THE BLUEPRINT

Of the Blue Planet's Impending Crisis

Vasundhara Issue 6 | June 2021

BLUE ECONOMY

It's impossible to go green without blue

YUVAN AVES

"An informed citizenry ensures good governance."



021 United Nations Decade of Ocean Science for Sustainable Development





On this 'Ocean Decade 2021-2030,' Eco-Club is delighted to bring "The BluePrint," the Sixth issue of Vasundhara Magazine, also the official Magazine of TERI School of Advanced Studies. This is a complimentary and innovative initiative aimed at bringing essential challenges in Environment and Sustainability domain to the attention of thoughtful community. We thank the contributors for sharing their personal experiences and anecdotes. The information in the Magazine was compiled from a variety of research papers/articles/government databases. This edition's information is true to the best of our knowledge as of June 15, 2021. However this should not be used as a substitute for scientific study.

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"Blue Planet"

This is the name Earth earned due to the abundance of water when viewed from space.

As a result, everything associated with water is referred to as "blue," such as "blue bonds," "blue economy," "blue justice," "blue revolution," and so on. Isn't it fascinating? Blue is also the hue of the sky, which signifies openness, serenity, and depth depending on the gradient. As we go deeper, we may see anything from the tiniest zooplankton on the surface to coral reefs to blue whales to flatfish. Just like life, blue waters have it all in a balanced manner.

With only 5% of our waters explored by humans, we know more about the surface of the moon than we do about our own oceans, which is an exciting and kind of mystery hidden in itself. Beyond fish and ships, our oceans supply climate management, clean air, blue carbon, coastal protection, renewable energy including ocean energy, floating solar energy, and offshore wind power, a home, food, trade and transportation, tourism and recreation, oil, and gas, revenue, and jobs, medicines, and so much more. These oceans sustain the livelihoods of 3 billion people who rely on them directly.

Despite the fact that they have so much to offer, we are seeing alarming declines in fish stocks, the death of our reefs, and sealevel rise that could force hundreds of millions of people to relocate. The oceans are gradually becoming lifeless. and that's because of Us. The situation is so grave that it is predicted that **by 2050, there will be more plastic in the oceans than fish.** This is just one of many potentially disastrous outcomes that could occur in the future.

Now is the time to repair our Blue Planet. It's time to stop leaving carbon footprints and start living only with footprints. To accelerate this process, the United Nations has launched the **Ocean Decade 2021-2030** to support the Sustainable development of our shared oceans, which officially commenced on June 1, 2021.

On that note, I am delighted to be able to share this issue titled **'The BluePrint**' with you. A Blueprint of the crisis is depicted in order to realize the true potential of the Ocean Decade in restoring our Oceans. From Ocean's exquisite beauty to the contemporary impacts we are witnessing to their solutions, every attempt has been made to incorporate most facets of the oceans. My gratitude knows no bounds towards Dr Fawzia for being a guiding light throughout the journey.

In these extraordinary times, when the entire country is fighting the second wave and we have no idea what's next, this tiny gesture was done to show that the pandemic will not break us. We've come to fight, to rise, and to shine. Let there be hope and strength. And let's not give the pandemic the upper hand...

> You can't stop the waves, but you can learn to surf. - John Kabat-Zan



The science required to create the ocean of our dreams.

The Ocean Decade 2021 – 2030 will offer a 'once-in-a-lifetime' chance for countries to collaborate to provide the global ocean science needed to ensure the long-term sustainability of our shared ocean.

Decoding Oceans and their Significance

The global average temperature has risen by 1.2°C since pre-industrial levels, which occurred between 1850 and 1900. 2020 was the second warmest year on record after 2016.

Yet, despite the pandemic shutdowns, carbon dioxide (CO2) levels in the atmosphere have risen to their highest level in almost 4 million years, reaching 419 parts per million, the highest level ever recorded in human history.

Furthermore, a <u>recent study</u> indicates that there is a **40% chance** that we may temporarily reach the **1.5°C tipping point** in any one of the next five years, after which the probability of extreme drought, wildfires, floods, and food shortages will skyrocket.

Another <u>research</u> shows, the Earth will hit a temperature tipping point in the next 20 to 30 years, with the cumulative effect known as the "land carbon sink" diminishing as temperatures increase.

Emissions and temperatures are both smashing records. But do we really have to be concerned?

Yes, if humanity is to be saved!

The three poles, which endure more heat than other portions of the planet, are already showing symptoms of danger: the North Pole, South Pole, and Third Pole, which represent the Arctic, Antarctica, and Himalayas, respectively.

- The Thwaites glacier in Antarctica, which is larger than the United Kingdom, is melting faster than
 previously anticipated due to more warm water flowing beneath it, posing a risk of splitting up.
 Breaking up of this world's largest glacier can result in a 65-cm rise in sea level, in the coming
 decades.
- For the last 30 years, the Arctic has warmed at least twice as fast as the rest of the world, due to a phenomenon known as Arctic amplification. The extent of polar sea ice in July 2019 was at its lowest in 40 years.
- Greenland lost 152 gigatons of ice between September 2019 and August 2020. 1 gigaton of water can fill 4,00,000 Olympic-sized swimming pools. Water 152 times that amount has been added to the Oceans, while the ocean surface rose, so did its temperature. "Greenland is going to be the canary in the coal mine, and the canary is already pretty much dead," said Ohio State University glaciologist, Ian Howat.
- A third of the ice shelves in Antarctica are expected to melt due to global warming of 4°C. If the temperature rises and the ice buffers evaporate, unimaginable amounts of water will rush into the oceans, warn UK experts. The floating ice shelf works like a cork in a bottle, preventing the rapidly melting glacier's considerably greater ice mass from spilling into the ocean.

The ice is melting at an alarming rate, as is the sea level!

Let's consider this: What will we lose if sea levels rise?

- **Oxygen**: Marine plants, nearly all of which are marine algae, create 70-80% of the oxygen humans breathe in the global ocean the Earth's oceanic waters, which includes the Arctic, Atlantic, Indian, Pacific, and Southern (Antarctic) oceans more than all of the world's rainforests combined.
- **Temperature regulator**: Temperature is moderated by absorbing and dispersing solar radiation so that no spot becomes too hot for life to thrive in, as well as warming colder places.
- Water cycle balance: The water cycle the transport of water from the seas to the air to the clouds, over miles, and back to the sea or to fall on land is fueled by oceans. Rain would be extremely rare if clouds did not form over the ocean, and the planet would become desert. Every year, we would see our lakes and water supplies dwindle a little more until there was nothing left.
- **Carbon sink**: The ocean sequesters roughly one-third of all carbon emissions, more than any other body on the planet. Carbon dating back 8,000 years has been discovered in the deepest Blue Hole. (More on page no. 15)
- **Green Space**: Aside from the ordinary hazards of fire due to desertification (because of the disrupted water cycle), the fires would dump tonnes of carbon dioxide into the already suffocating atmosphere, hastening global warming. Plants will die, leaving no oxygen for humans, assuming they survive the oppressive heat.
- Livelihood: 500 million people dependent on ocean ecosystems for coastal protection and livelihoods will be vulnerable.
- Food security: 90% of the world's seafood comes from small-scale fisheries. The ocean is the Number 1 source of protein for more than a billion people.
- Economy: ²/₃ of global gross marine product relies on a healthy ocean. The value of the ocean economy is estimated to be \$2.5 trillion, making the Ocean the world's seventh-largest economy.

As a result, disrupting any cycle or removing any component would imply disrupting our shared Ocean. Thus, Oceans are critical. The entire amount of vertebrate sea life (including fish) has fallen by over a third since 1970!

According to the United Nations Development Programme (UNDP), the Hindu Kush Himalayan (HKH) mountain ranges, might lose up to ²/₃ of their ice by 2100, putting 2 billion people at risk of food and water shortages.

Lake Poopó, Bolivia's second-largest lake, has vanished, leaving kilometers of dry ground in its wake owing to Climate Change and Human negligence. Lake Poopó was everything to the 'Uru,' also known as the 'people of water.' It was their source of livelihood and even their identity.

Overall, climate action isn't just about restoring Polar bears, Penguins, and melting ice caps; it's about us, saving Humans.

It is past time to break free from this addiction by shifting away from the use of fossil fuels in energy, transportation, and other sectors, as well as changing diets and agricultural practices to limit Climate change.

HERSING TIDE

The climate change-sea level rise (SLR) nexus has been a topic of vivid interest in the climatology realm. It has been established that global climate change is a significant factor behind sea-level rise. Research estimates that sea levels have risen approximately by <u>8</u> centimeters in the last 23 years.

Scientists predict that this rate of acceleration has been more rapid than it was half a century ago. Global warming is the primary concern behind the climate crisis and rising sea levels. There are several drivers of sea-level rise, the most common ones are thermal expansion of water and melting of glaciers in Greenland, Antarctica.

Oceans play an important role in our ecosystem <u>by</u> <u>absorbing heat and carbon dioxide</u> from the atmosphere, as we burn more and more fossil fuels and release carbon dioxide and other harmful gases, the ocean heat rises. Environmental degradation and biodiversity depletion also contribute to rising CO2 levels, almost 19% of global carbon dioxide emissions can be attributed to deforestation. Research also suggests that rising sea levels are inextricably connected to tsunamis. It is because of sea-level rise, that tsunamis of smaller scales now pose a big threat, as they can now infiltrate further inland, causing more damage.

Rising sea levels have also increased the frequency of <u>King tides</u> around the globe. The daily average height of water level reached by high tides has increased, hence making coastal areas more prone to flooding.

Sinking Cities and Islands

If sea levels continue to rise at the current rate, it will jeopardize the lives of thousands of communities who reside in coastal areas, eventually, coastal populations would be forced to relocate, which will, in turn, disrupt the demographic distribution. The world will see a new cohort of climate refugees. It is also estimated that due to rising sea levels, lowlands and several island countries might go underwater.

The Republic of **Maldives** is an island country, southwest of India, consisting of almost <u>1200</u> coral islands, most of which lie just above 1.8 meters from sea level. If climate change isn't checked now, the island country will completely go underwater, affecting the lives of almost 350,000 people.

The President of Maldives, Mohamed Nasheed conducted an <u>underwater</u> <u>cabinet meeting</u> to highlight the deteriorating status of the island. "We are trying to send our message to let the world know what is happening and what will happen to the Maldives if climate change checked", President Nasheed said.



