



SOA
SUSTAINABLE OCEAN ALLIANCE

State of Our Ocean

2019 EDITION

Davos, Switzerland

SOA Leadership

Daniela V. Fernandez, Founder & CEO,
Sustainable Ocean Alliance

Advisor and Editor

Nishan Degnarain

Scientific partner

Professor Doug McCauley,
University of California Santa Barbara

State of Our Ocean

2019 Edition

Davos, Switzerland

The *State of Our Ocean Inaugural Report 2019*
is Published by Sustainable Ocean Alliance.

About Sustainable Ocean Alliance

Sustainable Ocean Alliance (SOA) is a global non-profit organization that advances the impact of startups, social enterprises, and ocean leader initiatives, which are developing solutions to preserve the health and sustainability of our ocean. SOA's Ocean Leadership Program and Ocean Solutions Accelerator empower the next generation to become leaders and create a measurable impact on our ocean by providing them with education, resources, and opportunities to become an integral force of change.

Sustainable Ocean Alliance team

Daniela V. Fernandez – Founder and CEO

Craig Dudenhoeffer – Chief innovation officer

Michael Skinner – Chief operating officer

Brandon Levy – Program director

Kate Dos Santos – Events and communications manager

Alisa Futritski – Special projects coordinator

Audrey Reisdorffer – Marketing and strategy lead

Edited by

Nishan Degnarain

Additional edits by

Ben Hourigan

Graphics by

Lori Silva – Mt. Burdell Marketing

© 2019 – Copyright by Sustainable Ocean Alliance. All U.S. and international rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying and recording, or by any informational storage and retrieval system, without the express written consent of Sustainable Ocean Alliance.



SOA
SUSTAINABLE OCEAN ALLIANCE

Developing Leaders.
Cultivating Ideas.
Accelerating Solutions.

TABLE OF CONTENTS

01 PREFACE	04
02 EXECUTIVE SUMMARY	05
03 OCEAN RISKS DASHBOARD	08
04 MILESTONES AND INITIATIVES 2018	20
05 REGIONAL OCEAN THEMES	22
06 SOA VOICES FROM AROUND THE WORLD	30
07 OCEAN TECHNOLOGY STARTUPS	32
08 BREAKTHROUGHS IN OCEAN SCIENCE, TECHNOLOGY & EXPLORATION IN 2018	34
09 SPECIAL TRIBUTE	35
10 OCEAN PRIORITIES FOR 2019	36

1. PREFACE



The *State of Our Ocean* report comes at a time when the fate of our planet is at a crossroads. Last year, the Intergovernmental Panel on Climate Change (IPCC) warned us that limiting a drastic temperature increase to our atmosphere would require rapid, far-reaching, and unprecedented changes in all aspects of society. Simultaneously, plastic pollution is flooding our waterways, corals are bleaching at abnormal rates, and criminal activities at sea remain rampant. We require a fundamental and immediate transformation within our governing systems, businesses, and civil society if we, as the last generation capable of making significant strides in protecting our environment, are to rise to this challenge.

I founded Sustainable Ocean Alliance (SOA) to offer a new playbook that cultivates leadership and provides a support system to diverse minds that can develop innovative solutions to counter the perils facing humanity's greatest asset: our ocean. To answer this call, Sustainable Ocean Alliance (SOA) will accelerate 100 ocean technology companies by 2021, run a global accelerator program, expand its young leader network to represent every country on the planet, and have a young leader's voice present at key convenings of ocean leadership.

This inaugural *State of Our Ocean* report underscores the urgency with which we need to design new models for collaboration, invest in emerging technologies, and redesign outdated systems that we have inherited. This report has been generated with input from our Ocean Leaders and insights from ocean events over the past year such as *The Economist Group's* World Ocean Summit, the Our Ocean Conference in Bali, and the SOA Ocean Gala. SOA's Ocean Leaders are under 35 and represent the global population. They have shown their perspectives and views on where they see the need for greater progress at national and international levels.

We hope you join us on this journey to protect and sustain the health of our ocean.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Daniela V. Fernandez'.

Daniela V. Fernandez
Founder and CEO
Sustainable Ocean Alliance

2. EXECUTIVE SUMMARY

Welcome to Sustainable Ocean Alliance's inaugural *State of Our Ocean* report.

This is the first in what will become an annual publication series, which will highlight progress on ocean issues over the past year and identify ocean leadership priorities for the upcoming year. It has been compiled by ocean experts as well as by Sustainable Ocean Alliance community. Several important themes have been raised for world leaders to focus on for the next 12 months, reflecting on progress made over the past year:

Here is a rundown of some of the key issues highlighted by SOA members and ocean experts in this 2019 edition of the report:

Awareness raised on ocean issues in 2018

Awareness of ocean challenges heightened in 2018 through the first G7 Declaration on the Ocean, San Francisco's Global Climate Action Summit, Sustainable Development Goal 14, Norway's Blue Economy Panel, and climate negotiations at COP24.

However, there has been insufficient progress, and environmental challenges are increasing, in particular:

Climate change. The Intergovernmental Panel on Climate Change (IPCC) highlights we are on course for 2.7–3.7°C warming by 2100, which would make 99% of our coral reefs extinct, and we have only 12 years to act.

Overfishing. The Food and Agriculture Organization (FAO) states that we continue

to fish beyond sustainable yields.

Mass extinction. The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) has increased the number of marine species on the endangered list. WWF's Living Planet Index shows wildlife has declined 60% since the 1970s.

Pollution. 90% of plastic polluting our ocean is derived from just 10 rivers. Agricultural runoff continues to cause ocean dead zones, and new chemicals like polychlorinated biphenyls (PCBs) are increasing mortality rates in marine mammals.

Failing to address these challenges would be a critical mistake, as they represent a multi-trillion-dollar risk to the global economy and to 2 billion people who depend solely on seafood protein. Entire countries are at risk due to climate change, rising sea levels, and more powerful storms. It is those who are most vulnerable who are at the greatest risk in coastal and small island states.

As well as identifying the major ocean issues that SOA Ocean Leaders would like the international community to focus on, we also asked for their feedback regarding the current efforts to restore ocean health and asked them to award a grade to leadership around the world. We recognize that change is hard. However, on average, SOA Ocean Leaders graded their respective national governments with a "D" and international efforts with a "C". This is far from resounding confidence in current efforts.



Development pressures continue to rise around the world

At the same time, as environmental challenges are being addressed, there are growing economic pressures. China's Belt and Road Initiative now touches 68 countries and a quarter of the world's exclusive economic zones (EEZs). With 160m+ people joining the middle class each year, and 30m+ in population growth, there will be growing pressures on our ocean over the next decade for seafood, shipping, and coastal development.

Current resources and capacity are insufficient to restore our ocean to health

Small island developing states (SIDS) remain poor; on current growth paths SIDS would take over 100 years to reach OECD standards of living. As the effects of ocean health collapse are felt first in SIDS, a radical new shift in infrastructure is needed while not further indebting many of these countries. OECD prior commitments to a climate fund of \$100 billion a year from 2020 are yet to materialize.

There has been insufficient progress to holistically address the risks of a collapsing marine ecosystem, particularly in the effects on long-term capital funds, such as pension, sovereign wealth, and insurance.

If these risks are adequately mitigated, we could create an ocean dividend of greater prosperity from a healthier ocean ecosystem. Hence, there is a need for multi-stakeholder partnerships and a commitment on a scale greater than the Marshall Plan in the aftermath of the Second World War. This will entail risk and innovation, engaging the right leaders and talent, unlocking capital resources, and embarking on untried approaches.

This is where technology and innovation can transform ocean governance

Many exciting breakthroughs in ocean science, technology, and exploration took place in 2018. Highlights include the launch of OceanX,

the expansion of Saildrone's autonomous capabilities, new satellite tracking of global coral reef health, and scientific discoveries around the twilight zone and seabed in the Pacific.

Priorities for 2019

This report highlights several priorities for 2019:

1. Maintain focus on the ocean in global policy debates through media, exploration, and advocacy.
2. Cultivate technological innovations and spur investment in the ocean technology sector.
3. Develop new multi-stakeholder partnerships around the ocean and engage business leaders and global talent.
4. Ensure progress on Biodiversity Beyond National Jurisdiction (BBNJ) negotiations in 2019 to ensure ocean life is protected on the high seas (45% of the world's surface).
5. Set global ecotourism standards for coastal and ocean-based tourism.
6. Propose a moratorium on seabed mining license allocations until sufficient science has been conducted on the marine biology of these locations.
7. Increase marine protected areas (MPAs) to cover 20% of our ocean. Provide more sophisticated regulations and oversight to ensure protection extends to the right locations, depths, equipment, and times of year, and that effective enforcement is incorporated in such efforts.
8. Ensure that sustainable ocean startups comprise at least 5% of the supply chain of major ocean enterprises.
9. Ensure sufficient multilateral funding, transparent spending, and effective disbursement of capital directed toward ocean sustainability.
10. Address inequality around the world, between the OECD and SIDS, as well as inequality within countries that affect those whose livelihoods depend on the ocean.

"If done well, we could create an ocean dividend of greater prosperity from a healthier ocean ecosystem."

