

Ocean based solutions for a sustainable future

Among the United Nations 17 sustainable development goals (SDGs), [SDG-14](#) aims for conservation of life below water. It is critical to tap the vast potential of marine assets and use marine resources for sustainable futures.

Ocean biodiversity and climate change are often in the news for the impact of climate change and struggle for human and biodiversity survival. As global temperatures rise, so do ocean levels. This rise in ocean levels is a potential threat to the coastal lives and to the very existence of some of the small island countries. According to [ocean risks and resilience action alliance](#) (ORRAA) 800 million people will be at risk due to ocean level rise by 2050. Furthermore, ocean acidification due to climate change is destroying the ocean-based biodiversity. For example, 50% of corals in the great barrier reef have been destroyed because of climate change. Mitigating effects of climate change on oceans is a challenge but the next big challenge is ocean pollution.

Industrial pollution can be one of the factors. Unfortunately, tourism too exploits nature to some extent and gives rise to the ocean and coastal land pollution. On the other hand, tourism is entangled with the economies and human livelihoods in many parts of the world. The plastic pollution coming from human activities has reached to an extent where it has created dead zones deep down the oceans where the survival of ocean plants and animals is no longer possible.

However, oceans are not just part of the problem, they can be a source of 'the solution'! Moreover, nature-based solutions through oceans can tackle land problems too. Let's discuss these blue solutions for a greener future - by achieving one sustainable development goal at a time!

Water shortages and ocean-based solutions

97% of Earth's water is in the oceans. And there is water stress on the existing freshwater water resources. Desalination treatment can convert ocean water to usable water, and it needs more attention.

Desalination is a process that separates minerals from ocean water. Conventional desalination methods have energy intensive processes, high environmental impact and at large scale also pose a threat to marine life. So, more research and development is needed to find ways to make desalination treatment a sustainable process. Research is being conducted by designing innovative containers that can desalinate seawater at individual scale as well as the desalinating plants for larger scale. Employment of solar

based desalination processes can reduce its environmental impact. Sustainably desalinated ocean water can be a source of water for domestic, agriculture and for industrial use. This may reduce the water stress on freshwater ecosystems. In this way ocean-based solutions can help achieve availability of water for all - the target of [sustainable development goal SDG6](#).

Is 'blue food' more sustainable?

[Food constitutes one third](#) of the manmade GHG emissions worldwide. And the ocean is a great source of food. Climate change has also affected the food generating capacities of oceans. [Ocean based food has lower carbon footprints](#). This 'blue food' needs more attention to decarbonise the impact from food consumption. This will not only help to share the stress on land-based food production but can also generate more innovative and alternative healthy food options.

600 million people - which is approximately 10% of the [world's population lives in the coastal areas. And around 2.4 billion](#) (approx. 40% of world population) people live within 100 km from the coast. 'Blue food' has a potential to achieve the sustainable development goal 2 - [SDG2 for zero hunger](#). There are several approaches this potential can be utilised either by expanding the existing aquaculture domain and increasing ocean based food dependence or by bringing in reforms in the existing aquaculture practices to adapt to climate change.

The expansion of seafood production without considering the climate change factor would be unsustainable. The climate change adaptive aquaculture practices are more promising in the long run, however, might not fulfil the per capita demands on fishing. In fact, a combination of these approaches is necessary. Seaweed harvesting can be one of the initiatives for sustainable seafood.

Decarbonising the blue planet with 'blue biodiversity'

In the climate change scenario seaweed has much more to promise than to be a food source. Seaweed is helpful for decarbonising the environment.

The seaweed farms can be helpful to reverse climate change as it can absorb greenhouse gases. However, it is also necessary to consider if the expansion of seaweed farming is economically viable.

Other than this ocean-based carbon which is often called 'blue carbon' is stored in mangroves that absorb greenhouse gases such as carbon dioxide and convert them into biomass. This means blue biodiversity can act as a natural sink to GHGs which is great!

