municipalities in the World Heritage Geirangerfjord area.

“Awareness is on the increase, but hardly any tangible measures have been implemented. This is one of the reasons why we propose a green harbour in Valdå,” says Sandnes.

The Mayor’s idea is to build a large harbour, where cruise ships can connect to renewable shore power, instead of running their diesel engines while anchored in the fjords. Tourists will be transported to the surrounding World Heritage area by local electric vessels.

His vision includes hydroelectric power plants, ferries and other local means of transport.

IDEAL LOCATION - Valdå is outside the defined boundary of the World Heritage area, the fjord is deep and – most importantly – there is abundant renewable energy available from the hydro power plant at Tafjord, further into the fjord. The high voltage line passes only one kilometre from the proposed harbour.

“This makes shore based power technically and financially feasible. The estimated cost is in the neighbourhood of 100 million NOK, a fraction of what it will cost elsewhere in the area.”

Bellona supports the idea of green harbours as a basis for developing zero-emission transport and new business opportunities in the World Heritage area – proposing an environmental triangle, with green harbours at Valdå, Stranda and Hellesylt.

“National authorities must facilitate the power infrastructure,” emphasises Jan Kjetil Paulsen.

The Mayor in the municipality of Norddal agrees.

“We are not able to shoulder the infrastructure cost alone,” Sandnes says, adding that national and regional authorities have a vested interest in the protection of the World Heritage fjords.

“We have, as a nation, committed to protecting the UNESCO listed fjords. If we fail, we may lose our World Heritage status. That would be an incredible tragedy for Norway as a whole,” he continues.

INNOVATION NECESSARY - Infrastructure is an important piece of the puzzle, as is vessel innovation. In the Nærøyfjord area further south, regional entrepreneurs have collaborated to build the worlds first hybrid plug-in carbon fibre catamaran, specially designed for sightseeing in Norwegian fjords.

Since the summer of 2016, Vision of The Fjords has ferried passengers from the tourist hub of Flåm and into the spectacularly narrow Nærøyfjord.

“We wanted to take the lead and show what is possible,” says CEO Rolf A. Sandvik in The Fjords DA, who commissioned the Brødrene Aa yard to build the innovative vessel in 2015.

Back then, battery technology did not support the vessel size, and the developers chose hybrid technology. When the catamaran reaches Nærøyfjord, it switches to electric power, and sails silently and emission-free into the World Heritage area.

“When building a boat that will carry passengers into a vulnerable area for the next decades, there is no alternative but to commission something environmentally friendly. If Norway is to live up to its tourism motto: ‘Power by nature’, the local transport system in our World Heritage fjords must become 100% zero-emission,” says Sandvik. The Fjords DA currently operates eight sightseeing vessels in Nærøy and Geiranger. Battery technology is constantly improving, and the next vessel they will commission will hopefully be 100% emission-free.

Vision of The Fjords cost approximately 100 million NOK to develop. In addition comes charging infrastructure on shore, also developed and financed by The Fjords DA. Still, the owners are convinced it will pay off. However, Sandvik finds it hard to accept that neither local nor national authorities offered any financial or regulatory incentives to even the playing field and speed up the necessary change.

“Few have the financial muscles to do what we did,” he says, adding that serious actors in the Cruise industry have embraced the Vision of The Fjords in their land programmes, proving that zero-emission...
Electric Arctic adventures

The schooner “Opal” might look old, but it is fitted with state of the art electric propulsion technology.

Silently, “Opal” brings tourists whale watching, northern lights spotting and skiing in remote Arctic landscapes.

“Opal”, owned by North Sailing, is the world’s first plug-in hybrid regenerating sail ship. The silent technology allows for closer and less disturbing encounters with the marine giants. Combined with substantial emission cuts, “Opal” takes a big step towards more sustainable operation in the fragile Arctic.

The unique electric propulsion system was developed in cooperation with Bellona and several other partners in the innovative Rensea project. The ship charges with shore power during the night, which provides enough power to run day-tours on batteries only.

“Tourists in general are increasingly aware of the climate and environmental footprint they leave behind, and thus we are convinced that the demand for environmentally friendly alternatives will continue to increase”, says Agnes Árnadóttir, who runs the Norwegian branch of the family owned Icelandic company.

The new and improved “Opal” first set sails in July 2015. Since, North Sailing has installed the hybrid-electric propulsion system in a second boat. Their aim is to make their entire fleet zero-emission.
The world is facing huge challenges related to emissions from fossil fuel. The cost of energy is high, especially in terms of negative environmental impact. More than ever green technology is needed.