— Nishan Degnarain



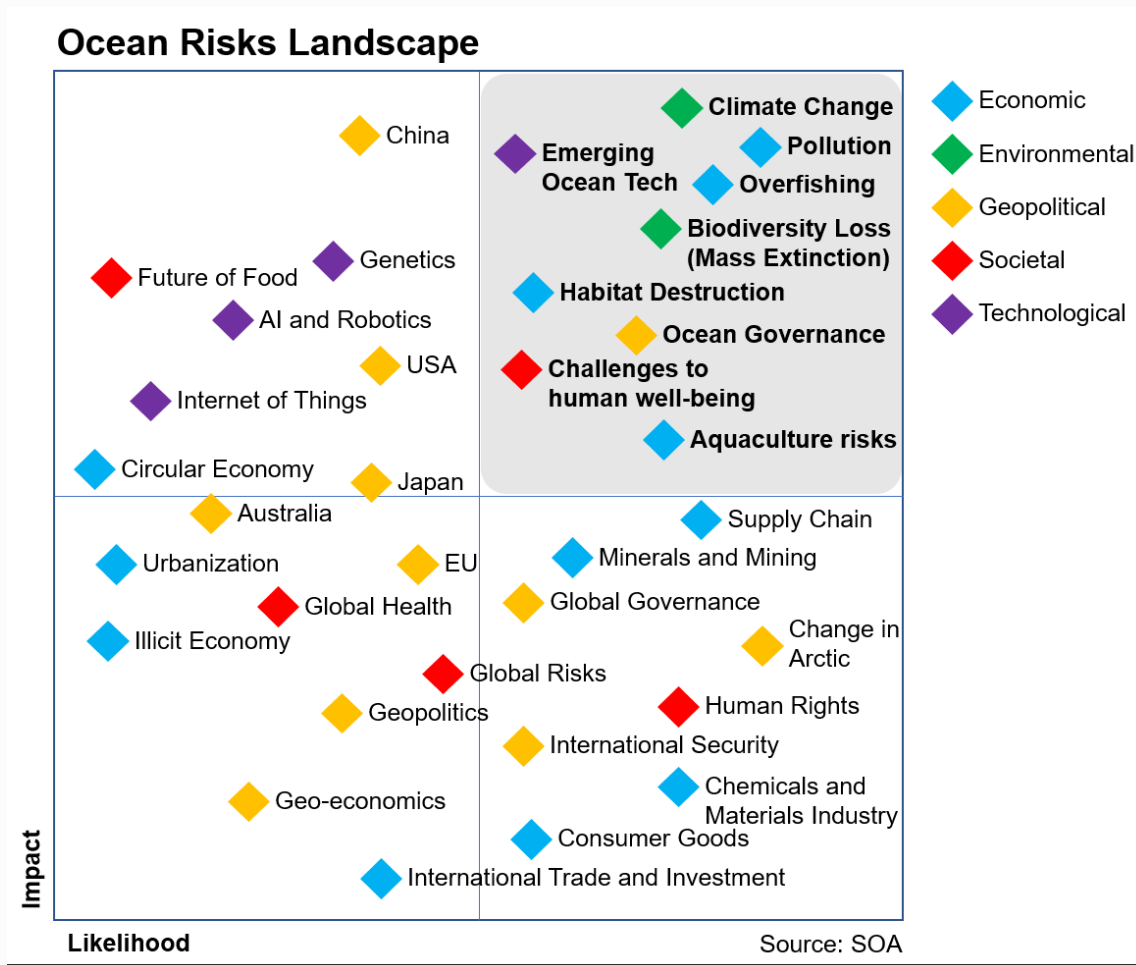
This report is structured into the following sections:

An overview of the major risks to the ocean, as identified by scientists and our SOA community. An acknowledgement of significant milestones achieved in 2018. An update on themes affecting every major ocean basin, including the opinions of

the SOA community. A scan of breakthroughs in ocean science, technology, and exploration from 2018. And finally, a list of top priorities for 2019, as identified by the SOA community.



3. OCEAN RISK DASHBOARD



The ocean is vital for life on our planet, and also provides a source of income, nutritious food, and supports the livelihood of billions. Economic assets dependent on a healthy ocean (e.g., tourism, fisheries, shipping, and offshore energy) are estimated at \$24 trillion, according to a joint report by the Boston Consulting Group (BCG) and the Worldwide Fund for Nature (WWF). Despite their immense importance, marine ecosystems face dangers that put marine biodiversity at risk: climate change, ocean warming, increased acidification, oxygen depletion, pollution, overfishing, and illegal fishing. The development of effective global policy solutions and disruptive ocean focused technologies could help us navigate toward a cleaner and safer future for us and our ocean.

Climate change's impact on the ocean

The ocean is being hit hard by climate change: effects include ocean warming, ocean acidification, and oxygen depletion. The UN's Intergovernmental Panel on Climate Change (IPCC) described the risks of climate change if temperatures increase by 1.5°C by 2100, saying 99% of coral reefs would become extinct. However, with current efforts, the IPCC forecasts that the world is off-track and will hit 2.7–3.7°C warmer temperatures by 2100. The IPCC has given the world just 12 years to turn around the situation before facing irrevocable damage.

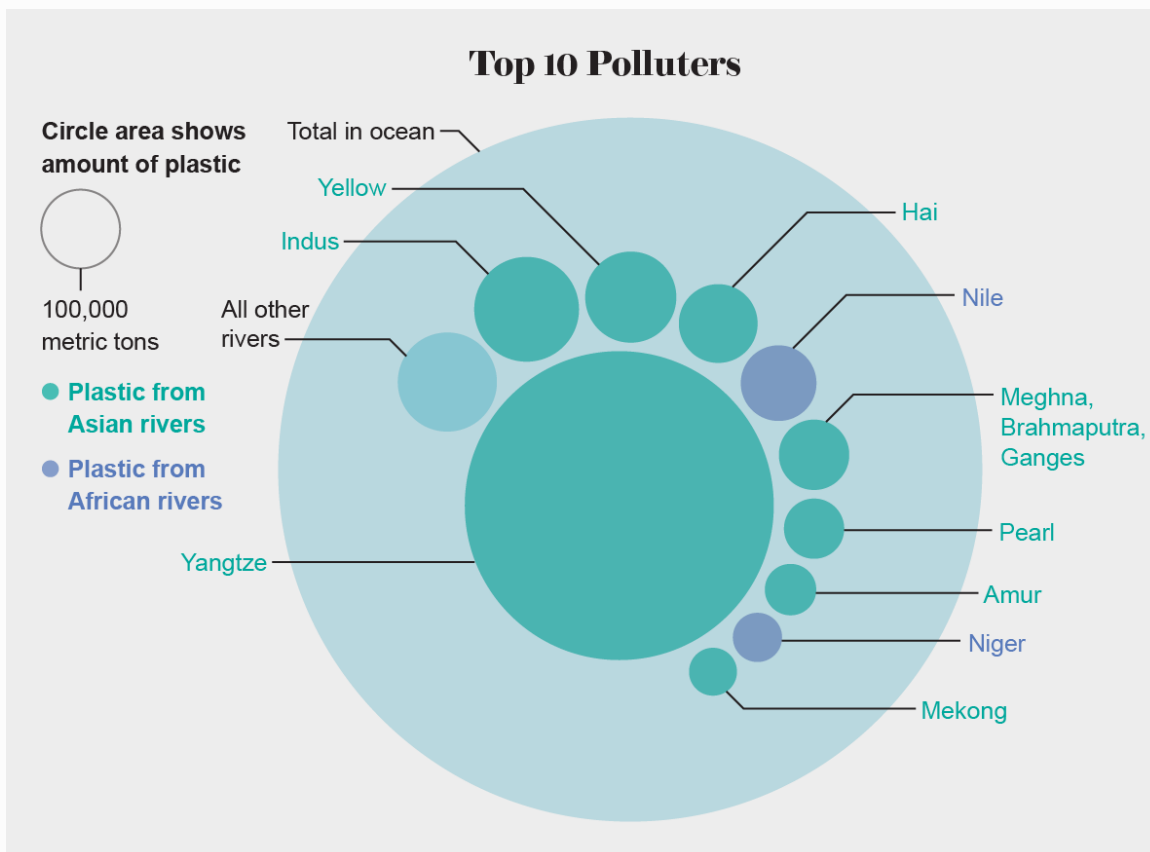


A future ocean that is hotter, more acidic, and a more difficult place for ocean life to breathe presents serious challenges. The ocean has absorbed more than 90% of the heat produced via greenhouse gas-associated warming since the 1850s. According to the National Oceanic and Atmospheric Administration in the United States, the global ocean temperature during the first half of 2018 was the fourth-highest for the period on record. Ocean life is largely accustomed to stable temperatures. Climate change will reorder the distribution of life in the ocean, as fish and shellfish in cold waters are predicted to shift habitats to escape warming, potentially creating complications for countries that depend on the proximity of these resources for income and food.

Warmer waters result in a lower capacity for the ocean to absorb oxygen (a process known as ocean deoxygenation), leading to rapidly expanding dead zones at different depths of the ocean. Indeed, a 2010 study showed warming waters had killed off a staggering 40% of oxygen-producing phytoplankton in

our ocean since the 1950s. Since the first industrial revolution, the acidity of the ocean has increased by roughly 30%, making it more difficult for many organisms to form healthy skeletons and shells. According to a study published in 2017 by UNESCO's World Heritage Centre, if global emissions continue at current levels, all coral-containing World Heritage Sites will cease to exist by the end of this century.

Coral reefs are home to more than a million species, and their disappearance has economic consequences. A 2013 Deloitte study found that the Great Barrier Reef alone generated about US\$7 billion in revenue for Australia, largely via tourism. Sea level rise from melting polar ice and more volatile weather from warming surface temperatures may be the most impactful forms of ocean-related climate change. Scientists predict that half of the population in 25 megacities (those with more than 10 million inhabitants) will be affected by sea level rise if climate change is not slowed; Miami and Shanghai have already suffered related effects.



Credit: Amanda Montañez; **Source:** “Export of Plastic Debris by Rivers into the Sea,” by Christian Schmidt et al., in *Environmental Science & Technology*, Vol. 51, No. 21; November 7, 2017

Ocean pollution

The biggest man-made threat to ocean health is carbon pollution. In the last decade, the ocean has absorbed nearly a third of the carbon dioxide emitted by industry. This has slowed climate change, but at great cost to ocean health. When carbon dioxide is absorbed by seawater, it increases acidity levels—threatening ocean life ranging from the microscopic snails that feed salmon to the coral reefs that support tourism and one-third of marine biodiversity.

Plastics are a particularly insidious form of ocean pollution. According to the non-profit group Ocean Conservancy, coastal countries generate 275 million metric tons of plastic waste annually, and 8 million metric tons of plastic goes into the ocean every year. Just ten rivers carry 90% of this plastic pollution. The

Ellen MacArthur Foundation predicts that by weight, there will be more plastic than fish in the ocean by 2050. Plastic pollution has been documented in the deepest parts of the ocean (e.g., near the Mariana Trench), and in the most remote ocean ecosystems (e.g., Antarctica). Certain forms of plastic can linger for centuries.