Moving on to Southeast Asia, The Republic of Indonesia is an archipelago country consisting of 14,752 islands, approximately. Its capital city, Jakarta, is sinking. It is the fastest sinking city, in the world. It is estimated that some areas in Jakarta are sinking by almost 25 centimeters. Jakarta now already stands below sea level. Several reasons can be attributed to Jakarta's situation, the primary reason being global warming. The situation is critical to the point that walls have been built around the city to hold back water due to rising sea levels. The walls however have already started to leak and break apart. Another important factor behind Jakarta's sinking is the overuse of groundwater, almost 60% of the population relies on groundwater.

Excessive groundwater pumping makes the surface of the land weak, which then can break apart and sink, this phenomenon is called groundwater-related subsidence. The area has witnessed a surge in the frequency of massive floods since the 2000s. The water system of the city is faulty and supports a huge population. 85% of the wastewater generated in the city is directly dumped into oceans and only <u>5%</u> of the city has a sewerage system. Almost 95% of North Jakarta might go underwater by 2050.

Singapore, being a low-lying island, has historically been under serious threats of flash flooding, heavy downpours, and thunderstorms due to climate change. Despite covering only 0.0005% of the world's land area, it contributes approximately 0.11% of global carbon emissions, with the industrial sector being the predominant contributor. It is estimated that the island nation is warming up at a 2x rate than other nations, witnessing a rise of 0.25 degrees Celsius annually. Similarly, the city of <u>Mumbai in India is estimated to</u> <u>go underwater by 2100</u> as well. Mumbai is a manmade city, an amalgamation of 7 islands. It is India's financial capital and is the synonym for "Big City" in India. A city where, as Indians often say, every dream comes true. However, Mumbai is also one of the most populated cities in the world and is struggling with crumbling infrastructure.

During heavy downpours, the city often finds it difficult to drain out regular floodwater, this situation would be further aggravated with rising sea levels. The low-lying geography of the city, in conjunction with an intense burden on natural resources, makes the situation worse. The city is already below the sea level at high tides and is facing the worst of floods in a lifetime, and if sea levels continue to rise, Mumbai will submerge, killing millions of its people.

The World and Palm Islands are man-made archipelagos extravagant islands in Dubai. The World is a man-made archipelago resembling the countries of the Earth, so massive that it is visible from space. The ambition was to build luxury hotels and offices on the islands, exclusively for the super-rich. However, The World is now sinking. The sands on which the islands were built are <u>falling back into the</u> sea. Likewise, Palm Islands is another group of manmade islands that stretch over 5 kilometers into the Arabian Gulf. It is being speculated that the Palm Island grounds are sinking downwards and with the expected rise in sea level in the imminent future, Palm Islands may go underwater. The construction of such islands has harmed the local flora and fauna. Sediments from such constructions can suffocate local aquatic animals and reduce the rate of infiltration of sunlight into the water bodies, affecting aquatic plants.

Lakshadweep as well isn't spared. It's sinking too!

Samudra: Ocean; Saga: Story Samudra Saga: Tale of the Ocean

Approximately 80% of the world's wastewater is released untreated. 1 out of every 3 fish stocks is overfished, depleting 90% of the world's big fish population.

Blue Carbon

Coastal and marine ecosystems are critical for climate change mitigation. Mangrove forests, tidal marshes, and seagrass meadows are examples of 'blue carbon' habitats that are extremely effective at trapping carbon. Mangrove forests, for example, absorb carbon 4x faster than terrestrial forests of the same size. However, each year, the potential of these settings to retain blue carbon is decreasing by an estimated 2-7% due to deterioration.

Marine Bird

Seabirds are among the most endangered birds on the planet. The International Union for Conservation of Nature (IUCN) recognizes 22 Albatross species, 15 of which are threatened with extinction and 7 of which are endangered or critically endangered.

Threats: Entanglement by fishing lines and nets, presence of invasive predators like cats and rats, plastic pollution

Marine Animal

1.Sea Horse

Seabird

According to the IUCN Red List, 12 of the 41 known species of seahorses are classified as threatened, while 20 others are listed as data deficient.

Threats: Pollution, eutrophication, and habitat destruction by fishing or tourism.

2. Merida Coral Snake

The Merida Coral Snake, the Catamayo Coral snake, and the Villavicencio Coral Snake constitute under the threatened, vulnerable, and critically endangered categories.

Threats: Habitat destruction, sea salinity, sedimentation

3. Goliath Grouper

Currently, about 12.4% of the global grouper species are threatened, 30% are treated as data deficient while 14% are near threatened. Atlantic Goliath groupers are critically endangered while the Nassau grouper is considered endangered by IUCN.

Threats: Overfishing

4. Daggernose shark

Sharks are deep-water pelagic species constituting 17% of threatened species, 13% near threatened, and 47% of data deficient species. All 7 species of sawfish, the large rays, are listed as critically endangered. 21% of the angel shark species are critically endangered while 78% are threatened.

Threats: Harmful fishing practices, demand for shark products and their fins, lack of shark fisheries management

Mangroves

Mangroves have been lost at a rate of 30-50% over the last 50 years. Their area is still shrinking at a rate of 2% per year. And when mangroves degrade, they emit a lot of carbon. Mangroves are estimated to contribute up to 10% of global deforestation emissions.

• Tidal Marshes

Marshes are shrinking at a rate of 1-2% per year due to development, conversion to farmland, or being covered by rising sea levels.

Seagrass Meadows

Seagrass meadows are also one of the most endangered ecosystems on the planet. Every year, seagrass coverage decreases by 1.5%. Over the last century, approximately 29% of the world's seagrass meadows have died out.

Marine Species

1. Blue whales (Balaenoptera musculus)

Over 100 feet in length, sitting on top of the food chain, whales play a significant role in maintaining the ecological equilibrium. Weighing 200 tons which is equal to 33 elephants, these folks are the largest animal on the planet, and their heart is the size of a Volkswagen beetle!

Threats: Climate Change, Habitat loss, exposure to toxins and harmful chemicals, fishing gear, and other foreign plastics.

2. Hawaiian monk seal (Neomonachus schauinslandi)

An endangered species of earless seal is endemic to the Hawaiian Islands.

Threats: Climate change, careless disposal of plastic and fishing nets, fishing gear, or get accidentally hooked or tangled in nets.

3. Black Skimmers (Rynchops niger)

As a beach-nesting species, the black skimmer is quite a vulnerable species.

Threats: Habitat inundation due to sea-level rise, habitat fragmentation, changes in coastal development patterns due to global climate change, overpopulation, and urbanization

4. Manatees (Trichechus sp.)

Manatees, a giant vegetarian that only feeds on flora, are just one step closer to extinction!

Threats: Global climate change, toxic algae due to growing pollution related to anthropogenic causes, loss of habitat, overexploitation, and growing plastic pollution

AMAZON OF THE OCEANS

Why are Coral Reefs Important?

Often referred to as the "Rainforests of Oceans", coral reefs are deemed to be one of the most primary elements of the biosphere. They play an important role in the ecosystem that renders benefits to humans as well as non-human components of life. Despite occupying only 0.1% of the world's ocean area, coral reefs support a quarter of all marine species. Reefs function as a place of habitat and a hiding place for several aquatic animals, which in turn, contribute to the marine ecosystem by filtering water and removing excess algae from the water bodies.



Coral reefs also play a significant role in promoting tourism, by virtue of which, it acts as pillars for several economies. It is estimated that the annual economic worth of colorful coral reefs ranges between \$29.8 billion to \$375 billion, supporting the livelihoods of around 500 million people. It is estimated that The Great Barrier Reef alone generates approximately \$1.5 billion each year, via fishing and tourism, thus acting as the backbone of Australia's economy.

Coral reefs absorb 97% of wave energy and operate as a storm barrier. <u>Anthropogenic activities</u> however have put coral reefs and corals under threat; nearly half of the world's coral reefs are no more..

Oil Pollution

Oil spills have a dual effect on water pollution and coral damage. Oil spilled over oceans typically floats on the water's surface. While this may protect deepsea corals from oil pollution, it may harm coral eggs and sperm that stay at the water's surface before fertilization.

Blast/Cyanide Fishing



In blast fishing, dynamites and/or explosives are triggered and exploded to draw fishes out of the crevices of coral reefs. The process stresses corals to the extent that they are compelled to expel their zooxanthellae, photosynthetic algae that live in their tissues maintaining a mutualistic relationship.

Likewise, cyanide fishing is a process where fishermen spray cyanide over reefs to stun and capture live fish, which stay hidden in reef crevices. Along the process, cyanide kills coral polyps and algae, important for symbiosis. It also degrades the coral reefs. Cyanide fishing is most common in Southeast Asia and South Pacific.

Blast fishing is a prevalent activity in almost 40 countries, while cyanide fishing is practiced in almost 15 countries. Both the fishing practices are carried out for colorful fish and reefs, which have a high demand in the lucrative aquarium and jewelry trade.

Deep-Water Trawling

This fishing technique involves dragging heavy nets across the sea bed, at a depth of more than 1 km. Such nets are fitted with rockhoppers or rubber rollers which destroy the corals along the sea bottom.



Coral Mining

Coral mining is the process of extracting live corals from the water and using them for other uses such as bricks, road fill, etc. Corals comprise limestone, which is mined as raw material for making cement used in building construction. Dead corals can be mined for calcium supplements, souvenirs or jewelry, and the marine aquarium industry.

Coral mining can take place anywhere around the world, where there is -coral, shallow water, but some of the regions where it is practiced extensively include The Maldives, Panama, The Great Barrier Reef, Indonesia, and East Asia.

Due to coral mining, polyps lose the substrate with which to attach themselves to the reef, this inhibits the growth of the reef. Sedimentation caused by mining can adversely affect aquatic animals as well. Removing corals can also make coastal areas more vulnerable to storms, floods, and coastal erosion.

Coral bleaching

In simple terms, coral bleaching refers to the whitening of corals, which indicates coral death or degradation. Coral bleaching happens when corals lose their symbiotic algae called zooxanthellae or when the algae lose their photosynthetic pigment due to the high sea surface temperature. Likewise, alteration of seawater chemistry due to anthropogenic water pollution and ocean acidification (indirectly related to the combustion of fossil fuels) can also trigger the bleaching of corals. Cyanide used to capture fish and sedimentation can also cause bleaching of corals. <u>Sunscreens</u> used by beach tourists are also a major cause of bleaching. Sunscreens rich in oxybenzone can cause corals to lose nutrients, turn white and die. Palau was the first country to have banned "reef-toxic" sunscreens. Tourists bringing in such sunscreens will have to pay a fine of up to \$1,000 and such sunscreens will also be confiscated.

Coral bleaching will not only affect the habitats of aquatic plants and animals but can make some aquatic species go extinct. As corals would lose color, it'll severely affect the economy and livelihoods of several countries where marine tourism is a significant contributor to GDP and employment.