How does it work? There are two ways the ocean absorbs carbon dioxide in the atmosphere, either via physical or biological processes. The ocean waves act as a physical sink for carbon dioxide that goes into the ocean deep inside. This process is more efficient at lower temperatures of water. Alternatively, the carbon is converted to other organic compounds through biological processes and stored as a biomass. The process is like that of fossils. But with rise in temperatures - ocean acidification is destroying this ocean biodiversity - this highlights the importance of keeping the 1.5 degree C target alive also for the oceans.

Renewable energy

Additionally, the ocean is a source for renewable energy production through waves and ocean thermal energy.

Though these technologies are still at an early stage, more research and development for further commercialisation can bring the ocean potential to make the energy cleaner and more affordable - [SDG 7](#). The rise in sea level induced by climate change is also causing changes in hydrodynamics of tidal energy. This may drive the need for more intricate attention to the environmental impact assessment and techno-economic analysis of tidal energy production.

Recently in November 2021 [UK government has announced £20 million annually for tidal electricity production](#). Keeping the cost low remains a challenge.

Navigating through oceans - solutions for transport and mobility

Oceans connect nations and ocean-based transport is a key player in 90% of international trade. Shipping contributes to almost one third of total global NO_x emissions and contributes to 2.6% of total global emissions according to a [report by OECD at international transport forum](#).

Reforms in the shipping sector can play a critical role in achieving the reductions in global GHG emissions. Research on alternatives such as ammonia-based shipping is rising. Emphasis on use of clean [energy for the shipping sector](#), ships run on solar or wind energies, assure to be more sustainable.

While switching from conventional fuel to renewables, innovations in design and development in ship building is also crucial. For example, the desalination of ocean water followed by hydrogen production from the ocean water splitting to run the ships is one of the ways for reducing the fossil fuel dependence and lowering the GHG emissions. In fact, organisations like the [sea-cleaners](#) are already doing this.

Conclusions: a promise of a resilient future

Ocean is a source of food and home to many species and a source of fuel, medicine, and whatnot! Perhaps the perfect solution to climate change keeping 1.5 degree C alive may come from nature - would come through the oceans. Actions are being taken to tap the potential of oceans and minimise the potential threats to humanity worldwide. The ocean based solutions were vastly discussed at COP26 on a day dedicated to oceans - [the Marrakech Partnership for Global Climate Action](#) - 'Ocean Action day' event where Ocean for climate declaration was launched. Countries have come forward as signatories to the ocean for climate declaration. The UN has declared the [2021-2030 'a decade of ocean science for sustainable development'](#). It will be worth noting the global and local ocean-actions by the end of the decade by 2030. Soon after the COP26 in Glasgow, UK has launched a tidal energy initiative worth £20 million annual investment in November 2021. Recently the issues have been brainstormed at the [UN Ocean conference](#) in Lisbon last month.

To summarise, here I enlist 8 key areas where scope for ocean science research and development is foreseen -

1. Processes of ocean cleaning and minimising ocean pollution
2. Ocean water treatment (desalination) for water security
3. Sustainable reforms in ocean-based food production
4. Ocean based renewable energy production
5. Innovation in ship design and climate adaptive manufacturing processes
6. Environmental and economic sustainability of ocean-based trio - transport, trade and tourism
7. Ocean based deep mining of metals and minerals
8. Disaster management and advancement in early warning systems

The list above is non-exhaustive. The ocean-based solutions can promise 21% reduction in overall manmade GHG emissions according to [the high-level panel for sustainable ocean economy](#). To conclude, an integrated approach to ocean-based solutions that can minimise ocean pollution, promise minimising fossil fuel dependence; that can fulfil the market demands and is also economically viable would lead to a resilient greener future.

Further reading:

<https://www.oecd-ilibrary.org>

<https://www.oceanpanel.org>

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