The United Nations Environmental Program reports that more than 660 species of ocean animals are documented to be affected by plastic pollution. This includes sea turtles, dolphins, whales, seabirds, and manta rays. Plastic pollution has also been detected in seafood sold for human consumption. A 2015 study by a team of researchers from the University of California, Davis, and Hasanuddin University found man-made debris in 25% of seafood market fish and 67% of all species sampled in the United States. The ingestion of plastic has grave effects on ocean animal



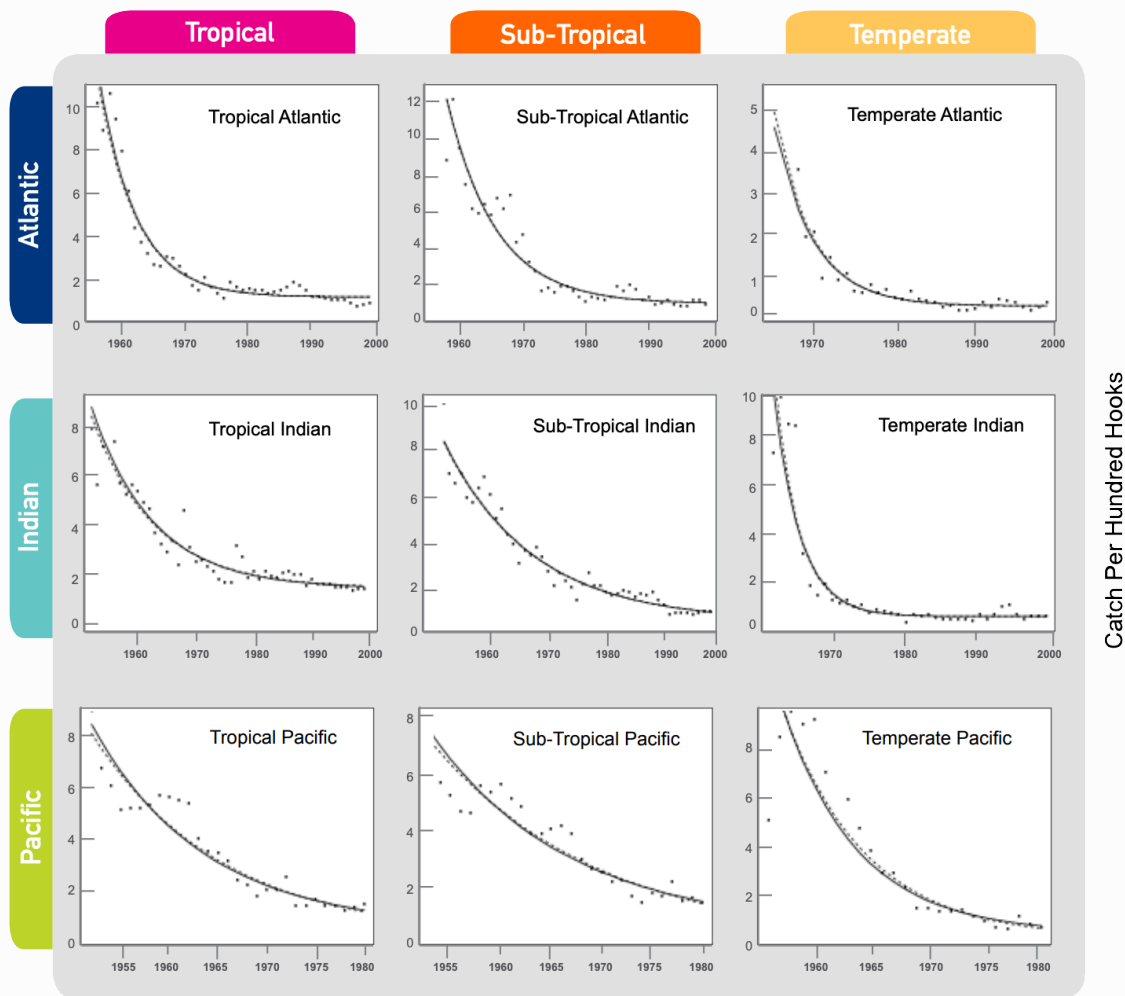
health, and researchers are trying to better understand what impact it has on human health. Potential solutions for the flow of plastics into the ocean include adopting policies that curb the use of single-use plastics like bags or straws, developing alternative materials, and improving the capture of plastics that leak out of waste systems.

Another major source of ocean pollution comes from the runoff of fertilizers used in agriculture. These are carried down rivers and into the ocean, where they create population explosions of algae and bacteria. This in turn

depletes oxygen levels, killing fish and creating inhospitable conditions for marine life. As a result, more than 400 ocean “dead zones” have been documented worldwide. The spread of these areas could be limited with more responsible fertilizer use.

Industrial pollutants such as heavy metals and mercury from coal power plants continue to affect marine life. Even residual traces of banned chemicals such as PCBs, which were once a common coolant, are being blamed for failed pregnancies and the rapid decline in orca populations, according to a 2018 Science study.

Loss of Big Fish in the Ocean



Source: Myers, R.A. and B Worm, *Nature* 2003

Overfishing

According to the UN Food and Agriculture Organization, fish provide more than 3.1 billion people with 20% of their animal protein, and serve as a critically important source of nutrients essential to good health, like iron, zinc, and omega-3 fatty acids. Legal overfishing presents a major challenge. The Food and Agriculture Organization's (FAO) 2018 report *The State of World Fisheries and Aquaculture* estimated that about one-third (33.1%) of global fish stocks are overfished. Illegal and unreported fishing exacerbates overfishing. A study published in 2014 in *Marine Policy* found that up to a third of all wild seafood imported

into the United States was believed to be illegally caught.

In the case of long-living, slow-growing marine species like bluefin tuna, a single incident of illegal fishing can set an entire ocean ecosystem back by decades. New surveillance technologies and platforms for data-sharing are needed to rein in illegal fishing. The Agreement on Port State Measures, a global treaty that went into force in 2016, could curb illegal fishing vessels' access to ports and help block the flow of illegally caught fish to markets. Greater transparency is also needed among international fishery regulators (RFMOs) to more effectively regulate legal overfishing.

"We need to fill 3 empty chairs with their voices when we make decisions: the poor, children, and the other creatures of earth."

— Henrik Grape (World Council of Churches)



Big issues continue to exist with the overuse of antibiotics, genetic modification, and the use of wild-caught fish feed for aquaculture.

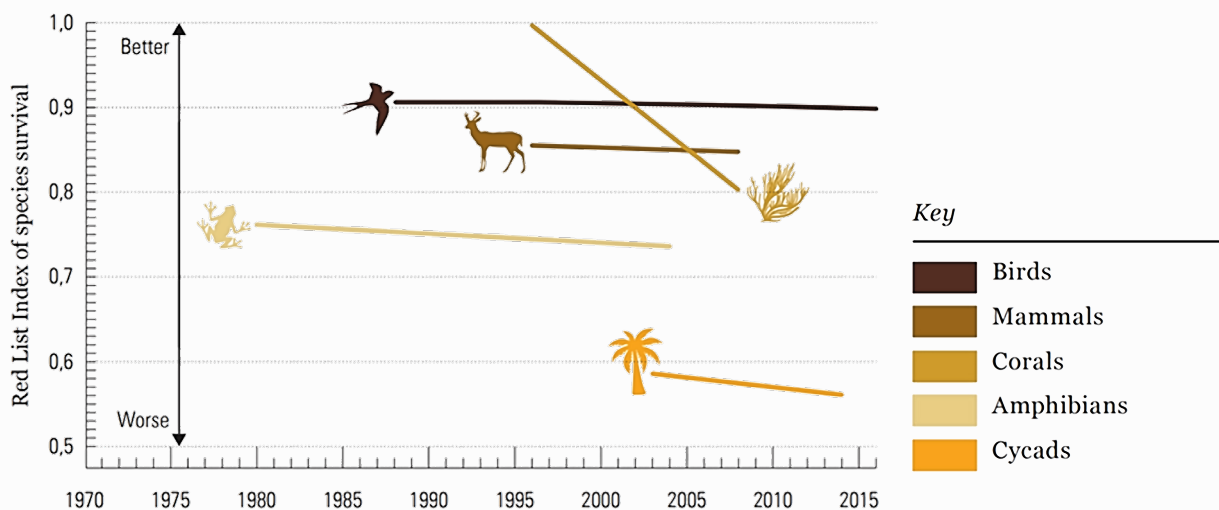
Aquaculture risks

In 2014, for the first time, the global population ate more farmed fish than wild fish. This was a development as transformative as our ancestors' shift from hunting and gathering to agriculture. According to the FAO, the aquaculture industry has grown from producing about 3 million tons of fish in the 1970s to producing 76.6 million tons of fish by 2015, valued at nearly \$160 billion. As of 2016, the industry employed about 23 million people worldwide.

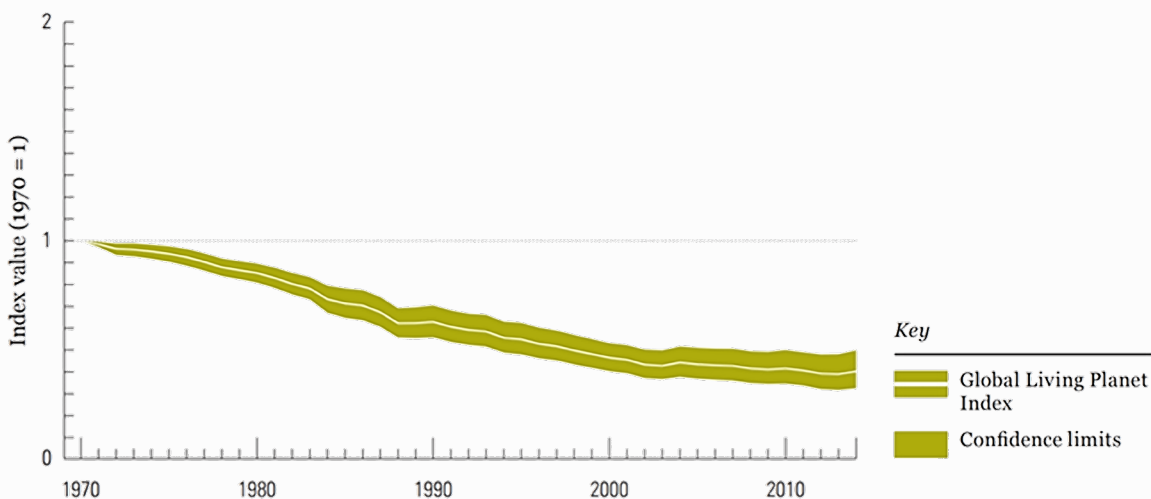
While growth in aquaculture has been geographically diverse, the vast majority has emanated from Asia. China alone represents more than 60% of global aquaculture

production. The industry's expansion could help meet growing global demand for food from animal sources, which may increase by 80% by 2050—fueled by global population growth and increasing wealth in developing countries. According to the FAO, in 2016 about 68% of ocean farmed fish food was made up of finfish, while about 21% was made up of mollusks, and about 10% was crustaceans.