Lakshadweep is a group of islands located 200 to 440 kilometres (120 to 270 miles) off the southwestern coast of India in the Arabian Sea. It is a union territory as recognized by Gol.

Coral bleaching has become an area of severe concern here. According to research conducted by the Nature Conservation Foundation (NCF), coral cover in Lakshadweep has decreased from <u>51.6 % in 1998 to 11% in</u> <u>2017.</u> The reason is the rising sea temperature caused by the El Nino ocean current.



Corals are the most productive and wonderful ecosystems on earth. We must conserve corals at any cost. Some organisations like Coral Reef Alliance, Ocean Conservancy, Coral Restoration FoundationReef Check Worldwide and many more have been actively participating in saving our very own corals. As an individual, we can pledge to not pollute our oceans and rest will follow.,



The Dearth of Humanness

Columbian

Endangered whales shrinking

North Atlantic right whales 3 feet shorter than 20 years ago

Home / News / Agrifood / Food chain **sustainability** / Black Sea facing ecological disaster due to overfishing

Black Sea facing ecological disaster due to overfishing

MATT SIMON

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04.01.21 8:00 AM SCIENCE

Narwhal Tusks Tell a Troubling Tale

An analysis of the 10-foot-long teeth shows that as the Arctic warms, narwhal diets are changing, and their bodies are accumulating more mercury.



Home > Environment

ENVIRONMENT LOCAL

Deadly stony coral water areas or die spreads to West Bay

What do sea turtles eat? Unfortunately, plastic bags.

Could rise in Panama City Beach tourism be causing dip in sea turtle nesting this year?





Q MENU Ô

Scientists are Saving Critically Endangered Vaquitas by Listening to nem

Island Restoration

SCIENCE Sea lions, turtles and iguanas are already encountering plastic in the Galapagos islanc DownToEarth

CLIMATE CHANGE

Global warming: Mollusc species collapsing in eastern Mediterranean, finds study

Marine organisms that cannot adapt to rising temperatures migrate to cooler

> ctic shipping more than doubled in six years putting whales and other marine life at risk



Seascape: the state of our oceans 'Aphrodisiac' of the ocean: how sea cucumbers became gold for organised crime

Overfishing and smuggling of this crucial animal are affecting biodiversity and the livelihood of local fishers in Sri Lanka

aribbean islands face loss of otection and biodiversity as agrass loses terrain

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26 May 2021

Let this end.

CARBON SEQUESTRATION through oceans

Researchers say that the removal of carbon from the atmosphere will depend on emissions in the coming years. Initiatives like the Paris agreement and the Kyoto protocol have compelled countries to reduce and maintain certain CO2 levels. This can only happen if we reduce the already existing carbon dioxide in the atmosphere.

As the climate change situation worsens, Oceans seem to be the potential solution. Now, why this topic is important is because of the lesser-known yet crucial role of water bodies. Currently, Oceans absorb $\frac{1}{3}$ of the carbon emitted by human activity, roughly 2 billion metric tons each year. This would increase the concentration in the oceans by only 2% but will double the load in the atmosphere.

Oceans are responsible for 'Carbon Sequestration' or the process by which carbon dioxide is removed from the atmosphere, which is achieved through various chemical and biological processes. Colder and nutrient-rich parts of the ocean absorb more carbon dioxide than warmer parts. Therefore, polar regions like the Arctic Ocean are referred to as carbon sinks. Plankton at the ocean surface use photosynthesis to convert carbon dioxide into sugars in the same way trees and land plants do on land. Sea creatures consume these planktons and absorb carbon. And when they die, they sink to the bottom of the ocean. The problem with this is that when they decompose the carbon gets released back into the water, and if the number of plankton is not closely observed the plankton could begin to die off.

It is also contributing to a rise in ocean acidification and making it more difficult for organisms like oysters and corals to build shells. Therefore, there should be a strategic plan or method which not only removes Carbon dioxide from the atmosphere but also reduces acidification for aquatic life and increases their diversity.



Researchers have come up with 3 possible approaches for storing carbon in oceans:

- Chemical It involves alkalinity to store CO2 as dissolved solid minerals by adding carbonate and silicate materials into the oceans.
- Biological or fertilizing Ocean It is basically a biological method that helps in carbon sequestration by the <u>phytoplanktonic</u> photosynthesis process. It involves Ocean Iron fertilization, large scale seaweed cultivation, and restoring a coral ecosystem that stores carbon.
- Electrochemical This process includes electricity to accelerate chemical reactions that store carbon. This involves seawater electrodialysis. Engineers from MIT developed a large, specialized battery that can suck CO2 from a stream of air, even if it is present in very low concentrations. Also, Scripps Institution of Oceanography have developed SOLO, a "robotic carbon observer", equipped with instruments for measuring organic and inorganic carbon, both in solution and tied up In particles

Carbon footprint is not only about Pacific garbage patch and saving turtles but also about ocean acidification, carbon sinks, and important organisms like planktons. It's time to put the technology to its best use for the oceans, marine life, and the planet.

Our oceans are being choked with plastic.

3% of all plastic produced in the world is estimated to end up in the ocean. The main pathways for plastics into the ocean are road run-off (66%), wastewater treatment systems (25%), and wind transfer (7%).

- Every year, at least 8 million tonnes of plastic end up in our oceans, accounting for 80% of all marine debris from surface waters to deep-sea sediments, and to be precise it's about **dumping one truckload of plastic** every minute.
- Abandoned fishing gear, often known as ghost gear, is a huge threat to marine biodiversity, accounting for up to 10% of plastic trash in our oceans by volume, making ghost gear the most destructive form of plastic pollution to marine organisms.
- Discarded nets, lines, and ropes now account for approximately 46% of the Great Pacific Garbage Patch. As it degrades, ghost gear continues to trap species long after it has been abandoned, pollutes ecosystems, and enters the food web.
- According to a recent study, only **10 plastic products accounted for 75% of all garbage found in our oceans** i.e. plastic bags, plastic bottles, cutlery, wrappers, synthetic rope, fishing items, plastic caps, industrial packaging, glass bottles, drink cans in that order.

Microplastics

- Plastic shreds as small as a grain of sand have been found in our oceans, contaminating our food and water. These 'microplastics,' which are bits smaller than 5 mm, can arise from a variety of sources.
- A single washing machine load of acrylic clothing can release an estimated 7,30,000 fibers into the wastewater system. Synthetic fabrics account for more than ¹/₃ of the microplastics found in our oceans followed by car tyres as the second-largest source, accounting for 28% of all emissions as a result of erosive wear while driving. Other sources of microplastics include city dust, road markings, marine coatings, personal care products, and plastic pellets.

Plastic debris ingests or entangles marine species, causing severe injuries and deaths. Plastic pollution jeopardizes food safety and quality, endangers human health, and harms coastal tourism while also contributing to climate change.

The 5 floating plastic islands also known as garbage patches are all set to annihilate much marine life while also contributing to climate change, which kills over a million animals each year. Some of these garbage patches, such as the one in the North Pacific, are the size of France, Spain, and Germany combined.

COVID-19 and Ocean plastic

The pandemic has provided the Oceans with an ecological timebomb - gloves, masks, PPE, and bottles of hand sanitizer, so much so that we may soon have more masks in the Mediterranean than jellyfish.

5 minutes in your hand, 1000 years in the oceans!

More than 90% of seabirds have plastic in their stomachs.





Who is the major polluter?

Asian rivers account for 81% of the plastic waste that enters the world's oceans. Surprisingly, 90% of all plastic waste entering the world's oceans originates in just 10 rivers, the majority of which flow through Asia's most polluted cities. The Yangtze River, China's longest river, is the worst offender, with 1.47 million tonnes of plastic pollution reaching the oceans each year, primarily as a result of densely populated areas nearby, inadequate waste management, and garbage imports.



... the list goes on and on; you can always come up with your own solutions, ensuring that there is no greenwashing, and communicating this message to the common society will help increase the odds of having breathable oceans because what goes into our Oceans goes into our food.

Oceans are now seen as not only a '**Carbon sink**' but also a '**Plastic sink**'. Every year, 570,000 tonnes of plastic enter the Mediterranean, which is equivalent to dumping 33,800 plastic bottles into the sea every minute.

Law of the Sea and Geoengineering An Introduction

With Climate Change emerging as the most potent threat to the planet, one strategy that is being considered to counter and tackle climate change is geoengineering. It is understood as an intentional manipulation of the Earth's climate system on a large scale while ensuring that there is no disruption of energy and resource-intensive economies. Geoengineering has been defined by the Intergovernmental Panel on Climate Change (IPCC) as a large set of methods and technologies aimed at deliberately changing climate change to reduce the adverse impacts of climate change. Most, but not all, methods are designed to achieve either: reducing the amount of solar energy absorbed into the climate system (solar radiation management, SRM) or increasing the atmospheric net carbon sink to an extent that is sufficiently large to alter the climate (i.e., carbon dioxide removal, CDR).

For the purpose of international environmental law, the most important aspect of geoengineering is that its large-scale outdoor research and implementation would have an impact on the environment within the country and in areas beyond national jurisdictions. Holistic evaluations of such technologies also demonstrate that if implemented it will deteriorate the current environmental conditions instead of improving or mitigating the impact of global warming. Largescale geoengineering is also an unacceptable option for many non-state actors because irreversibility and negative implications can impact the power dynamics and inequity between the states.

The Oceans have been considered as one of the most important areas to be governed by the international community and have been an object of International law. The United Nations Convention on the Law of the Sea (hereinafter UNCLOS) is a comprehensive multilateral agreement that established a legal and institutional setting for international cooperation to govern the activities of states and private actors in, and above the oceans. The UNCLOS also becomes relevant for the assessment and regulation of Geoengineering projects that involve the oceans and might adversely impact the marine environment.

The UNCLOS also provides that "States have the obligation to protect and preserve the marine environment" without qualification or exception. The sovereign right to exploit their natural resources is explicitly subject to their duty to protect and preserve the marine environment. In this context, geoengineering could be considered a means of exploiting the ocean's natural resources. For CDR, the natural resource would be the water's ability to absorb carbon. Applying this category to SRM is difficult but not impossible, for example, considering the ocean's capacity to produce reflective clouds as a natural resource.