Green Technology of Norway (GToN) is a collaboration between four Norwegian companies with a vision to make a huge difference in energy utilization. Only 30 - 48% of the energy produced on board a ship normally is used efficiently. 40 - 75% of the waste energy can easily be utilized.

Together we offer technology that utilizes waste energy from cooling and exhaust systems, used for a variety of purposes to enable substantial fuel and cost savings to be made, in addition to the major environmental benefits.

By joining forces - optimizing interfaced systems, we take energy efficiency to a new level.

Make the future

...with LNG. The cleaner burning fuel. Proven and reliable. LNG - fit for future and stricter regulations.

ANNONSE
Aquaculture goes electric

This summer, the world’s first fully electric fish farm service vessel will be launched in Norway. The vessel is the brainchild of 81-year-old Arnold K. Hansen.

If all the approximately 450 fish farm locations in Norway replace one of their diesel powered service vessels with an electric vessel, emissions from the aquaculture industry will be cut by 43,000 tonnes CO₂ annually – the equivalent of more than 16,000 cars – and 436 tonnes of NOₓ.

“But it was actually concern for people’s health that spurred the idea, the fear that breathing in the diesel fumes could cause cancer,” says Arnold K. Hansen.

In 2003, Hansen and his son took over the family business, Grovfjord mekaniske verksted, a few miles into the fjords from the Northern Norwegian town of Harstad. Since 1919, the company had specialized in boat repairs. Father and son developed Grovfjord into a shipyard, specializing in building light aluminium vessels for the ever-growing aquaculture industry.

From utopia to reality ›

When the planning started in 2012, a fully electric zero-emission service vessel was still utopia. Battery technology was nowhere near the necessary capacity or size. The first ideas thus revolved around hybrid technology. In the wake of the electric car revolution in Norway, battery technology evolved faster than anyone had envisaged.

“Thus we could go for a 100 % battery electric and zero-emission solution,” says Hansen, who has collaborated with local scientists to develop the vessel.

But there were additional stumbling blocks: innovation was moving faster than the regulatory authorities. There was no regulatory framework for the certification of vessels up to 15 metres. Arnold K. Hansen did not have time to wait for the authorities to come around. He asked the classification company DNV GL to suggest a regulatory framework to the Norwegian Maritime Authority, who embraced the initiative.

“We pushed forward a regulatory framework that will benefit many,” says Hansen.

A growing market ›

Fish farms scatter the entire Norwegian coast. Some are close to populated parts of the coast, while others are situated in remote areas. Thus a flexible design was necessary.

“We hope to develop a standard vessel, but each vessel will probably have to be adapted to specific needs,” explains Hansen.

The so-called GMV Zero service vessel can be charged at its base and by the feeding barges on site, which in most places have shore power.

“With a rapid charger, it can be charged over lunch,” says Hansen.

Eventually, Grovfjord plans to deliver service vessels with six different battery capacities.

“We plan to build 12 vessels annually,” says Hansen, who does not expect to be alone in the electric service vessel market for long.

“Zero-emission is no doubt the future,” he adds.

The world’s first plug-in hybrid service vessel – “Elfrida”, built by another Norwegian yard: Ørnli Slipp – was launched in February this year, and is already hard at work for Salmar Farming.

Estimates suggest that the Norwegian aquaculture could increase fivefold by 2050. Hence, the potential market for innovative service vessels such as the GMV Zero is set to shoot through the roof.
The harbour as a renewable energy hub

The green harbours of the future can become clean energy hubs for both land and sea-based transport, particularly in bigger cities. The key is shore power.

**THERE ARE** 32 main ports in Norway, handling the transportation of goods along the more than 100,000 kilometre coastline. Bellona’s wet dream is that all of them, along with the 10 largest cruise harbours, will offer renewable shore power in the future.

“High infrastructure costs is a major obstacle,” says senior shipping adviser Jan Kjetil Paulsen in Bellona. But he knows a way around:

“To make shore power more financially feasible, we should widen the scope and think of harbours as clean energy hubs for both land and sea transport, providing multiple sources of green energy for all types of vessels and vehicles.”

**FACTS:** Potential emission cuts from cruise ships and cargo ships

- 660,000 tons of CO₂ (equal to 5% of emissions from the Norwegian car fleet)
- 679 tons of Particulate Matter (equal to 100% of emissions from the Norwegian car fleet)
- 37 tons of sulphur dioxide (equal to 100% of emissions from the Norwegian car fleet)
- 7072 tons of NOₓ (equal to 58% of emissions from the Norwegian car fleet)

Source: A 2016 study of shore power made by Bellona, Siemens, Nelfo and EFO
GOODS traffic 

Arctic shipping

As the sea ice melts, shipping activity increases in the Arctic. "It is time to say no to HFO," says the Norwegian shipping company Hurtigruten.