In addition, this has been followed with a rapid expansion in aquaculture sites globally, with the biggest species being salmon, tuna, sea bass, prawns, shrimp, oysters, and scallops. Major risk factors include the overuse of antibiotics, genetic modification of certain species, and inefficient use of fish feed for aquaculture.



IUCN Red List Index of species survival for mammals, birds, amphibians, corals and cycads.



The Global Living Planet Index: 1970 to 2014 Average abundance of 16,704 populations representing 4,005 species monitored across the globe declined by 60%. The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (range: -50% to -67%).

Mass extinction

Life on land may be rapidly approaching what scientists have dubbed the sixth mass extinction, as human-caused extinction rates approach levels last experienced during the era that saw the end of many dinosaur lineages. The situation in the ocean is a little brighter—for the moment. According to the International Union for Conservation of Nature, about 15 ocean animal extinctions have occurred in the last 500 years. During the same period, more

than 500 land animals have been driven into extinction by human activity.

However, a 2016 report in *Science* projected that rates of extinction in the ocean could increase dramatically. Ocean animals that are under threat include the Hawaiian and Mediterranean monk seals; blue whales, which were depleted in the early 1900s; and all six species of sea turtle found in United States waters. Without a change to business as usual in ocean management, we could soon initiate a sixth mass extinction in the ocean.



Children go through garbage at Flores region sea coast in Labuan Bajo, Indonesia (2012).

Human well-being and the ocean

The ocean is more than a beautiful home to impressive wildlife: it is a critically important source of nutritious food, income, and stability. The ocean yields US\$2.5 trillion annually in goods and services, making it equivalent to one of the largest single economies in the world, according to a joint study by Boston Consulting Group (BCG) and WWF. The ocean also provides millions of jobs in fishing, aquaculture, tourism, energy, transportation, and biotechnology. The value of ocean resources is even more important for impoverished countries. Fishery net exports from developing countries have been valued at US\$42 billion, more than meat, tobacco, rice, and sugar combined, according to the FAO's 2016 edition of *The State of World*

Fisheries and Aquaculture.

The ocean is a source of highly nutritious food for humanity. Researchers estimate that if current trajectories of fishery decline persist, 845 million people could become at risk of diseases associated with malnutrition.

Ocean health and human health intersect in other ways that are important but sometimes less obvious. Fishery declines have also been linked to human trafficking. Child and slave labor have been used to harvest fish in the wild. Some analysts also suggest that piracy in Somalia and West Africa is linked to disenfranchised fishermen turning to violence in order to protect decreasing fish stocks. In situations where overfishing has depleted lucrative species, organized crime has also escalated.



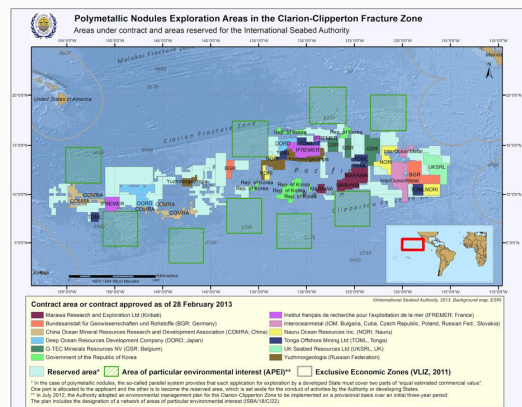
Destruction of mangrove forest by Cyclone Sidr in 2007. Khulna, Bangladesh.

Habitat destruction

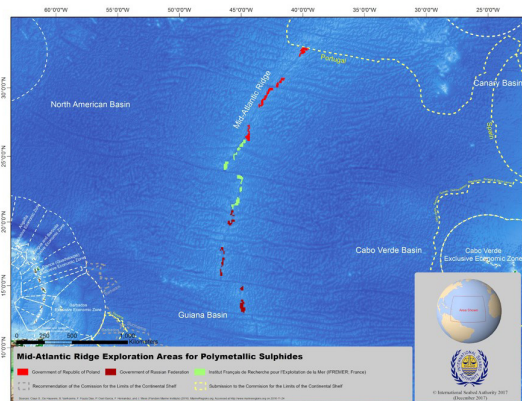
An industrial revolution is beginning in the ocean, with parallels to the industrial revolutions that have taken place on land.

This involves a rapid expansion of marine industries such as ocean farming, coastal tourism, and marine transport, and a fivefold increase in deep-sea mining exploration. According to a report published by the International Union for Conservation of Nature in 2018, while mining in international waters is not expected for several years, 29 exploration contracts have already been issued, covering more than 1 million square kilometers of deep ocean. Regulations to manage deep-sea mining under development at the International Seabed Authority would be insufficient to prevent permanent damage to marine ecosystems and a loss of unique species, according to the report.

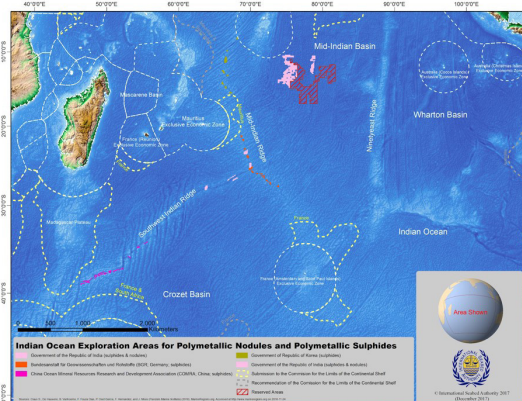
On land, animal extinction rates began accelerating rapidly during the first two industrial revolutions, when there was much less awareness of the link between human health and the environment. Now, the ocean presents an exciting opportunity to intelligently move a marine industrial revolution forward without associated spikes in animal extinction—which could compromise the ocean's nourishing resources.



Seabed Mining Map Clarion Clipper Fracture Zone



Map of Mid-Atlantic Ridge Exploration Areas for Polymetallic Sulphides



Map of Indian Ocean Exploration Areas for Polymetallic Sulphides and Nodules

Multiple exploration activities for seabed mining took place in 2018.



Growth of seabed mining licenses, and risk to some of the most sensitive environments (e.g., hydrothermal vents).

Source: Deep Sea Mining Watch (Benioff Ocean Initiative) deepseaminingwatch.msi.ucsb.edu

Shifting ocean governance

The ocean has always been difficult to govern: it covers 90% of the habitable space on earth, creating an immense, supranational domain with unique regulatory challenges. Unlike many natural assets on land, many ocean resources (such as bluefin tuna) regularly swim across jurisdictional boundaries. In addition, damage incurred within one country's jurisdiction (e.g., plastic pollution) can affect countries that are many thousands of miles away.

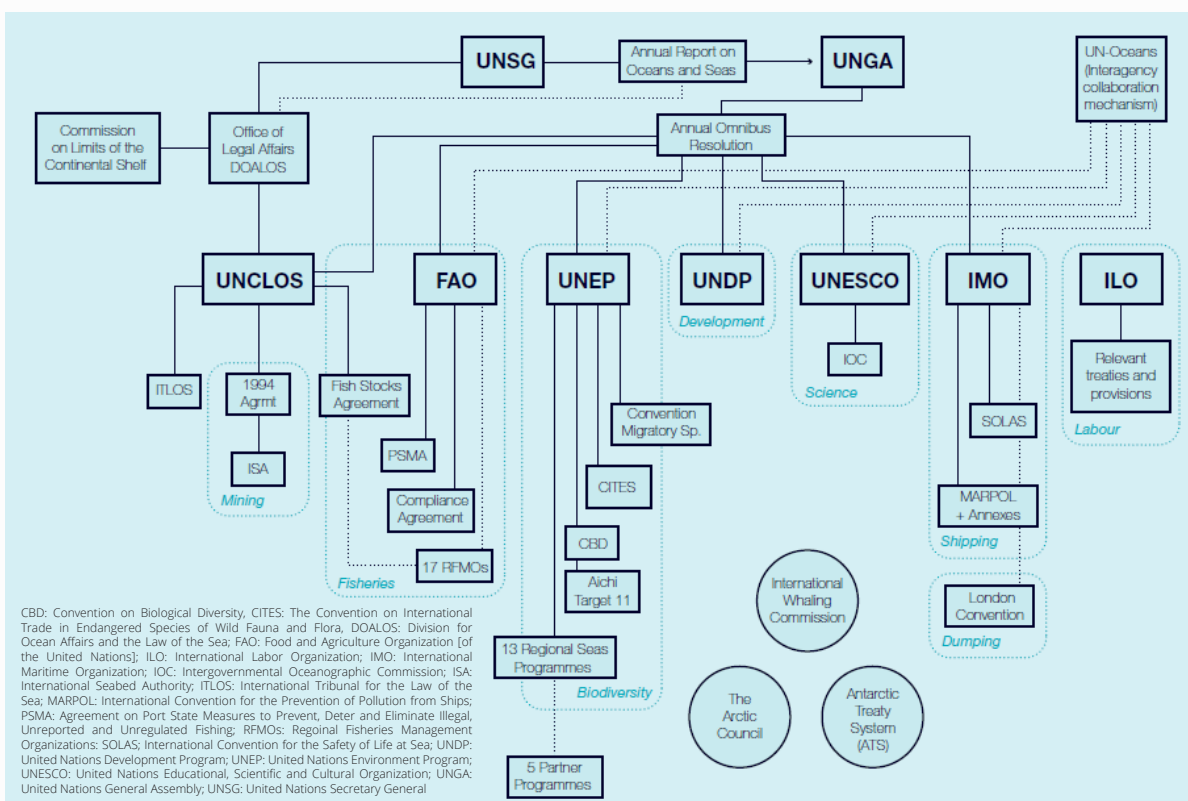
We have deferred developing policies that properly address these complexities, even as we approach or cross tipping points on overfishing, pollution, and climate change.

Most of the ocean lies outside the jurisdiction of any single country, presenting major challenges when it comes to the responsible management of biodiversity and resources.

In 2015, the United Nations committed to a new kind of legally binding treaty to better manage high seas biodiversity. Fish stocks tend to move toward the planet's poles as they escape warming waters. This can create worrisome volatility in low-latitude, often less-developed regions—as fish resources travel out of the reach of countries that need them most.