Under certain circumstances, UNCLOS could be used as a possible justification for geoengineering. In the case of CDR, parties to the convention might make the case that the threat to the ocean pH due to acidification is more severe than the environmental harm of the geoengineering project. Since there is a strong link between atmospheric CO2 and ocean acidification, sequestering CO2 might be argued to fulfill a state's responsibility under UNCLOS Article 192 or 194(1). This justification would, however, not be available for SRM methods. It is also less likely to be successful for Ocean Fertilisation given the breadth of evidence regarding its potentially negative environmental impacts. The oceans act as carbon sinks and have the capacity to absorb approximately ¼ of anthropogenic carbon dioxide emissions. Once emissions reduce and cease, this process will continue, eventually removing most of the remaining anthropogenic carbon dioxide until the atmosphere and ocean reach a new equilibrium. In this regard, some CDR methods would arguably not be a transfer and transformation, but instead merely the acceleration of a process that is already occurring in response to anthropogenic disturbance to the atmosphere.

Although in many ways it remains uncertain whether UNCLOS can be used for specific scenarios of geoengineering but it is also very important to currently note, despite the fact that UNCLOS is one of the most powerful legally binding instruments, it has not been implemented to its full potential to ensure the protection of the marine ecosystem. This is a pity because the extensive scope and largely unqualified nature of its environmental provisions mean that it is at present also the only legally binding global instrument that could be invoked to challenge any proposed geoengineering project on environmental grounds.

Hemavathi S Shekhar Ph.D. Legal Studies Department, TERI New Delhi

MPAs for Building Ecosystem Resilience to Climate Change

Oceans are believed to be the cradle of all life forms on the Blue planet. From planktons to blue whales various life forms burgeon in the ocean. While oceans support so many different life forms, it cannot be denied that over the years there has been a drastic change in the health of the oceans. The health of the oceans is deteriorating leading to the formation of oxygen-depleted zones called Dead zones in the oceans. These zones are not able to support any life forms and are increasing at an alarming rate due to anthropogenic activities.

Sea level rise and acidification

Climate projections made by the Intergovernmental Panel on Climate Change (IPCC) indicate that the sea level is expected to rise by 11-88 cm by the year 2100. Among the many impacts of sea-level rise are the adverse effects that warmer temperatures will have on the world's fisheries. It is predicted that the abundance and fecundity of fisheries will decline due to the warming of the oceans, low dissolved oxygen, and nutrients at the ocean surface, reduced phytoplankton biomass, shifts in range and species abundance patterns, and ocean acidification, changes in salinity structure, and changes in upwelling, These changes may lead to alteration of developmental times, and create mismatches between the developmental stages of fish species and food sources, along with reduced body size. Since pre-industrial times, the oceans have absorbed ¹/₃ of the human emissions of CO₂, causing the surface ocean layers to become an average of 26% more acidic. If this trend continues, acidity will increase by 100% or higher by the year 2100. Acidification of the oceans is raising concern due to increased stress on marine life.

Marine Protected Areas for adaptation to climate change

With the emissions of greenhouse gases (GHGs) and their impacts accelerating, it may be that even the Paris Agreement that resolved an extreme emissions reduction trajectory to limit global warming to 1.5°C by the year 2100, will not deflect the grave stress and damage to life on Earth.

These heightened impacts will have notable consequences for wildlife and will place many of the benefits received from the environment at risk. Therefore, apart from taking aggressive measures to reducing GHGs, it is urgent to enhance ecosystem resilience, preserve their wildlife, and secure their ability to provide essential goods and services. This may be achieved by the highly practical and costeffective strategy of creating Marine Protected Areas (MPAs). In conjunction with strong fisheries management practices outside them, MPAs have effectively served, as a nature-based tool, for repairing damage to habitats and overexploited fish stocks and for biodiversity conservation. However, the benefits accrued from an MPA are greatly dependent on the efficacy of implementation and management, and in particular, to the level of protection accorded to it, and thus a marine reserve produces the highest conservation benefits.

Marine protected areas are the primary mode by which nature-based solutions may be utilized to adapt to and mitigate the effects of climate change. The implementation of Aichi Target 11 would advance the quantitative aspects of SDG 14.5 and also the qualitative aspects of the MPAs. A competent plan for the conservation and management of MPAs considers both the habitat and species to be essential. Marine regions designated as MPAs could function as a network, serving to increase resilience to climate change and permit economic activities that are conservationbased, in particular during the current pandemic scenario. Effective management of an MPA utilizes an integrated approach, taking into account the ecological, social, and economic aspects, for sustainability in the long term. The outcomes would be increased food security and prosperity for mankind and may have the effect of offsetting predicted declines in the productivity of oceans and fisheries.

> Ms. Christina De Souza Associate Fellow, Coastal Ecology and Marine Resources Centre, TERI Goa

Mapping the Vulnerabilities of Blue Sphere



Marine Life Dead Zones: Dead Zones where

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Q. The recent development projects have forced various fragile ecosystems under a lot of stress. We would like to know about one such ongoing project – the Adani Mega Port Project v/s the Pulicat Lagoon and how difficult or easy was it to urge people to join the movement?

Any kind of environmental or social justice has been pure because of an informed, proactive, persistent public. The great journalist P. Sainath rearticulates the Indian freedom movement. The history we read is that a few charismatic men got us freedom. That is not the case. Millions of people went out on the streets and got freedom for the country. So, an informed citizenry ensures good governance. Moving on to what is happening here in Chennai; we look at these projects and call them Development. Development is a very positive term so I use the word 'Discriminatory development' because often it's the powerful politicians that decide where and how the plans would be to profit people at the apex of power. It's not because those places are conducive for that project, or because of any scientific validity. They choose the sites to ensure people are easily overpowered. I live in Chennai, and historically South Chennai is where the zamindars, the landlords live, the rich cream; and North Chennai is a very hydrodynamic, fluid, watery place. Three rivers flow through there that form this massive expanse of salt marshes, mudflats, backwaters, creeks, coastal dunes paving the way to the 2nd largest brackish water body in India, the Pulicat lagoon where thousands of fisherfolks live. The first dirty industries of Chennai, the pharmaceutical companies and fertilizer factories came up in North Chennai and are very badly suited because of the constant influence of the ocean. It's extremely prone to cyclonic activities and floods as compared to South Chennai. These industries came because the people here did not have any political power. The people living in South Chennai can put the companies out of power so they chose a place where people can't speak for themselves. So, I think it's important in our narratives that we tarnish the word 'development' with 'discriminatory development' because it is

"An informed citizenry ensures good governance" In conversation with Yuvan Aves

Mr. Aves is a writer, educator and activist based in Chennai. His interests include reimagining an Earth-centric and childcentric education in schools, the reciprocity between languages and ecologies, and ground-up processes of change and politics.

most often the case. So right now what threatens the entire Chennai region is that there is an existing small shipyard and port facility of about 300 acres built by L&T and the Adani group is expanding it to 6,111 acres. There are a lot of illegalities and disturbing facts about it. Several hundred acres will be built on the Kosasthalaiyar river and breakwaters will be expanding more than 2 km into the ocean. If those currents are blocked, no sand comes in to replenish the sand lost through winds and the sea. Because of the unplanned development in Chennai every year there is an ocean intrusion of more than 50 meters per year. Pulicat is Chennai's guard against strong weather events because of its mangrove, sand dunes. Apart from the illegalities like the placement of the port inside the Pulicat Bird Sanctuary, the Adani Port will block the longshore currents and erode the sand islands that separate the Pulicat from the Bay of Bengal, hence making it susceptible to merging into the Bay.

Q. What do you think about the trade-off between development and the environment in developing countries?

I think the problems we face today are due to topdown structures. Policy, decision making, the law is decided by the people at apex, who are far away from ground reality and ramification of environmental mismanagement. The greatest examples of environmental good governance are the Adivasi communities, artisans, fisherfolks, who practice reciprocity. Their approach to governance is groundup, which means decision-making emerges from a place of deep belonging. All big decisions are made by WEIRD countries, which stands for Western Educated Industrialized Rich Democratic. But the reality of most countries is not WEIRD in that sense, so it cannot be applicable. The word Sustainability is a WEIRD concept. It has massive shortcomings because it makes you look at the earth as a resource to use, something inanimate, something to be exploited for a longer time. If you look at the communities like Maori, Kechua, their environmental management is the practice of mutual well-being, both for the resources as well as for themself. In a post-sustainability world, our values should be mutual well-being and reciprocity.

Q. Do you believe that the focus of the government has been on the tourists visiting Andaman rather than the indigenous communities or the islanders?

Would you like to share any interesting anecdotes from when you visited the Andaman and the local fishermen communities there?

I was in Havelock Island for a short while where we learned that the Indus Valley civilization was about 4000-4500 years old whereas the Andaman tribes have been there for almost 60,000 years! That's far back in time than Indian civilization which is not in common knowledge. They are ancient communities that have been living sustainably in such a fragile ecosystem. And we end up calling such people primitive. We've known these landscapes for a while and have made them unlivable within a few centuries. Looking through that lens, there is much to learn from practices, the value systems, the life philosophies of such people.

The latest threat to the Andaman is NITI Aayog's Mega-City plan, where the Onge tribes' last reserve exists. The plan is to relocate them to some other place. This raises a lot of questions: does somebody who has lived there for tens of thousands of years have greater autonomy or does this very recent political power entitle you to make this decision? It calls for deep humanitarian questions. This 'Vision Document' of NITI Aayog says 'we want to make it the next Singapore'. There are plans to lay cables from India, right under the ocean till the Andamans.

When the Indian Ocean Tsunami hit us in 2004, all local tribals started moving up the mountains the previous day. The great linguist G.N Debi had researched this in one of the greatest linguistic studies of India. The Nicobaris, the Jarawa, the Onge have words for wave textures which allows them to perceive different kinds of waveforms. They have dozens of ways of speaking about what the surface of the water looks like. They have words for the call of the White Bellied Sea Eagle and to understand where they should go out for fishing. Their language is ocean-centric and so they are able to sense even the slightest seismic disturbance on the waves and move upland. This entails a level of in-depth local information that our most advanced technical and meteorological instruments cannot provide.

While diving in the Andamans I've seen corals, the clownfish and the sea anemones, the Tridacnidae having huge giant clams that open and close, sea cucumbers. It was a pleasure to see Sand Bubbler crabs sift sand into tiny mustard seed-sized sand balls that radiate like sun rays across their severalsquare-meter burrows. Before your eyes, you can see them growing and then the tides wash it away. These are some memories I have of seeing life on the shores of Andaman.

Q. We see you inspire many people to stand up for the environment through your social media handles. How difficult is it to get people on board? And what is the government's response to this?

