



Ocean Nourishment – Pre-Budget submission 2021-22

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Ocean Nourishment™ Corporation (ONC) is an Australian owned and developed climate technology company focused on utilising the vast potential of the deep ocean to store carbon. Our process mimics nature and supports the biological export of carbon by supplying limiting nutrients. These inputs can be sourced from renewable energy and the evolving hydrogen economy. This pioneering ocean carbon technology aims to undertake the large-scale restoration of ocean ecology to address global climate change, national food security and open ocean ecosystem health.

If we were to enhance the natural process of plant photosynthesis in the ocean by 10%, we could remove one tenth of mankind's annual emissions from the ocean and atmosphere. Of oceanic regions assessed as suitable for use, there is more than enough space to achieve this. Several such spaces occur in Australian waters, allowing the concept to be trialled and prototyped under the umbrella of Australian environmental controls.

“With the world’s third largest Ocean Territory (EEZ), and access to large quantities of locally available renewable energy, our country has the potential to be the world leader in carbon drawdown.”

ONC have identified two initial sites in Australian waters. The sites are off the NSW coast and off the North West Shelf of WA. We would like to use one of these locations to run a semi-permanent demonstration trial over a two-year period. The WA site has been modelled and a peer reviewed paper on selection of the site for ocean carbon drawdown is published.

Specific micronutrients and Nitrogen are the key limiting nutrients in the pertinent offshore surface ocean regions. Nitrogen can be produced from renewable sources as part of the emerging Hydrogen economy. Hydrogen (as the gas H₂) can then be switched and transported as Green Ammonia (NH₃), which is more energy dense than hydrogen and can be piped and stored using conventional processes rather than at cryogenic temperatures. Ammonia is; therefore, both a battery for energy transportation, and the main nutrient supply of Nitrogen for Ocean Nourishment.

Ocean Nourishment involves biomimicry of the ocean's natural nutrient upwelling biological process to create scalable multiple ecosystem service benefits including:

- Deep ocean carbon transfer and sequestration – Negative (carbon) Emissions, Drawdown
- Restoration of marine (carbon) biodiversity – Fisheries Enhancement
- Export of ocean (carbon) acidity from the surface ocean – Acidity Reversal

For more than 10,000 years humans have successfully farmed the land, capturing solar energy from the sun, and managing photosynthetic driven plant growth. In the same way, by working to enhance phytoplankton growth at the base of the marine food chain, Ocean Nourishment proposes to safely manage ocean spaces which are currently nutrient poor, with precision nutrient addition, delivering to ocean plants their specific nutrient requirements for optimal growth.

To grow, phytoplankton in the ocean requires nutrients (Nitrogen primarily) and sunlight and they draw CO₂ from the surrounding water. The CO₂ is replenished from the atmosphere, thus effectively removing it from the atmospheric total.

The life cycle of phytoplankton is short, of the order of 8 days. Some are consumed by marine organisms such as zooplankton and flow up the food chain; the rest die and sink to the floor of the ocean taking the CO₂ with it. In deep ocean it can stay there for many hundreds of years.

A one tonne input of Nitrogen nourishment can lead to the sequestration of fourteen tonnes of CO₂ and the growth of fish as a valuable source of protein. With standard reactive Nitrogen, carbon sequestration is achieved at a cost of around \$US20-25/ tonne of CO₂. Whilst cheaper green (renewable) nutrient solutions are appearing, costs are currently estimated to be roughly double, providing moral tension until price parity is reached or bettered.

Our Ocean Nourishment technology has been painstakingly trialled with sea water samples obtained from promising sites around the world. Culture bottle experiments have been carried out with these samples at the Sydney Institute of Marine Science. The scientific work has been published as peer-reviewed papers in high-status journals. In addition, the engineering challenges of introducing the nutrients at carefully monitored concentrations from ships have been developed and published. At larger scale, monitoring from satellites will be introduced. Some aspects of this development work are novel and have been patented. Principles and key findings have been presented at significant world conferences.

ONC is seeking support for demonstrating its home-grown technology in Australian waters. Whilst Australia has invested in soil carbon farming and other land-based initiatives, the ocean carbon opportunity awaits funding and Federal government support.

Australia already has a lead position in ocean carbon research, and this could be consolidated with the right policy support and science technology roadmap. ONC will be represented at the COP 26 UN climate conference in the UK with other significant ocean carbon organisations from around the globe.

“We therefore request policy support from the Australian Federal Government for ocean carbon and an Australian ocean technology economy roadmap. We further request the inclusion of ocean carbon as a key agenda item as part of Australia’s contribution to COP 26.”