These are also the same regions where illegal fishing is most intense, ocean governance is weakest, and populations are growing the fastest.

SUMMARIZED SCHEMATIC DIAGRAM OF INTERNATIONAL OCEAN GOVERNANCE STRUCTURE, SHOWING SECTORAL APPROACH AND PLETHORA OF ORGANIZATIONS



Source: Global Ocean Commission

Another emerging challenge is that countries may lose their economic incentive to responsibly manage the health of their fish reserves once they realize their assets are migrating beyond their borders.

One positive development has been the establishment of protected areas, which can

aid at-risk ecosystems and boost fisheries. Based on a review of 144 studies, researchers at the University of York concluded that about 30% of the ocean would need to be placed within protected areas to meet marine management goals. Currently, only about 3% of the ocean is well protected.

Emerging ocean technologies

Emerging technologies are changing the way we harvest food, energy, minerals, and data from the ocean. Rapid innovation in marine robotics, artificial intelligence, low-cost sensors, satellite systems, genetics, and methods for collecting and analyzing data may help us create a cleaner and safer future for our ocean. It may also present its own set of problems for ocean health.

Protecting the vitality of the ocean and the economic benefit we derive from it will require slowing climate change, and the ocean itself may be part of the solution. The ocean is an enormous storehouse of green energy which we are just beginning to plug into—possibilities include wave, offshore wind, tidal, and thermal energy. A record 4.3 megawatts of new offshore wind power was installed around the world during 2017, increasing the market by 95%, according to the Global Wind Energy Council.



Ocean thermal energy conversion technology, which exploits the temperature difference between shallow tropical waters and the deep sea to generate electricity, is being explored. Remaining hurdles include making the harvesting of ocean energy more cost-efficient. Ocean mining is another emerging tech-driven industry. Portions of the seafloor are rich in gold, platinum, cobalt, and rare-earth elements, yet these resources have, up until now, lain mostly out of reach. New, 300-ton waterproof mining machines have been developed, which can travel to some of the deepest parts of the sea. Mining claims have been published on more than 1 million square kilometers of ocean in the Pacific, Atlantic, and Indian oceans. However, mining the seafloor without destroying critical deep-sea ecosystems remains a challenge that must be solved.

Meanwhile, organizations and companies can now collect and process greater amounts of data from the ocean, which is being harnessed to detect illegal fishing, empower sustainable companies to connect with consumers, promote maritime security, and help build intelligent zoning plans that better balance the needs of fishermen, marine transportation, and ocean conservation. Other exciting innovations are also emerging: a robot that swims like a tuna, underwater data centers, self-driving ships, coastal sensor systems that text alerts about sharks in swimming areas, and geodesic spheres that serve as offshore fish farms. Properly embraced, disruptive technologies will help us successfully take more from the ocean while damaging them less.

4. OCEAN MILESTONES AND INITIATIVES IN 2018

In a busy 2018, the ocean community pursued significant milestones and launched many new initiatives. Here are some of the highlights identified by the SOA community.

1

Action on plastics

G7 Ocean Blueprint (the Charlevoix Declaration). For the first time, the G7 group of industrialized countries made a declaration recognizing the importance of the ocean, and committed to reduce plastic pollution. The Ocean Cleanup's System 001 was launched in San Francisco in a pioneering effort to clean the Great Pacific Garbage Patch.

2

Whaling overturned

Calls from some to resume whaling were overturned. While there is to be no whaling in the high seas, Japan announced it is leaving the International Whaling Commission and will resume commercial whaling in its own waters in 2019.

3

South African MPAs

South African marine protected areas (MPAs) increased twelvefold.

4

Shipping emissions

Although at a less ambitious rate than Paris Agreement commitments, the shipping industry is taking steps to curb emissions from vessels.

“The half of our planet which is high seas is protecting terrestrial life from the worst impacts of climate change. Yet we do too little to safeguard that or to protect the life within the ocean, which is intrinsic to our collective survival. Protecting the biodiversity of the high seas by bringing good governance and law to the whole ocean is the single most important thing we can do to turn the tide for the blue heart of our planet.”

— Professor Alex Rogers, Oxford University, UK

5

The Seabed 2030 initiative

Seabed 2030, a joint project between The General Bathymetric Chart of the Oceans (GEBCO) and the Nippon Foundation with the aim of mapping the global ocean floor, became operational. Currently, only 9% of the seabed has been mapped in high resolution.

6

Global Climate Action Summit

This summit was held in San Francisco to raise awareness on climate change and ocean related initiatives. However, the IPCC says more action is needed.

7

New UN high seas treaty

Efforts are underway to create a treaty on biodiversity beyond national jurisdiction, which is expected to be completed by 2020.

8

Norway's Blue Economy Panel

This panel was launched to define investment principles for a sustainable ocean economy.

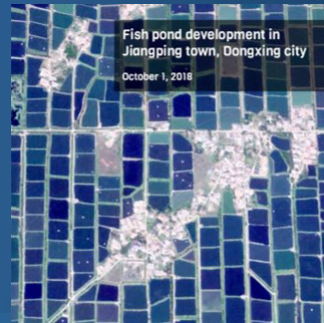
5. REGIONAL OCEAN THEMES

16



Fish Pond Development
Jiangping town, Dongxing City
January, 2003

17

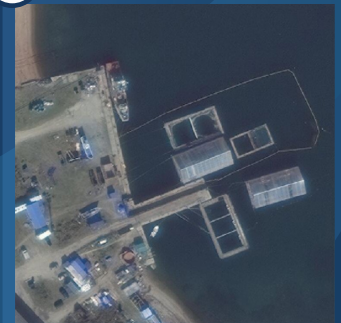


Fish Pond Development
Jiangping town, Dongxing City
October, 2018

18



Andersen Airforce Base,
Guam Sea Level Rise



Suspected Illegal "Whale Jail"
Bukhta Srednyaya, Russia
September, 2018

19



Philippines
Boracay Bay Pre Cleanup
March, 2018



Philippines
Boracay Bay Cleanup Impact
October, 2018

20



China Coal Power Station
Huadian Nanxiong Power Station
January, 2017



China Coal Power Station
Huadian Nanxiong Power Station
September, 2018

21



South China Sea
Cuarteron Reef
April, 2018

22



South China Sea
Fiery Cross Reef
March, 2018

23



South China Sea
Gaven Reef
March, 2018

24



South China Sea
Subi Reef
March, 2018

25



South China Sea
Woody Island
March, 2018

PACIFIC OCEAN 2018 BRIEFING

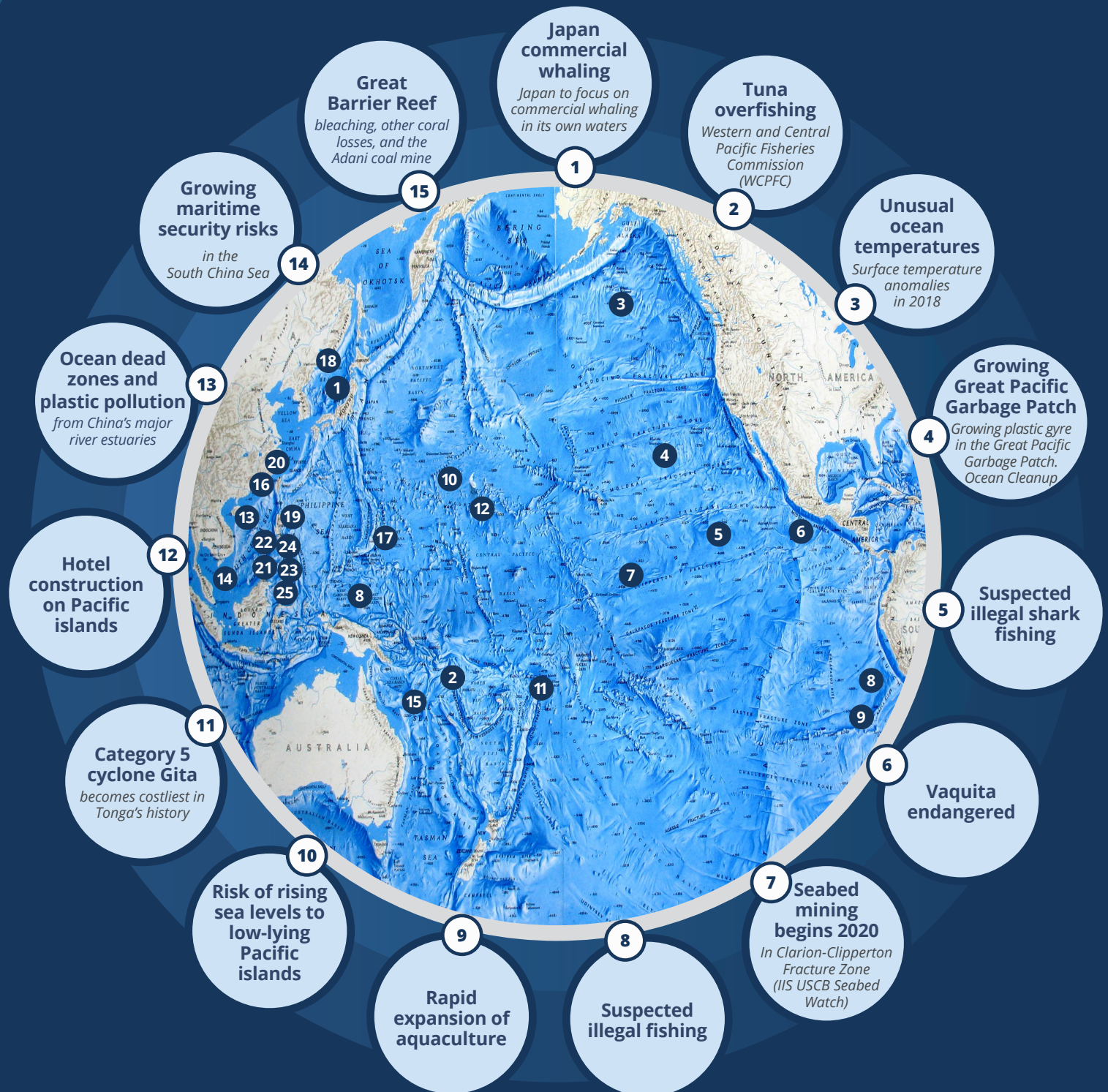


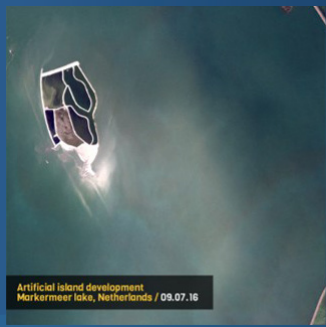
Image Credit: Earthrise Media

ATLANTIC OCEAN 2018 BRIEFING

11



Artificial Island Development
Markermeer Lake, Netherlands
September, 2015



Artificial Island Development
Markermeer Lake, Netherlands
September, 2016

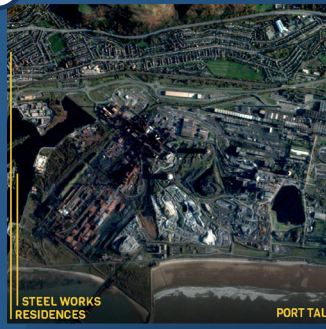


Artificial Island Development
Markermeer Lake, Netherlands
September, 2017



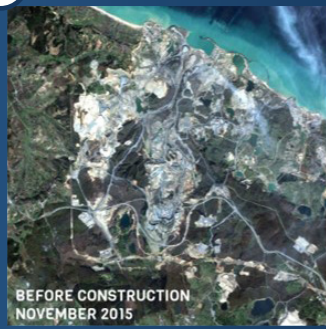
Artificial Island Development
Markermeer Lake, Netherlands
October, 2018