In activism, wins are few. You fight for five things and you might win one. When the public gets together and the energy collectivizes from the ground and grows, it is a very powerful movement. I'll give an example from a previous campaign. There is a place

called Vedanthangal, a bird sanctuary, which was threatened by illegal pharmaceutical factories that wanted to expand owing to which the government wanted to de-notify the bird sanctuary by 60%. We had a school campaign and asked a group of kids to make art. Art opens up humanity. I can't think of any other political or civic interaction a four-year-old could engage with and make their voice heard! The campaign spread and the government had to halt the project. With Pulicat we had a lot of positive developments. First, there was a public hearing where we had an art campaign that was so powerful, that it got published in magazines and journals in India and abroad. There was a school campaign again where 500 children signed a letter and sent it to authorities leading to a press conference. Thus, the public can do anything if they have faith, determination, and patience.

Q. You have been a popular writer amongst children for books like Saahi's Quest. How important is it for the younger generation to be at the forefront of these environmental issues and what is the way forward? How do we achieve that since education now has changed so much?

My greatest faith is in children. When you are a child you are proactive, you are naturally curious, you're asking questions, you're not politically correct. Parents tell you 'Hey! This is wrong.', you ask 'why?' If the entire citizenry imbibes this, it would change the way governance functions, it would change the way we look at the earth. The most stable, resilient ecosystems are the most diverse. Diversity is at the core of ecological resilience. Excluding other kinds of education is a kind of casteism. So, yes, I believe that reimagining educational institutions could change humanity.

Q. Would you like to share a message with the younger generation? How cautious should the youth be regarding the environment?

I want to say something which I have been writing about recently- Citizen science, by a geophysicist at the University of California. He works with 'complex system modeling'. His research includes different political cultures, prevalent practices in society and if that was time-scaled into the future, what would it end up doing to the earth?

He found that the only thing to reverse the ecological trends we are facing today is ground-up direct action, either via activism or self-governance systems that stem from the people on the ground, not from the top, imposed upon them. So, I think youth must be proactive, you don't accept what is told to you, you ask why and question every answer. The great poet Antonio Machado says, "Traveler, there is no path. The path is made by walking..."

You refuse to believe anything that parties with vested interest tell you, you develop the courage to create your own path, absolutely different from others. Be proactive at questioning and thinking and be informed. Environmental Tràde-Offs: What would you choose?

Quick Overview

As the planet teeters on the brink of an impending climate crisis, renewable sources of energy, especially wind, hydropower, and solar energy have emerged as unrivaled substitutes of fossil fuels, to truncate the world's dependence on oil and gas. While the debate on the relative efficiency of renewable energy sources, in comparison to fossil fuels, continues to persist, it has been proven time and again that tapping the aforementioned energy sources is an economically viable option, which also significantly contributes to environmental wellbeing.

Traditionally, wind turbines and solar panels have been installed on land. As technological evolution paced up and land resources became scarce, it was argued that water-based solar and wind harnessing technologies should be considered. The rationale behind renewable technologies on the water was that land space could be saved for living, infrastructure development, and farming.

Floating solar farms are more difficult to develop (additional cost) and run than land-based solar farms, which should come as no surprise given this is a relatively new solar power technology, it necessitates the use of specialist solar power equipment as well as expert solar panel installation knowledge. Floating solar capacity is rapidly increasing, from 70 megawatts peak power (MWp) in 2015 to 1,300 MWp in 2018. More than 300 floating solar projects exist today across the world. According to a <u>report</u>, global demand for floating solar power is predicted to expand by 22% annually on average from 2019 to 2024.

Why floating solar panels and wind turbines?

It has been argued that water-based renewable technologies are <u>potential improvements</u> over landbased ones. Water usually has a cooling effect on floating panels, which catapults their capacity for energy generation. Further, as floating PVs naturally form a shade over water bodies, it'll lower the temperature of the water, help maintain oxygen levels and prevent excessive evaporation. Due to insufficient sunlight infiltration, this shade makes photosynthesis difficult, restricting the growth of <u>autotrophic</u> organisms such as algae and other creatures. Algae can be hazardous to human health if found in a source of drinking water, and it can also cause the death of aquatic plants and animals.

Economically speaking, water bodies lying idle or used solely for recreational purposes can be put to good use, by installing solar panels on them, which will help to increase the 'scale' of production of renewable energy, and thus, help to sustain the energy requirements of a large population. Likewise, it has been argued that offshore wind farms can generate much more profit than wind farms on land. The speed of wind is usually higher over the sea, which enables wind turbines to generate almost twice as much energy as what would have been possible on land. In countries with a huge coastal population, large-scale wind energy production would be beneficial, both environmentally and economically, since a large population can be catered with a clean source of energy.

Now, it is true that floating solar panels and wind farms would help in increasing the scale of renewable energy production, which will, in turn, help us combat climate change, but how do these technologies affect the marine ecosystems? Are there any negative effects of such technologies?

Impact on the marine ecosystem

Several scientists and ecologists have expressed their concerns over the negative effects of photovoltaics on marine ecosystems. One of their prime concerns is that floating solar panels, which are spread out over large areas on water bodies, might prevent sunlight infiltration, which would jeopardize the process of photosynthesis under the water. Consequently, water bodies will lose phytoplankton, in conjunction with other aquatic plants. This would bring down the level of dissolved oxygen in the water. Aquatic animals dependent on underwater plants would die, and their decomposition would increase the water temperature, further depleting the level of dissolved oxygen. An increase in water temperature, coupled with an increase in discharge of inorganic nitrates and phosphates into the water body, would imminently result in eutrophication.

High saturation of nutrients can cause unprecedented algal growth which reduces the level of carbon dioxide in the water body and raises the pH. High pH disrupts the chemical composition of water bodies and poses a threat to the survival of those underwater organisms which heavily depend on chemical cues for survival and reproduction. Such organisms are often rendered "blind", once their chemosensory abilities start malfunctioning. As these dense algae eventually die, bacterial and/or microbial decomposition further decelerates the level of oxygen in the water, killing fish and creating "anoxic or dead zones". Such zones are devoid of oxygen, and hence are unable to support most organisms. Maintaining a stable temperature of water bodies is essential for aquatic ecosystems to function. With solar panels installed on the surface of water bodies, the thermal gradient would get disrupted, interfering with various levels of the food chain and biogeochemical cycles (water cycle, carbon cycle, nitrogen cycle) with major detrimental repercussions for the marine ecosystem. Thus, Floatovoltaics is a band-aid solution that will eventually fail.

<u>Aditya – India's first</u> <u>solar ferry</u>



NavAlt Solar & Electric Boats, have created "Aditya" - India's first solar ferry for Kerala State Water Transport Department. The ferry uses solar-powered, cost-efficient fueldriven ferries as a commercial mode of transport. Aditya is the first transport in the world that derives 80% of its energy requirements from solar power. It has a capacity of 75 passengers, can run for 6 hours on a bright sunny day, without external charging. If compared across the total cost of ownership over twenty years, solar ferries would cost 274.4 lakhs as against diesel ferries that would cost 914.7 lakhs. Hence, diesel ferries can approximately cost three times as much as solar ferries.

Solar shipping is the most effective option for water conveyance, it is not only environmentally friendly but also economically profitable. If more and more investment channels become available, renewable modes of transport can truly be an attractive option for a "Sustainable future." For Wind farms, the biggest challenge lies in the construction of wind turbines. While on one hand wind turbines have significant positive effects on the marine ecosystem, the <u>noise</u> released during their construction can displace dolphins, fishes, and other aquatic animals away from their habitat, for a considerable amount of time. Such noises can also cause hearing damage and interfere with their communication. Moreover, <u>offshore wind farms can kill seabirds</u> who fly above oceans. In an attempt to avoid passing through the turbines, seabirds have to burn a lot of calories and fly around them. Offshore wind farms can also displace habitats for seabirds, used for feeding and breeding.

The effect of Hydropower development projects on marine life has been more devastating. Dams often act as obstacles to fish migration. Higher regions of a watershed are usually preferred by fishes for spawning and ensuring a fit habitat for nurturing their offspring. Dams often become a hurdle in their journey upstream. Pacific salmon often becomes a victim of such hurdles, for salmon which manage to swim upstream for spawning, rear their offspring for two years, before traveling downstream. Swimming downstream however has its fair share of obstacles. Since reservoir water is comparatively still, it slows down the pace of salmon smolts and makes them more vulnerable to predation. They need a safe passage to reach downstream. Further still reservoir water with a disproportionate share of nutrients can foster the growth of algae and wild plants which can displace other aquatic plants and animals. Plants and animals in the river downstream often get adversely affected whenever reservoir water is released since the water stored in reservoirs is usually cold and characterized by low levels of dissolved oxygen.

This brings us to an important juncture of environmental trade-offs. On one hand, renewable technologies are important to combat climate change, while on the other, even renewable technologies on water bodies have been witnessed to adversely affect marine life. Then, what is the way out? Should we go for preservation (complete non-usage of resources) or should we go for conservation (effective usage)?

It is important to keep in mind that no matter how fast technology progresses, the natural working of the ecosystem should not be hampered. Hence with solar panels and wind turbines, utmost importance is to be given to the installation process. Floating solar panels should be designed in a way that covers the least amount of surface water so that the usual process of aquatic photosynthesis remains stable. Likewise, wind turbines should also be installed carefully and should not overcrowd a water body, this will help reduce the chances of sea birds flying into them. All hydropower facilities should focus on installing fish ladders to aid fishes in finding a safe bypass/passage while traveling upstream/downstream. <u>Natel energy</u> has the potential to overcome the issues associated with traditional hydropower.

SINK OR SWIM, Littlest of the Andamans?

The Little Andaman is one of the largest islands in the Andaman group of islands. The diverse flora and fauna of the island make it a popular tourist destination. The island is also home to an endangered traditional tribe known as the 'Onge'. Similar to most indigenous tribes, the Onge's dependence on subsistence and natural habitat has inevitably led them to become hunters and fishermen.

The members of the tribe gather material for making houses (made of bamboo), <u>canoes</u>, or food from proximity. The most interesting aspect about the tribe is the fact that they are <u>animists</u> who speak volumes about their relationship with the environment. It indicates that the Onge's have revered nature and believed that nature was the basis of all creation. Thus, while carrying out their daily activities, they ensure utmost efficiency and consume only what is required for their survival.

Yet, this unique outlook didn't remain untainted as unlike other tribes in the Andaman, the Onge's gradually became more open to external influences whether it was in terms of culture or economic practices. However, they have still managed to live within their means unperturbed from external influences. Unfortunately, because of Niti Aayog's development aspirations for Little Andaman, they have been caught in a development fight. The plan would disrupt the fragile ecology of the region as large tracts of forests are being cleared (around 2 million trees) posing a serious risk to the ecosystem. This project may endanger the nesting habitats of leatherback turtles and megapode, coral reefs, and many other endangered species in the Little Andaman.