By: ellen viseth, Bellona

Heavy fuel oil is banned in the North Sea, the Baltic Sea and in the coastal areas of the US and Canada. Ironically, it is still allowed in the most vulnerable area: the Arctic.

About 44 percent of ships operating in the Arctic use heavy fuel oil (HFO).

The ships emit CO2, Sulphur and soot that accumulates on Arctic ice cover and accelerates ice melt. Increased shipping activity in the Arctic also raises the risk of a major oil spill.

Self-imposed ban

"The use of HFO has already been banned in the Antarctic, now it’s time to ban it in the Arctic as well," Hurtigruten CEO Daniel Skjeldam says.

Hurtigruten is the world leader in expedition travel, with 14 ships sailing from pole to pole. They are also operating the route along the rugged Norwegian coastline. Although they could, Hurtigruten has for years chosen not to use heavy fuel oil in any of its ships.

"An accident involving a mega ship and spill of heavy fuel oil in the Arctic would represent an environmental disaster. If HFO is spilled in cold Arctic waters, it will have larger consequences than anywhere else. The Arctic deserves sustainable growth and the industry needs to move first," says Skjeldam.

Companies push for HFO ban

This January he signed The Arctic Commitment on behalf of Hurtigruten, marking the start of a Ban HFO campaign. Later, the 23 companies in the Association of Arctic Cruise Operators also pledged not to use HFO in the Arctic.

The fact that more and more companies are swearing off HFO could become a lever of influence with the International Maritime Organization, hopes Sigurd Enge, Bellona’s manager for shipping and Arctic issues.

Hurtigruten goes hybrid

Enge urges ship owners to adopt regulations now; otherwise the shift to greener technology will take longer and be more expensive.

"Best available technologies, such as battery hybrid solutions, must be used in the Arctic. Yet, the very first step is to ban the dirtiest and cheapest fuel," adds Enge.

Hurtigruten is ready to meet the future with up to four hybrid powered expedition ships on order.

"The shipping industry must be a frontrunner in promoting regulations that will secure sustainable Arctic growth," Skjeldam says.

Joint call to ban heavy fuel oil

As the sea ice melts, shipping activity increases in the Arctic. "It is time to say no to HFO," says the Norwegian shipping company Hurtigruten.

Heavy fuel oil is banned in the North Sea, the Baltic Sea and in the coastal areas of the US and Canada. Ironically, it is still allowed in the most vulnerable area: the Arctic.

About 44 percent of ships operating in the Arctic use heavy fuel oil (HFO).

The ships emit CO2, Sulphur and soot that accumulates on Arctic ice cover and accelerates ice melt. Increased shipping activity in the Arctic also raises the risk of a major oil spill.

Self-imposed ban

"The use of HFO has already been banned in the Antarctic, now it’s time to ban it in the Arctic as well," Hurtigruten CEO Daniel Skjeldam says.

Hurtigruten is the world leader in expedition travel, with 14 ships sailing from pole to pole. They are also operating the route along the rugged Norwegian coastline. Although they could, Hurtigruten has for years chosen not to use heavy fuel oil in any of its ships.

"An accident involving a mega ship and spill of heavy fuel oil in the Arctic would represent an environmental disaster. If HFO is spilled in cold Arctic waters, it will have larger consequences than anywhere else. The Arctic deserves sustainable growth and the industry needs to move first," says Skjeldam.

Companies push for HFO ban

This January he signed The Arctic Commitment on behalf of Hurtigruten, marking the start of a Ban HFO campaign. Later, the 23 companies in the Association of Arctic Cruise Operators also pledged not to use HFO in the Arctic.

The fact that more and more companies are swearing off HFO could become a lever of influence with the International Maritime Organization, hopes Sigurd Enge, Bellona’s manager for shipping and Arctic issues.

Hurtigruten goes hybrid

Enge urges ship owners to adopt regulations now; otherwise the shift to greener technology will take longer and be more expensive.

"Best available technologies, such as battery hybrid solutions, must be used in the Arctic. Yet, the very first step is to ban the dirtiest and cheapest fuel," adds Enge.

Hurtigruten is ready to meet the future with up to four hybrid powered expedition ships on order.

"The shipping industry must be a frontrunner in promoting regulations that will secure sustainable Arctic growth," Skjeldam says.

Joint call to ban heavy fuel oil

As the sea ice melts, shipping activity increases in the Arctic. "It is time to say no to HFO," says the Norwegian shipping company Hurtigruten.

Heavy fuel oil is banned in the North Sea, the Baltic Sea and in the coastal areas of the US and Canada. Ironically, it is still allowed in the most vulnerable area: the Arctic.