12



Port Talbot, Wales
Pollution
2018

13



Istanbul Airport
Before Construction
November, 2015



Istanbul Airport
After Construction
June, 2018

14



Tyndall Air Force Base
Florida Sea Level Rise



Homestead Air Force Base
Florida Sea Level Rise



Kessler Air Force Base
Louisiana Sea Level Rise



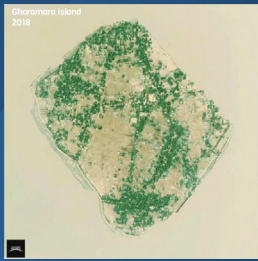
Image Credit: Earthrise Media

INDIAN OCEAN 2018 BRIEFING

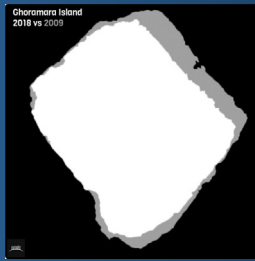
11



Ghoramara Island, India
2012



Ghoramara Island, India
2018



Ghoramara Island
2018 vs 2009.

12



Thilafushi Trash Island
The Maldives 2008



Thilafushi Trash Island
The Maldives 2017

13



Airport Construction in
The Maldives
September, 2016



Airport Construction in
The Maldives
March, 2016



Airport Construction in
The Maldives
July, 2018



Airport Construction in
The Maldives
September, 2018

14



Forest City Construction
Johor, Malaysia
March, 2015



Forest City Construction
Johor, Malaysia
December, 2015

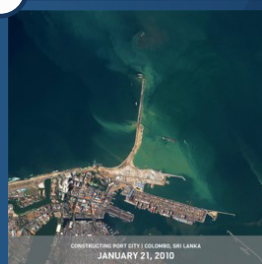


Forest City Construction
Johor, Malaysia
September, 2017

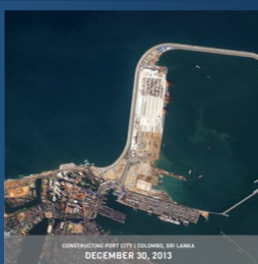


Forest City Construction
Johor, Malaysia
August, 2018

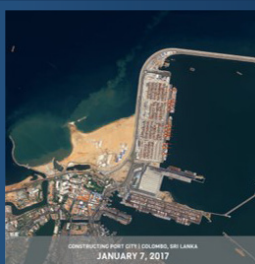
15



Constructing Port City
Colombo, Sri Lanka
January, 2010



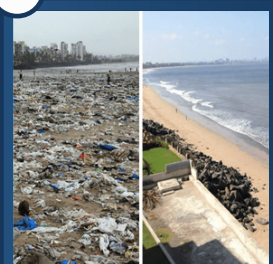
Constructing Port City
Colombo, Sri Lanka
December, 2013



Constructing Port City
Colombo, Sri Lanka
January, 2017



Constructing Port City
Colombo, Sri Lanka
July, 2018



Beach Clean Up
Mumbai, India
2018

16

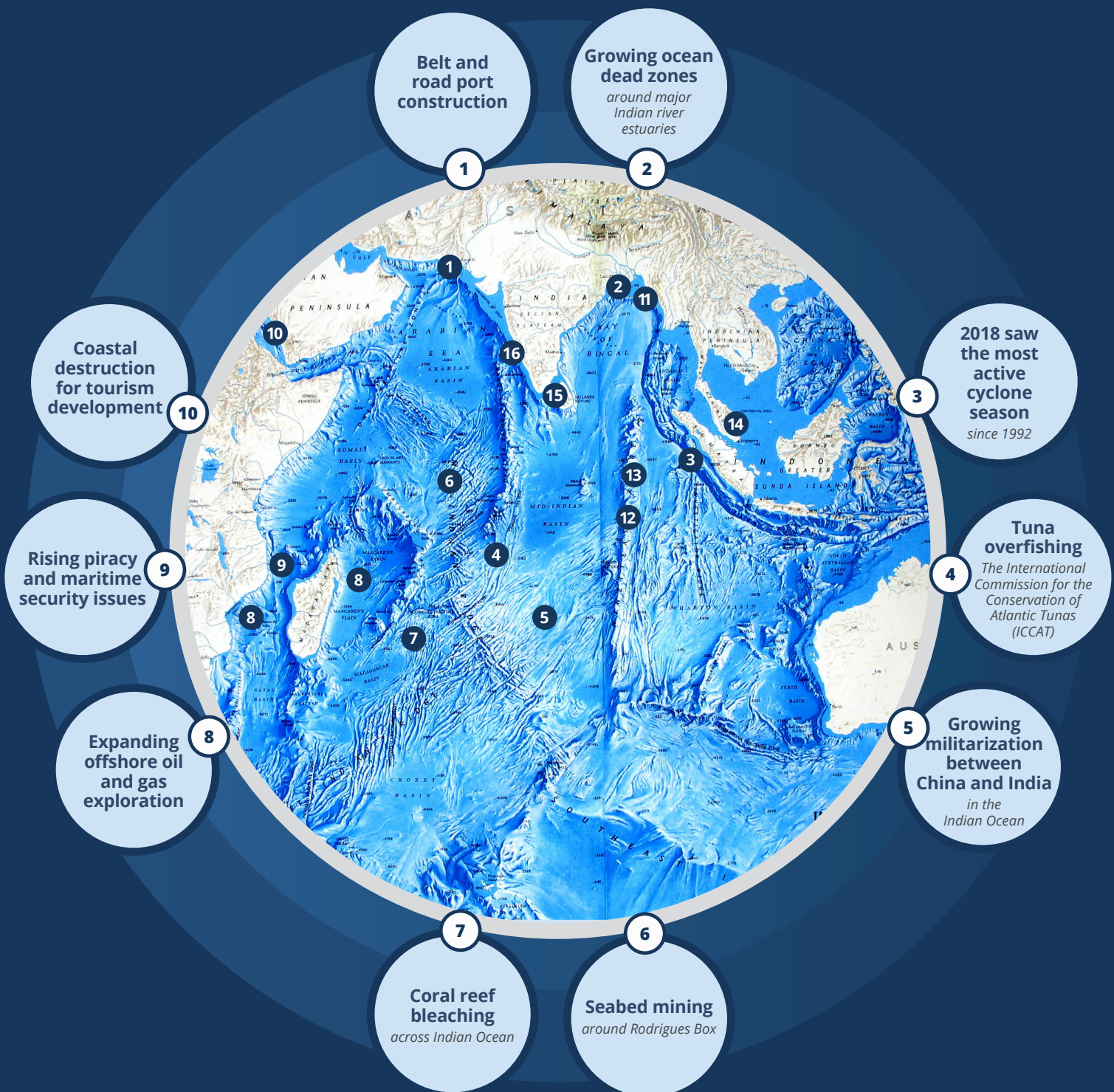
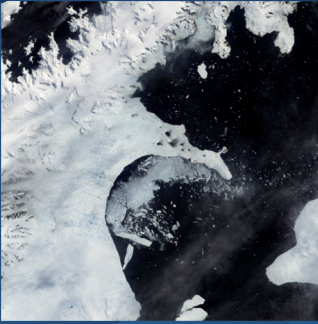


Image Credit: Earthrise Media

SOUTHERN OCEAN 2018 BRIEFING

6



Loss of Larsen Ice Shelf

Largest MPA in Weddell Sea blocked by Norway, China and Russia

Impact of expanding krill fisheries

1

2

Increasing risk from invasive species

5

Growing impact of climate change, warming ocean, and strengthening winds

3

Recent Ross Sea MPAs

4

ARCTIC OCEAN 2018 BRIEFING

6



America's Most Toxic-Releasing Facility
Red Dog Mine, Alaska
October, 2018

Growing oil and gas exploration

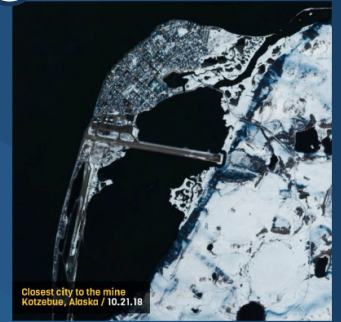
1

Loss of summer ice

First container ship travelled through in 2018

2

7



Closest City to the Mine
Kotzebue, Alaska
October, 2018

Loss of Summer ice and impact of polar biodiversity

5

Ten-year moratorium on commercial fishing in the Arctic signed

3

Growth in invasive species
(e.g., red king crab in Norway)