The experts are critiquing this plan despite a provision for a "green zone" as clearing most of the biodiversity and retaining a token "green zone" is not adequate and hence not acceptable. Also, tourism and fisheries are the main sources of income on these islands, and maintaining them necessitates the preservation of healthy ecosystems.

If we don't make our voices heard now, <u>Lakshadweep</u> might suffer the same fate.



BLUE ECONOMY It's impossible to go green without blue

The 'Blue economy' is crucial to the green ecosystem since oceans influence all-natural cycles, are involved in all economic sectors, either directly or indirectly, covering ²/₃ of the Earth's surface, it becomes necessary to take into consideration the marine ecosystems. Oceans supply up to 80% of the oxygen we breathe, while marine and coastal biodiversity support the livelihoods of roughly 40% of the world's population.

The <u>Blue economy</u> is defined as the sustainable use of ocean resources to promote economic growth, social inclusion, and the maintenance or enhancement of livelihoods while guaranteeing the ocean ecosystem's health. Traditional economic activities such as fisheries and aquaculture, maritime transport, and tourism are included, but it has lately expanded to include renewable energy such as offshore wind, deep-sea mining, waste management, and environmental protection and we have it all covered in the upcoming sections. Ocean generates a substantial amount of wealth, with an annual worth of <u>\$2.5</u> trillion making in the world's seventh-largest economy.

Blue Justice examines how the blue economy and "blue growth" programs implemented by organizations and governments around the world to promote sustainable ocean development influence coastal communities and small-scale fishermen. Blue bonds are also emerging as a novel way to provide long-term funding for marine and coastal protection achieve the Blue Economy by directing funds raised solely to projects that are considered ocean-friendly. Bonds to protect coral reefs, mangroves, and fisheries, as well as to combat ocean plastic waste, are recent examples. Financial institutions are gradually realizing that their actions can have a positive impact.

A <u>Blue Revolution</u> of sorts, if carried out properly and with equity in mind, may pave the way for a more resilient and Sustainable future.



What puts the Coastal communities at risk?

India has a 7,500-km-long coastline, two major island chains, and a 1.87 million square kilometer Exclusive Economic Zone. Settlements along India's coastline mostly consist of the traditional fisherfolk who are dependent on the coast for their survival. The coastal communities in India are marginalized and are dependent on marine resources for their livelihood. Unregulated tourism, coastal projects, coastal erosion, poaching, and activities pose some of the biggest threats to the survival of these communities.

Trawling, a dangerous form of mechanized fishing, leads to <u>the bycatch-driven</u> fishery, which is the incidental capture of non-target species. Trawling is not only a threat to marine biodiversity but is also unsustainable for the country's nearly 4 million fishermen and millions more who work in adjacent industries. With 61% of Indian fishermen living below the poverty line, diminishing fish populations threaten the whole community's long-term survival, particularly small-scale fishermen who rely heavily on inshore fish supplies for their income and food security.

In the state of Odisha, each year, as a preventive mechanism for bycatch, the government imposes a <u>7-month ban</u> on fishing starting from November 1st to May 1st, as this period coincides with the breeding season of the Oliver Ridley sea turtles, an endangered species of turtles that have been protected under the Orissa Marine Fishing Regulation Act, 1982 and Orissa Marine Fishing Rules, 1983. The traditional fisherfolk are often arrested by the authorities and their boats are seized for violating the ban. One of the oldest fishing communities of Mumbai, 'Kolis', who are believed to be the earliest inhabitants of Mumbai, is facing one of the biggest threats today - the Mumbai Coastal Road Project. The project threatens to displace the community by taking away their coastal lands.

The fishing community also faces threats across India's maritime boundary with Sri Lanka. Sri Lanka has accused Indian fisherfolks of crossing the maritime boundary (decided as per the maritime boundary agreements of 1974 and 1976) and detained several fishermen from the coastal villages of Tamil Nadu. The country has also raised issues like overfishing and the use of large nets by Indian fishermen which damages fragile aquatic life. This again poses a situation of distress for the fishermen due to the lack of available alternatives.

Furthermore, in today's development rhetoric, fishermen are considered as '<u>outliers</u>', with lower human development indicators than the country's averages that further aggravates the direness of their socio-economic well-being. Additionally, because the majority of fishermen are completely devoted to fishing, it is difficult for them to transition to other occupations. Their education and economic success are further hampered by their limited access to landbased enterprises.



According to the FAO Bay of Bengal Programme (BOBP), literacy rates in Odisha's coastal villages were lower than the national average and considerably lower among marine fishermen. The involvement of more youngsters in productive activities in the short term was a key contributor to the low levels of schooling in fishing communities. Access to schooling in the fishing settlements was also hampered by the relative isolation of numerous fishing villages.

While the coastal communities remain vulnerable to human interventions, natural and anthropogenic climate change directly influences the lives of these people that have, unfortunately, the smallest adaptive capability. And yet, with the expanding population and economic importance of coastal cities, susceptibility to the effects of climate risks is likely to rise. According to the exposure index in the "Coastal Vulnerability Atlas of India," the three states on the east and west coasts – <u>Andhra</u> <u>Pradesh. Maharashtra. and Odisha</u> – are extremely vulnerable to climate change.

The Indian coastline is dotted with human settlements ranging from fishing towns and hamlets to megacities. It is important to note that the sea-level rise is one of the most concerning consequences for these people. According to estimates conducted by The Energy and Resource Institute (TERI), a one-meter increase in sea level would displace nearly <u>7.1 million people</u> from coastal areas and expose 5,764 square kilometers of land to flooding. Even if greenhouse gas (GHG) emissions are stabilized in the near future, sea levels will continue to rise for decades suggesting that it can pose an existential threat to the population. In recent times, the Covid-19 pandemic has threatened the survival of several indigenous communities, especially the ones inhabiting the remote islands of Andaman and Nicobar. These coastal communities are extremely vulnerable to the novel coronavirus. The tribes like Jarawa, Sentinelese, Great Andamanese, and Shompen are the most isolated tribes in the world.

Despite being isolated, the members of these tribes face threats of contracting the virus from poachers, tourists, and even social workers. Tribes such as the Jarawa are at high risk because they come in contact with the settlers in barter to secure items such as rice. The scientists fear that these tribes might face the risk of being completely wiped out.

Evidently, rising sea levels and anthropogenic climate change pose a severe threat to India's coastal cities. Unsustainable development and rapid population expansion, high-density and unplanned settlements, and urban poverty with huge disparities in access to housing, public services, and infrastructure further exacerbate these problems. Therefore, there is an urgent need for climate change, developmental projects, and population growth factors to be integrated into climate adaptation and mitigation policy.

Fisheries and Economy

The development of the fisheries sector in India, dates back to the Second World War, wherein, the then Indian Government decided to go for an intensive fish production program as a part of the 'Grow More Food Campaign' to supply food to the Indian army and the masses. However, the Government's Five Year Plans are the real kickstarters for organized fisheries Development, as part of agricultural development.

The fisheries sector has been referred to as the most efficient sector and governments across the globe have laid emphasis on giving a boost to the sector because it-

Provides sustainable livelihoods- Several coastal communities are dependent on fishing for their livelihoods. It helps in sustaining the livelihoods of around 660–820 million people (or 10–12% of the global population).

<u>Contributes to food security</u>- Fish is a rich source of proteins and the fisheries sector can play an important role in achieving food security. For millions of people, fishing is a major source of protein, essential fats, and micronutrients, particularly in rural areas.

<u>Contributes to the GDP</u>- The economy of many countries and numerous coastal, riverine, insular, and lacustrine regions are dependent on the fisheries sector.

The Status of the Fisheries Sector in India

India is the second-largest fish producer in the world. Undoubtedly the fisheries sector plays a significant role in the Indian economy. India has seen an exponential increase in the sector over the years. Currently, India has been exporting its marine products to over 10 countries across the globe. During the last financial year (2019-20), India exported 12,89,651 MT seafood worth \$ 6.68 billion, which is equivalent to Rs. 46,663 crore. Sea Food (shellfish oysters, mussels) is becoming a more critical component of the global food system. In 2018, 179 million metric tons of fish were made, with aquaculture accounting for 82 million. In 2030, total fish production is projected to reach 204 million metric tons. In 2017, seafood accounted for 17% of the global population's animal protein consumption (7 percent of all protein). More people are consuming fish than ever before.

Because of increasing production (better technology and less waste), rising incomes, and increased awareness of the health benefits. Seafood (shellfish oysters, mussels) is becoming a more critical component of the global food system. In 2018, 179 million metric tons of fish were made, with aquaculture accounting for 82 million. In 2030, total fish production is projected to reach 204 million metric tons. In 2017, seafood accounted for 17% of the global population's animal protein consumption (7 percent of all protein). More people are consuming fish than ever before. Because of increasing production (better technology and less waste), rising incomes, and increased awareness of the health benefits.

Challenges of the Fisheries Sector in India The key challenges of the fisheries sector in India

- Shellfish, mussels, and oysters, which are important components of global seafood and the economy, are under decline.
- Overexploitation of marine resources is common due to unsustainable practices.
- A trustworthy database is lacking.
- Post-harvest losses are caused by a lack of infrastructure (cold storage). The government's research efforts are lacking.

Impact of Climate Change on the Fisheries Sector Temperature variations, acidification, deoxygenation, and changes in ocean currents are all effects of climate change on our oceans. Marine heatwaves have grown by more than 50% in the last 30 years.



Marine life is being impacted by these changes. Temperature spikes and acidity are impacting the fisheries sector. The distribution of fish stocks is altering due to shifting ocean currents and warmer seas which is, in turn, altering the structure of ecosystems.

What is seafood fraud?

Seafood Fraud is a practice of deceiving the customers about seafood with the motive of increasing profits.

What are some of the common seafood frauds? Seafood frauds include practices like seafood mislabelling, adding more than required ice or using glaze water to increase the quantity of the product, using food additives with the intent to enhance the physical appearance of the seafood.

What are the implications of seafood fraud?

Conservation efforts are compromised, while seafood fraud profits from harmful fishing practices. Illegal fishing can be deadly if people don't know what kind of fish they're eating, as happened in Bangladesh when Puffer fish (Lagocephalus sceleratus) was consumed. In 2008, inland Bangladeshis bought cheap puffer fish at local markets, resulting in 3 outbreaks with 141 cases and 17 deaths. In 2002, Khulna saw a similar case, as did Sylhet in 2016.

How can we prevent seafood fraud?