About 44 percent of ships operating in the Arctic use heavy fuel oil (HFO).

The ships emit CO2, Sulphur and soot that accumulates on Arctic ice cover and accelerates ice melt. Increased shipping activity in the Arctic also raises the risk of a major oil spill.

Self-imposed ban

"The use of HFO has already been banned in the Antarctic, now it’s time to ban it in the Arctic as well," Hurtigruten CEO Daniel Skjeldam says.

Hurtigruten is the world leader in expedition travel, with 14 ships sailing from pole to pole. They are also operating the route along the rugged Norwegian coastline. Although they could, Hurtigruten has for years chosen not to use heavy fuel oil in any of its ships.

"An accident involving a mega ship and spill of heavy fuel oil in the Arctic would represent an environmental disaster. If HFO is spilled in cold Arctic waters, it will have larger consequences than anywhere else. The Arctic deserves sustainable growth and the industry needs to move first," says Skjeldam.

Companies push for HFO ban

This January he signed The Arctic Commitment on behalf of Hurtigruten, marking the start of a Ban HFO campaign. Later, the 23 companies in the Association of Arctic Cruise Operators also pledged not to use HFO in the Arctic.

The fact that more and more companies are swearing off HFO could become a lever of influence with the International Maritime Organization, hopes Sigurd Enge, Bellona’s manager for shipping and Arctic issues.

Hurtigruten goes hybrid

Enge urges ship owners to adopt regulations now; otherwise the shift to greener technology will take longer and be more expensive.

"Best available technologies, such as battery hybrid solutions, must be used in the Arctic. Yet, the very first step is to ban the dirtiest and cheapest fuel," adds Enge.

Hurtigruten is ready to meet the future with up to four hybrid powered expedition ships on order.

"The shipping industry must be a frontrunner in promoting regulations that will secure sustainable Arctic growth," Skjeldam says.
GOODS TRAFFIC

Taking salmon from wheel to keel

Ports from Nordmøre to Helgeland plan to export fresh seafood by boat to their largest market: Europe. This could eliminate CO₂ emissions from 13,000 refrigerator trucks filled with salmon each year.

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.

"We could remove 13,000 trailers a year.

Paul Ingvar Dekkerhus
Director of Ports in Nord-Trøndelag"

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.

"We could remove 13,000 trailers a year.

Paul Ingvar Dekkerhus
Director of Ports in Nord-Trøndelag"

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.

"We could remove 13,000 trailers a year.

Paul Ingvar Dekkerhus
Director of Ports in Nord-Trøndelag"

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.

"We could remove 13,000 trailers a year.

Paul Ingvar Dekkerhus
Director of Ports in Nord-Trøndelag"

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.

"We could remove 13,000 trailers a year.

Paul Ingvar Dekkerhus
Director of Ports in Nord-Trøndelag"

"In practice, fish farmers are key to make this happen. Trailer transport is easy with good logistics. It requires both reorganization of systems and routines to achieve the goal of shipping salmon by sea. With the production volumes we have in central Norway today, it is both desirable and possible to achieve this goal. The fish farmers must be aware of their responsibility. This is a triple win that saves money, the environment and lives," says Paulsen.
Our Vision:
By 2050 international shipping will be sustainable and carbon-neutral. Other emissions and effluents must be eliminated or be within the nature’s ability to assimilate.

Bellona works with the industry to develop technology, value chains and business models for a sustainable future.

1. Use batteries and zero emission solutions when You can - and bio fuel when You must
2. Show respect to our fjords: Nature and tourists don’t like smog
3. Polar Bears hate soot and sulphur:
   No heavy fuel oil in the Arctic
4. No diesel when docked:
   Install a shore power plug now
5. Ships must be sustainably recycled:
   Off the beach
6. Avoid stowaways:
   Never dump ballast water
7. Get the freight off the roads -
   Say yes to rails and sails!
8. Save fuel - save money:
   Think energy saving
9. The ocean is our common pantry:
   Choose the paint on your hull carefully
10. Plan your passage, arrive at the right time.
    Slow down if needed.
Eidesvik fikk 6 millioner – nå bytter de diesel med batteri

Vil du også redusere energibruken i dine skip? Vi kan hjelpe deg frem til målet om å kutte både driftskostnader og klimagassutslipp.

Enova kan bidra til å øke konkurransekraften for rederier ved å ta i bruk ny energi- og klimateknologi. En rekke bedrifter i næringen reduserer nå sine klimagassutslipp med støtte fra Enova. Du kan også bli en av disse.

Les mer om mulighetene for dine skip på enova.no, eller ring oss på telefon 952 98 000.