4

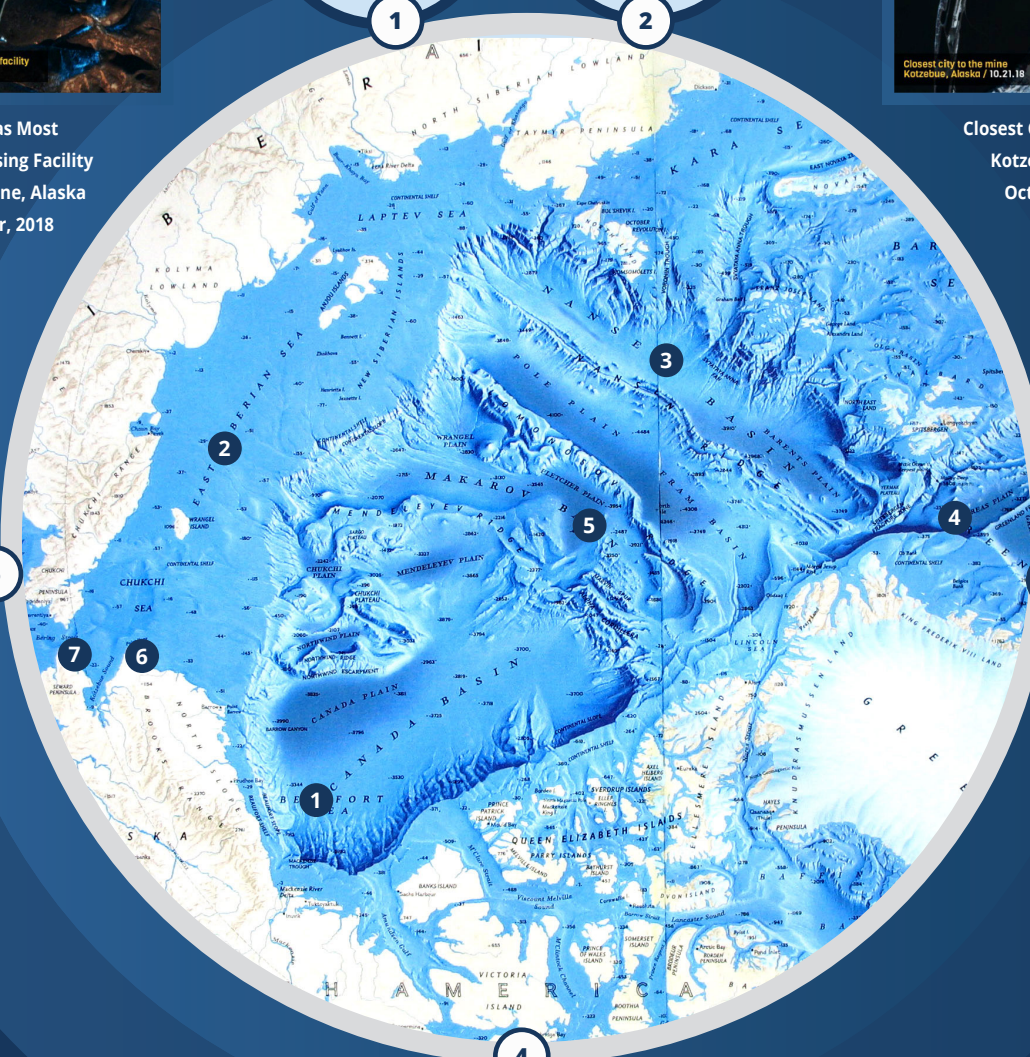


Image Credit: Earthrise Media

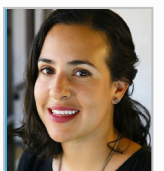
6. SOA VOICES FROM AROUND THE WORLD

The most inspirational ocean solutions seen in the past year.



Gabby Tan (Malaysia)

"The discovery of heat-resistant corals that may just give us one more shot at saving our beautiful reefs."



Marissa Cuevas (Mexico)

"The Ocean Cleanup launch, in particular where they describe the challenge they had with the anchor. They want to place the 'system' in the Pacific, which meant that the anchor

had to be extremely long and very strong to work. Since no one had attempted this before, it seemed impossible. Finally, they came up with a new model of anchor—one that uses the currents as brakes. The solution is brilliant, but also the message: as ocean entrepreneurs, we face many challenges that seem to be impossible initially, but finally we can always develop new, innovative solutions."



Marie Le Texier (France)

"The most inspirational ocean news I saw in 2018 was the Volvo Ocean Race Ocean Plastics Sustainability Education Programme. It used the power

of sports to inspire and educate millions of people on ocean health—2.5m people visited the 12 race villages. Very powerful and inspiring."



Tzuen Yap (Malaysia)

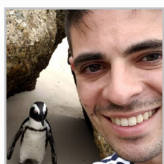
"Several initiatives by Balinese youth leaders to stop single-use straws. Many resorts and restaurants support their cause."



Annisa Meutia Ratri (Indonesia)

"The fishermen's efforts to create waste banks [*bank sampahs*] on Selayar Island, Indonesia."

What is needed to increase impact?



John Costantino (Norway)

"A potential solution is to drive more innovation in the private industry around our ocean, much like SpaceX is revolutionizing how space

travel is done by incorporating new tech and reducing cost and waste. I feel there is also a place for this kind of 'disruption' in the ocean space."



Eugénia Barroca (Portugal)

"The biggest roadblock is developing a solution that can be adopted economically. In our economic model [in Portugal], having a good

economy doesn't necessarily mean we will have a sustainable country. I think that change needs to come from all directions: the political and economic mindset should be transformed into efficient and sustainable resource management, together with improving our waste management. Of course, social well-being is needed as its basis. Nature and ecosystem services need to have a bigger value in our economy than what they have now."

In 2018, the ocean was the least prioritized by major companies, of all the Sustainable Development Goals (SDGs).

Figure 4: Company prioritisation of the SDGs

Q. Which SDGs have been identified as most relevant or a priority?



Source: PwC, SDG Reporting Challenge 2018 Base: Companies with priority SDGs (362)

CHANGE IS HARD!

SOA Members grading our Global Leaders on current efforts leading to Restoration of Ocean Health...



Far from resounding support for current efforts relative to Expectations.

What are the biggest roadblocks to restoring ocean health?



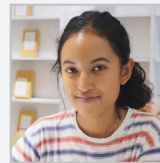
Alexa Goodman (Canada)

"Ocean issues are wicked problems and do not exist in silos. The problems are complicated and nested within other issues; many are related to politics and economics. ... Individuals without a connection to the ocean may not see the value in saving it. This leads to poor political decisions for short-term economic gain, which is usually at the expense of the environment, as these choices promote consumerism, which in turn drives climate change, plastic pollution, and overfishing, among many other issues."



Daniel Cáceres Bartra (Peru)

"[The biggest issue is] the lack of creativity toward sustainable economic-growth strategies, and just copying other countries' strategies of development."



Janis Argeswara (Indonesia)

"People want change, but without concrete regulation, they won't change. Bali is starting the year with some very good news of banning single-use plastics. However, a lot of small shops are still using plastic bags and straws because the regulations are not being effectively implemented yet."



Matthews Wafula (Kenya)

"Despite having a policy document on the ocean, a few individuals are encroaching into the ocean and building structures right at the shores of the Indian Ocean ... also destroying the mangrove forests."

7. OCEAN TECHNOLOGY STARTUPS

Innovative solutions that apply emerging technologies are being used to solve the most critical threats facing the ocean. Listed below are five companies building technologies for generating clean energy, decreasing bycatch, and reducing pollution caused by plastics and fossil fuels. These companies are alumni of SOA's Ocean Solutions Accelerator, a Silicon Valley based program which provides entrepreneurs with the support needed to transform their innovative ocean solutions into scalable businesses. SOA is committed to accelerating 100 ocean startups by 2021.

The following 5 startups participated in SOA's 2018 accelerator program:

SafetyNet TECHNOLOGIES

SafetyNet Technologies is making the fishing industry smarter through the development of user-friendly electro-mechanical devices to reduce bycatch. SafetyNet Technologies is closing a seed investment round in Q1 2019, and launching 4 commercial trials in Europe, the U.S., and Latin America.



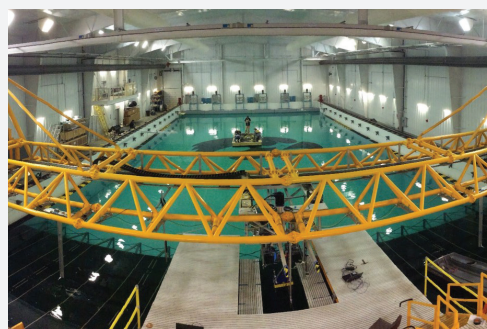
LOLIWARE

LOLIWARE is the world's first edible bioplastics company dedicated to replacing single-use plastics with hyper-compostable materials derived from seaweed. LOLIWARE has finalized their engineering plan to scale LOLISTRAW in 2019. The company forecasts \$90 million in revenue across 86 countries and plans to eradicate billions of straws over the next 24 months.





CalWave Power Technologies is developing a Wave Energy Converter to harness the renewable power of ocean waves to produce electricity and fresh water. In January 2019, CalWave received an additional multi-million dollar award by the U.S. Department of Energy to build a commercial scale drive train in parallel to their open water demonstration.



Sustainability Cloud is utilizing blockchain technology to divert ocean-bound plastic from waste streams into valuable material supply chains in a trusted, transparent way. In 2019, Sustainability Cloud will be launching in Europe, seeking partners that wish to transform the way they value waste.



ETAC designs and produces functional nanomaterials, which can be used to remediate oil spills and wastewater. In 2018, ETAC was selected as a startup finalist of the Cleantech Challenge Mexico and their solution was published in the American Chemical Society.



8. BREAKTHROUGHS IN OCEAN SCIENCE, TECHNOLOGY & EXPLORATION IN 2018

OceanX

Dalio Philanthropies launched OceanX, an initiative to explore the ocean and bring it back to the world through captivating media. OceanX combines exploration and engagement to raise ocean awareness and works with leading media, science and philanthropic partners to inspire the general public to love and protect our ocean. OceanX's Alucia2, the most advanced combined exploration and media vessel ever constructed, will set sail in 2019.

Saildrone

California-based autonomous vessel company Saildrone raised US\$60m of funding in 2018, and is planning a rapid expansion to create the largest fleet of solar-powered autonomous vessels on our ocean. This will pioneer new approaches in tracking ocean health at a fraction of the cost of existing methods.

Ocean Cleanup

Boyan Slat, aged 24, launched the Ocean Cleanup's System 001 from San Francisco in September 2018, to clean up the Great Plastic Garbage Patch. While the system is still in its trial period, it spurs hope that such efforts can help rid the world of existing plastic that continues to harm many marine species.

eDNA (environmental DNA)

eDNA is a promising new tool that can identify the presence of marine species from ocean water alone. Several leading companies are pioneering the development of this breakthrough technology.