Seafood fraud can be prevented by making use of molecular identification techniques like DNA Barcoding, next-generation sequencing.

What is DNA Barcoding and how can it prevent seafood fraud?

DNA Barcoding is a molecular identification technique that identifies the species of the fish. It is used in the case of processed fish as the usual morphological characteristics are lost so identification is possible only by using such molecular identification techniques. Fish traceability is possible because of such modern techniques and is the first step in eliminating such malpractices.

Threat to fisheries

The fish meal and fish oil (FMFO) businesses, which supply feed to worldwide aquaculture networks, utilize tonnes of fish captured through unsustainable fishing. Fish supplies are being depleted as a result of these practices. Fishermen looked to the FMFO industry for solace because it bought the trash fish (which isn't edible) that was brought in with the catch. However, the situation has changed, and the FMFO sectors have now become a threat to the fishing industry, as the revenue generated by supplying these sectors is fuelling unsustainable fishing. The unsustainable fishing is Juvenile catch is the most serious threat because of which many species have declined in the sea.

The **Norwegian fishing industry** can be considered an exemplary model for the world when it comes to the fisheries industry. This can be attributed to a number of policies and regulations which have been implemented by the Norwegian government.

- The government has implemented sustainable fishing by using blockchain technology which uses digital tags to reduce seafood frauds.
- The government has been allocating sufficient funds to promote long-term research in the fisheries sector.
- Regulations such as minimizing the mesh size of the fishing nets.
- The country has given a boost to aquaculture and salmon fish (species most commonly consumed in Norway) population has increased drastically.
- The recreational facilities are subject to official monitoring in Norway.
- Emphasis has been laid on developing sustainable fishing practices by understanding the dynamics of the fishing industry.

Maritime trade: An increasing threat to oceans

Oceans and seas have a great potential to add to the sustainable growth of our economies and are a source of livelihood for over three billion people. Trade via oceans a.k.a International marine transportation accounts for over <u>90% of the global</u> <u>trade</u> and therefore, is a major contributor to the tight interconnectedness of globalized trade.

While the sector is a relatively low-carbon form of transportation, it adds approximately <u>3% of global</u> <u>greenhouse gas (GHG)</u> emissions in absolute figures. This leads to several problems around the availability of water resources making oceans and seas not only vulnerable to environmental shocks, but also a point of contention among nations over the right to access to water resources, along with other political and economic reasons.

Currently listed as among the 10 states with the "largest interest in international seaborne trade", India, bordered by the Indian Ocean, is unguarded against these problems. Home to the largest shipbreaking yard in the world, along with a large crude oil market with a refining capacity of 249.4 million tonnes per year, India also remains exposed to severe health and environmental issues.

We are a country with problems related to access and availability of water resources, which have led to the emergence of various transboundary water conflicts with countries such as China, Bangladesh, Pakistan, and Nepal. Such disputes may further have severe health repercussions for people and groups, destruction of health-supporting infrastructure, forced migration, and the diversion of human and financial resources, particularly those needed to sustain and increase freshwater access. For the coastal developing countries and 'ocean economies,' marine transportation creates the dangers of oil spills and pollution and has a negative impact on businesses, including tourism, fishing, and hospitality. Some other pressing contributors to the marine ecological challenges today are - release of plastics and microplastics in marine trade, climate change leading to ocean acidification, and the loss of marine biodiversity.

It is a matter of serious concern that the worldwide shipping carbon emissions are expected to grow by 50-250% by 2050 under business-as-usual scenarios, compared to 2012 levels. As a result, the marine sector will be critical in meeting the Paris Agreement's objectives. Fortunately, with the reduction in marine activity during the Covid-19 pandemic, carbon emissions are projected to fall below the previously predicted levels.

Currently, the International Maritime Organisation (IMO), the United Nations agency that regulates shipping, has imposed stricter energy efficiency standards. These include the introduction of the sulfur cap, efforts to minimize nitrogen oxides and ozone-depleting gases, and decarbonization of shipping. Such restrictions, though, force enormous technical, operational, and structural changes in an industry that is often risk-averse and slow-moving to adopting change.

In the context of India, International treaty law, court rulings, the provisions of the Merchant Shipping Act, 1958, and the Marine Insurance Act, 1963 are all used to assign culpability for marine incidents.

Maritime decarbonization through the adoption of energy-efficient technology, optimization of ship operations, use of low and zero-carbon fuels, and regulatory measures has become a priority to policymakers, governments, and businesses. Additionally, going ahead, proactive collaboration may aid in the resolution of subsidiary issues such as maintenance of public health, food security, and of course social, environmental, and economic stability.

Ocean Tourism:

slowly degrading oceans?

It's no secret that oceans are an invaluable source of natural capital as they are home to a multitude of species and aid in carbon sequestration which is desperately needed to curb global warming. However, just like mismanagement of tourist activities on land gradually deteriorates the environment, the oceans too are being negatively impacted due to Ocean Tourism. Some of the most invaluable gifts of nature such as coral reefs are predicted to die as early as 2050 if the current state of affairs is not altered.

India too is not excluded from these statistics as it is seeing a boom in tourism and with as many as 200 beaches with recreational potential (according to the government), it is more significant than ever to draw up development in a way that protects these resources and does not move beyond the <u>carrying</u>. <u>capacity</u> of these places.

While sustainable and eco-tourism movements are making waves around the globe, luxury ocean tourism is nowhere near going down. From expensive cruises to easier access to protected areas, the contamination of the oceans threatens us all. Furthermore, when it comes to India, many of the peninsular states and islands have as many as 3288 fishing villages that still rely on fishing and other oceanic resources for their survival. The intervention of governments with development plans such as in Andaman is only threatening the lives of these people if they aren't recognized as prominent and key stakeholders to protect the oceans. Unfortunately, a change towards this direction is slow to be implemented as yet again economic growth is being prioritized while expanding tourist spots. This is also leading to newer government policies that are giving more ways to private actors with no due regard to holistic development and its environmental and social aspects.



Schemes such as the <u>Sagarmala schemes</u> stress only a single dimension of tourism and tend to overlook the fact that it will threaten the habitat of millions of people and biodiversity.

For the Western Ghats, the islands of Lakshadweep and Andaman, home to unique biodiversity hotspots, there is an even stronger need to take into account how the development plans will impact these species. This will necessitate taking aboard more environmental experts and local stakeholders while forging plans to broaden the scope of tourism.





The Blue Flag is a certification by the Foundation for Environmental Education (FEE). It is one of the world's most recognized voluntary awards for clean, safe, and environment-friendly beaches, marinas, and sustainable boating tourism operators.

If your beach has earned the blue flag certification, your tourism is well-taken care of. India is now on the list of blue flag beaches among 50 nations. 47 countries participated in the program, and 4,573 beaches, marinas, and boats have this certification. India's 8 beaches have bagged this award in the first attempt.

The beaches that got selected for the certification are:

Kappad (Kerala)

Shivrajpur (Gujarat)

Ghoghla (Diu)

Kasarkod (Karnataka)

Rushikonda (Andhra Pradesh)

Golden (Odisha)

Radhanagar (Andaman & Nicobar Islands)



India is known for its ambitious targets. So, after this big win, India aims to get the Blue Flag Tag for 100 beaches in the next three years. In the process of achieving this target, the Environment Ministry launched India's own eco-label 'BEAMS' (Beach Environment & Aesthetics Management Services) under its Integrated Coastal Zone Management (ICZM) project. The BEAMS program has resulted in achieving the international level of cleanliness at beaches.

The 'SDG' Connect



- SDG 3: The proper management of the beaches and by extension, the environment, helps the local communities with their livelihoods.
- SDG 9: The advanced and proper infrastructure creates employment opportunities related to the maintenance and management of beaches, marinas. and eco-tourism boats.
- SDG 8: It also creates opportunities for new technologies and skills that have an impact on other work sectors in the local communities hence achieving economic growth.
- SDG 7: It supports a lot of campaigns on Clean energy and implements them by using solar panels, wind turbines, energy-saving bulbs, etc.
- SDG 5: Blue Flag involves and employs every person regardless of their gender, caste, religion, etc. It also promotes women's empowerment by involving all the women in local communities in their workplaces.

In conclusion, eco-tourism helps in keeping the environment clean with the motive of practicing sustainable development for all the generations in the coming years.

it difficult for them to live. throwing trash in the ocean which is reaching the turtle and the fish in the upper two quadrants, hence making has the string to the net which caught the whale/whale baby in the lower right quadrant. The other humans are The bottle represents the plastic in the ocean, inside that is an island where humans stand. One of the humans etc. are still prevalent and prospering due to lack of common knowledge, concern and empathy. hunting of those innocent beings for trade. The use of animals in the industries of medicines, cosmetics, food oceans. Apart from polluting the water and making the lives of the marine creatures, they go on for gruesome The picture depicts how the humans through their intervention have grappled even the deepest parts of

Artwork by: Mansi Dave (MA SDP)



Conserving the Oceans: A Clarion Call

MEADOWS

Marine meadows or seagrass beds are submerged flowering plants, ranked amongst the most valuable ecosystems for providing a host of services ranging from protecting the coast against storms, carbon sequestration, sediment stabilization to sustaining the marine life and human economy. Possessing the longest leaves of its kind, Tape seagrass is a major carbon sink. It is found throughout the Indo-pacific region and provides refuge and feeding areas for about 1000 fish species. It buries carbon underwater 40 times faster than any tropical forest.

However, seagrass ecosystems are dangerously threatened by sand mining, sewage, fishing, and coastal construction. Educating about their importance is crucial and some volunteer programs like SeagrassWatch and SeagrassNet have been actively pursuing this. Monitoring programs should be initiated for seagrass management and mapping in collaboration with local communities.

Coral reefs are crucial for the food, shelter, and breeding of several species. They come in a variety of colors and sizes and coexist with zooxanthellae algae in a mutualistic connection. It's no surprise that the Great Barrier Reef attracts thousands of visitors each year; Corals are estimated to be worth \$30 billion USD globally. But these beautiful reefs are dying at an alarming rate and researchers have estimated that 90% of these would disappear by 2050. Major threats include overfishing, ocean acidification, pollution, and coral bleaching.

Coral gardening or asexual coral propagation uses coral fragments from wild populations or donor colonies which are transported to a nursery and cultivated for several months. Later, they are out planted onto natural reefs to become reproductive, spawning members of the population. Raising coral colonies in nurseries allows practitioners to produce hundreds of colonies while minimizing the risk to existing coral populations. Other coral cultivation methods include nurturing damaged corals in an artificial setting until they can be transplanted while the other method is collecting coral gametes and rearing them in an aquaculture setting before transplantation. Individual efforts can help speed conservation. Keeping the beaches clean, using minimum fertilizers and chemicals, and stopping coral commercialization by neither buying nor selling them can also contribute to conservation.

Some funds financing blue carbon mitigation activities include the Global Environment Facility Trust Fund, the Special Climate Change Fund, the Green Climate Fund, and the Adaptation Fund. Besides climate funding, biodiversity-related finance mechanisms can also support the restoration of blue carbon ecosystems such as the Swiss Grants Fund.

Carbon markets are another funding stream that essentially quantifies and sells the stored carbon as credits to buyers who use them for emissions trading. The voluntary carbon markets enable governments and businesses to receive certified carbon credits for managing their emissions in exchange for investing in restoring ecosystems. Such mechanisms include Reducing Emissions through Decreased Deforestation (REDD+) and National Appropriate Mitigation Actions (NAMA).

However, it's possible that these mechanisms alone won't be enough to protect blue carbon habitats, and exploring other funding options seem necessary such as Blue Bonds, payments for ecosystem services, debt-for-nature swaps, and promoting eco-friendly products.

PROJECTS AND CAMPAIGNS: OCEAN DECADE 2021-2030

Projects launched by the Indian Government

Sagarmala Project - The project initiated in the year 2015 was launched to give a boost to the areas of port modernization and new port development. Out of more than 574 projects identified for Sagarmala Project implementation, 121 projects had been completed as of 30th September 2019 and 201 projects are in the process of being implemented.

Project Unnati - Launched in the year 2014, under this project, the government has identified 116 initiatives out of which 86 initiatives have been implemented aiming to ramp up India's 12 major ports' efficiency and productivity.

Green Initiatives - As a part of the Swachh Bharat Mission the government has been keen on combating the issue of oil pollution in the ports. Haldia port has been rated as the cleanest port in India.

Campaigns across the Globe



Campaign Launch Year: 2017 Country/Countries involved: 57 countries have joined (Global campaign) Objectives: Creates a global platform by urging member countries to take a Clean Seas Pledge and to dramatically reduce marine litter.



Campaign Launch Year: 2017 Country/Countries involved: UK Objectives: To introduce a comprehensive UKwide Deposit Return Scheme (DRS)



Campaign Launch Year: 2013 Country/Countries involved: Australia Objectives: Encourage Australians to support the scheme of 'cash for containers' which would reduce marine pollution



Campaign Launch Year: 2019 Country/Countries involved: Mediterranean countries Objectives: To achieve net-zero leakage of plastics into the Mediterranean sea by 2030.

Knowledge Upgrade

Bageshwar women bring the 'Chipko Andolan' back



In order to prevent the felling of the oak trees, hundreds of women came and hugged the trees in the Jaakhni village of Bageshwar district, Uttarakhand. The trees that were about to be cut were from a nearby forest that belongs to 'Kotgari Devi', Goddess of Justice in the hills of Uttarakhand. These villagers don't even collect fodder from the forest.

This practice of dedicating the forest to Goddess increased green belts and green patches from two to more than a hundred acres in the Bageshwar, Almora and Pithoragarh districts. This ritual dates back to 1978. It involves an oath-taking ceremony followed by signing a stamp paper that says the community is dedicating the particular forest or green belt area to the goddess and no one is to damage the property.

PROJECT FOR MAPPING GENETIC DIVERSITY IN THE INDIAN OCEAN



Biological diversity has decreased since the inception of industrialisation. The need for mapping genetic diversity was realised by the Council of Scientific and Industrial Research-National Institute of Oceanography (CSIR-NIO), Goa. CSIR, under one of its flagship projects TraceBioMe, initiated this project to study the presence of different kinds of organisms, trace metals and micronutrients, an extensive sampling of water, sediments, planktons and all sorts of organisms.

GIS TECHNOLOGY CAN HELP SAVE THE OCEAN

Dawn Wright, the oceanographer and chief scientist at geographic information system (GIS) provider Esri, has pointed out the importance of technology in order to save the oceans. Only 19 percent of the oceans are mapped till date and so, we need sustainable solutions like GIS. This location intelligence technology is used in risk mitigation to crisis response, market analysis to operational efficiency can also be used for mapping oceans. Ocean maps will be essential in solving the problems of overfishing, habitat destruction, pollution, and biodiversity loss. Not only this, Oceans are responsible for carbon sequestration which means surviving climate change by absorbing 90 percent of the emissions and producing 50 percent of the oxygen we breathe. The data-driven map will help people see why exactly we need to save the oceans.

ONLY TWO UNPOLLUTED FRESHWATER SOURCES LEFT IN THE COUNTRY

NITI Aayog and Water-Aid India recently reported that around 70 percent of India's water bodies are contaminated. There are two unpolluted freshwater sources left in the country. One is the aquifers that lie below the floodplains of rivers and the other is the water lying below our forests.

We have been struggling to deal with Covid for the past one year. What would happen if another pandemic strikes in the form of a water-borne disease due to these contaminated sources?

Decontaminating all the water bodies will take decades; reverse osmosis removes all the essential nutrients and ultraviolet aqua guard treatment is perfect, but costly. Strict actions must be taken to develop the most feasible method to preserve these for future generations. Till then, these forests and floodplains must be declared water sanctuaries.



FRANCE MAY JOIN INDIAN OCEAN INITIATIVE

The Indian Ocean Initiative to protect and facilitate maritime cooperation between countries was first suggested during the 14th East Asian Summit. France's interest came to the forefront when their foreign affairs minister visited the country in April. This could be a significant move in terms of strengthening the alliance and increasing the influence of the initiative.

GLOBAL CALL FOR HALTING DEEP-SEA MINING

The second second

International giants such as Google, BMW etc. have called for a halt to deep-sea mining in order to decrease the exploitation of sea-beds. They have committed to eliminating raw materials sourced from deep-sea mining in their supply chains such as copper, nickel, manganese etc. The larger consensus is due to a lack of data on the environmental consequences of the same, the activities must be stopped.

JAKKUR LAKE: STELLAR EXAMPLE OF INCLUSIVE REJUVENATION

Situated in North Bangalore, 'Jakkur Lake' has become a prominent example of inclusive and sustainable development. Polluted and degraded earlier, it has managed to regain its former glory and sustain it as well. A notable point is the inclusion of the fisherman community of the region which depended on the lake for their livelihood and hence, proved to be key stakeholders in its rejuvenation. With their help, the lake has become cleaner, a host to more bio-diversity, and continues to support the fisherman as well.



OUR BEACHES DISAPPEARING!

According to new research, by the end of the century, over half of the world's sandy beaches would have receded significantly as a result of climate-driven coastal flooding and human meddling, posing a threat to wildlife and coastal populations.

ARE



SRI LANKA WITNESSES ITS WORST ENVIRONMENTAL CATASTROPHE TILL DATE

A Singapore-registered cargo ship carrying chemicals began burning on May 20th and had been on fire for as long as two weeks! The large amount of toxic contents on the ship such as nitric acid, sodium hydroxide etc. have contaminated the coastline to a large extent and even managed to reach the beaches and coat them with the toxins. This event will also inevitably impact the economy as it has impacted popular tourist beaches and made fishing impossible. A police complaint has been lodged against the captain of the ship who allegedly knew of the nitric acid leak which caused the disaster.

DROP IN OCEANIC SHARK POPULATIONS



The government has proposed the building of a township and area development project in the Great Nicobar islands. However, the delicate ecology of the region poses a threat to the turtle and megapode nesting sites, the coral reefs and other endangered species if the project moves forward. Despite this, the Union Environment Ministry has cleared it for a grant. This grant is one of the first steps in the environmental process and will be followed by further assessments.

FUKUSHIMA'S NUCLEAR WASTE DUMP IN THE SEA

Fukushima's nuclear accident is the most disturbing one of the year. The Japanese government had planned for two years to release treated radioactive water into the Pacific Ocean. The contaminated water has been held in tanks since an earthquake and subsequent tsunami damaged the Fukushima nuclear reactor in 2011. The government International Atomic Energy Agency and some experts have argued that the release of the water is not dangerous and will do no harm to the ocean. This decision was ridiculed by many neighboring countries like China and South Korea. According to them, the leak of large amounts of radioactive materials has had farreaching implications on the marine environment, food safety and human health.

RAPID HEATING OF INDIAN OCEAN

The situation of the cyclone has been worsened due to the rapid heating of the Indian Ocean. India is still recovering from cyclone Tauktae which was an unusually strong cyclone in the Arabian Sea that resulted in widespread disruption. This week, another severe storm, Cyclone. Yaas, formed in the Bay of Bengal, leading to more than a million people being evacuated into safe shelters. Mohanty Government suggested investing in an improved emergency response framework based on climate change conditions for better evaluation of extreme events in the future.



GREAT NICOBAR: THE NEXT VICTIM TO DEVELOPMENT PLANS

The government has proposed the building of a township and area development project in the Great Nicobar islands. However, the delicate ecology of the region poses a threat to the turtle and megapode nesting sites, the coral reefs and other endangered species if the project moves forward. Despite this, the Union Environment Ministry has cleared it for a grant. This grant is one of the first steps in the environmental process and will be followed by further assessments.



CLIMATE CHANGE-RESISTANT CORALS, A LIFELINE FOR BATTERED CORALS

Coral reefs have been disappearing due to coral bleaching across the globe. The same has been happening in Hawaii. Half of the coral reefs have been affected since 2015. It's very interesting to note that corals can sometimes recover, while others resist bleaching altogether. An experiment has been done to revive the affected corals. Katie Barott of the University of Pennsylvania experimented by taking a coral that seems to be resistant to climate change and using that as the seed stock to propagate and put out on a different reef that might be degraded. They found that bleaching-resistant corals stayed that way, even in a new environment. The results of the transplantation study were promising.







DID YOU KNOW?

The Bajau, also known as Sea gypsies in Southeast Asia, spend their entire lives at sea, working eight-hour diving shifts with traditional equipment and taking short breaks to catch fish and shellfish for their families. Bajau pushes the boundaries of free diving, staying underwater for up to 13 minutes at depths of around 200 feet.

Look for the hashtag #OceanDecade to show your support for the campaign and to keep up with the progress of the movement



Seaspiracy



My Octopus Teacher

Disclaimer: All of the photos used in this magazine were taken from copyright-free image websites such as Unsplash and Pexels, where image credits are not provided.

Decoding Oceans and their Significance

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Let us make a commitment to leave the world a bit better than we found it, so that when it is our time to go, we can rest assured that we have not wasted our time and have given it our all.