Coral-reef Stressors

Pioneering research by Stanford Professor Stephen Palumbi has revealed new insights into why coral reefs get bleached. This research could become the basis for developing more resilient coral reefs. The race is on to develop resilient coral strains before the impact of climate change eliminates our most fragile reefs.

The Twilight Zone

Very little is known about the ocean's twilight zone, a region under 200 meters that's teeming with over 1 million undiscovered species. New technologies and a bold new expedition by Woods Hole Oceanographic Institution will enable us to understand more about this critical zone of life.



9. SPECIAL TRIBUTE

Ruth Gates and Paul Allen

This year, we celebrate the lives of two ocean leaders who dedicated their lives to restoring ocean health.



Ruth Gates (1962–2018)

Ruth Gates was one of the world's leading coral researchers, based at the Hawaii Institute of Marine Biology where she had been director since 2015. Her work was recently showcased in the award-winning movie *Chasing Coral*. She was at the forefront of developing more resilient coral reef strains by incrementally increasing the temperature tolerance of corals.



Paul Allen (1953–2018)

Paul Allen was the co-founder of Microsoft. Through his investment fund Vulcan, he became a strong supporter of ocean conservation efforts. The fund invested in efforts to preserve coral reefs, protect endangered marine species, and pioneer new ocean exploration techniques using the latest technologies.

10. OCEAN PRIORITIES FOR 2019

As this report shows, our ocean is facing unprecedented challenges in terms of scale, scope and speed of change. In a complex, multi-stakeholder environment, here are 10 priorities for our ocean that the SOA community believe world business and government leaders can focus on in 2019.

1. Policy attention



Raise the attention of the ocean in global policy debates—COP25 negotiations, Blue Economy Panel, etc.—elevating the profile of the ocean on the global agenda.

In the 1980s, the world came together to address the complexities of chlorofluorocarbons (CFCs) and the hole in the ozone layer. We need a similar effort to show that multiple actions are leading to the loss of life and protection that our ocean gives us. It is critical to maintain ocean health as an important discussion point on the global agenda.

2. Ocean tech solutions



Cultivate technological innovations and spur investment in the ocean technology sector.

Emerging technologies and business models are opening new possibilities for restoring ocean health. However, there needs to be a vibrant market for such ocean technologies to scale and disrupt existing systems. In 2019, it's imperative that new ocean technology funds be raised to scale technologies such as clean shipping, sustainable seafood, and the development of a circular economy.

3. Partnerships



Develop new multi-stakeholder partnerships around the ocean and engage business leaders and global talent.

Many voices and value systems

are being excluded from the ocean debate. We need to build new global partnerships alongside very local partnerships that can harness the insights of those who depend daily—and over many generations—on the ocean, and wish to influence businesses and government leaders for more effective action. Many of these communities are remote, and a special effort is needed to engage to build such new multi-stakeholder partnerships.

4. BBNJ negotiations



Ensure progress on BBNJ negotiations in 2019 to ensure ocean life is protected on the high seas (45% of the world's surface).

In 2019, it will be crucial for international policymakers to create a new legal instrument to protect biodiversity in the high seas. This is a highly significant, international treaty for our ocean. SOA calls upon policymakers in each and every country to ensure such a legal instrument can effectively safeguard biodiversity.

5. Ecotourism



Set global ecotourism standards for coastal and ocean-based tourism.

Tourism can be responsible for the destruction of some of the most fragile parts of our ocean ecosystem. How can we turn tourism into a force for good and not one of coastal destruction and cosmetic change? Can 2019 be the year we set meaningful ecotourism standards that actively contribute to restoring ocean health?

6. Seabed mining



Propose a moratorium on seabed mining license allocations until sufficient science has been conducted on the effects on marine biology of these locations.

In 2020, the UN's International Seabed Authority votes on allowing commercial seabed mining operations to begin. This means 2019 will be a crucial year to muster efforts and declare a moratorium on seabed mining until we have a full scientific assessment of the environmental impact.

7. Marine protected areas



Increase marine protected areas to cover 20% of our ocean.

Several groups are exploring targets of protecting up to 30% of our ocean, and even

all international waters, which would comprise 45% of the earth's surface. However, we also need more sophisticated regulations and oversight of these protected areas to ensure protection extends to the right locations, depths, equipment, and times of the year, and that effective enforcement is incorporated in such efforts.

8. Startup supply chain



Ensure, through engagement, that sustainable ocean startups comprise at least 5% of the supply chain of major ocean enterprises.

Most ocean tech startups need markets and supply chains to scale. However, the barriers to entry remain high. To make a meaningful

difference, we would like to see major corporations and governments be a positive, disruptive force in building more sustainable business practices to restore ocean health.

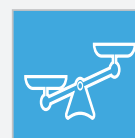
9. Funding



Ensure sufficient multilateral funding, transparent spending, and effective disbursement of capital directed toward ocean sustainability.

At recent Our Ocean conferences, philanthropic pledges of over US\$8 billion have been made. However, there is very little transparency on the effectiveness of this spend. We call for there to be a (a) greater spending on the ocean, especially from multilateral organizations, (b) greater transparency of where this spend is going and how this contributes to scalable solutions, and (c) greater innovation in how this funding is disbursed to develop radically new and scalable models. This also includes developing innovative new financial instruments using the latest fintech solutions to ensure each dollar spent goes further.

10. Address inequality



Address inequality around the world, especially between the OECD and SIDS.

Communities of people who depend on the ocean (e.g., coastal fishers and islanders) are often some of the poorest in society. Economically powerful nations must support developing nations to meet challenges posed by declining ocean health and promote solutions that bridge income disparity.

REFERENCES

- "Reviving the Ocean Economy: The Case for Action," (2015), World Wide Fund for Nature, accessed at <https://www.worldwildlife.org/publications/reviving-the-oceans-economy-the-case-for-action-2015>
- "Tracking the global footprint of fisheries," (2018), Vol. 361 Issue 6378, Science.
- "IPCC Special Report: Understanding Global Warming of 1.5C," (2018), accessed at <https://www.ipcc.ch/sr15/>
- "At what price? The economic, social and icon value of the Great Barrier Reef," (2013), Deloitte Access Economics, accessed at <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf>
- "Quantification of ocean heat uptake from changes in atmospheric O₂ and CO₂ composition," L. Resplandy, R.F. Keeling et al. (2018), Nature, Volume 563, accessed at <https://scripps.ucsd.edu/news/research-highlight-ocean-warming-detected-atmospheric-gas-measurements>
- "NOAA's National Centers for Environmental Information, Monthly Global Climate Report," (October 2018), accessed at <http://www.ncdc.noaa.gov/sotc/global/2018/10>
- "Climate and Biogeochemical Interactions in the Tropical Ocean," (2018), Global Ocean Oxygen Network (GO₂NE), UNESCO-IOC accessed at <http://sdg.iisd.org/news/scientists-urge-immediate-decisive-action-to-tackle-deoxygenation-in-oceans/>
- "Stemming the Tide: Land-based strategies for a plastic-free ocean," (2017), Ocean Conservancy accessed at <https://oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf>
- "The New Plastics Economy: Rethinking the future of plastics," (2016), Ellen MacArthur Foundation and World Economic Forum, accessed at http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf
- "Turning the Tide on Plastics: Clean Seas Campaign," (2018), UNEP accessed at <https://www.unenvironment.org/news-and-stories/story/one-year-after-launch-cleanseas-tide-turning>
- "Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption," C. Rochman, A. Tahir, et al. (2015), Scientific Reports Volume 5, Article number 14340, accessed at <https://www.ucdavis.edu/news/plastic-dinner-quarter-fish-sold-markets-contain-human-made-debris/>
- "Declining oxygen in the global ocean and coastal waters," D. Breitburg, L. Levin et al. (2018), Science Magazine Vol 359 issue 6371 accessed at http://www.sciencemagazinedigital.org/sciencemagazine/05_january_2018



"Predicting global killer whale population collapse from PCB pollution," J. Desforges, A. Hall et al. (2018), Science, DOI: [10.1126/science.aat1953](https://doi.org/10.1126/science.aat1953)

"The State of World Fisheries and Aquaculture," (2018), UN's FAO, accessed at <http://www.fao.org/fishery/sofia/en>

"Red list research finds 26,000 global species under extinction threat," The Guardian (5 July 2018), accessed at <https://www.theguardian.com/environment/2018/jul/05/red-list-research-finds-26000-species-under-extinction-threat>

"Ecological selectivity of the emerging mass extinction in the ocean," D. McCauley et al. (2018), Science Vol 353, Issue 6305, DOI: 10.1126/science.aaf2416

"Draft mining regulations insufficient to protect the deep sea – IUCN Report," (2018), accessed at <https://www.iucn.org/news/secretariat/201807/draft-mining-regulations-insufficient-protect-deep-sea-%E2%80%93-iucn-report>

"The Future of Our Ocean," (2016), Global Ocean Commission, accessed at http://www.some.ox.ac.uk/wp-content/uploads/2016/03/GOC_2016_Report_FINAL_7_3.low_1.pdf

"Protecting 30 percent of the ocean has many benefits," C. Roberts, B. O'Leary (2016), University of York, accessed at <https://www.york.ac.uk/news-and-events/news/2016/research/oceans-conservation-fisheries/>

"The Global Wind Report 2017," Global Wind Energy Council, accessed at <https://gwec.net/policy-research/reports/>

"Charlevoix Blueprint for Healthy Oceans, Seas and Resilient Coastal Communities," (2018), G7, accessed at <https://g7.gc.ca/en/official-documents/charlevoix-blueprint-healthy-oceans-seas-resilient-coastal-communities/>

"2018's top 10 ocean news stories (commentary)," D. McCauley and F. Joyce (2018), Mongabay, accessed at <https://news.mongabay.com/2018/12/2018s-top-10-ocean-news-stories-commentary/>



SOA
SUSTAINABLE OCEAN ALLIANCE

Developing Leaders.
Cultivating Ideas.
Accelerating Solutions.

Sustainable Ocean Alliance has identified the key issues in 2018 and priorities for 2019. If there are issues you think should be included in the 2020 version of *State of Our Ocean*, please email our Communications Manager at information@soalliance.org.