

Blue Carbon in the Blue Economy in the Blue Pacific

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In 2026, the opportunities for advancing our understanding and the values of our maritime natural infrastructure for planetary benefit have multiplied. This paper investigates the South Pacific countries actions and legal avenues to strengthen their ocean-based economy based on scientific evidence, and thus to empower current and future generations.

The Blue Pacific

The Big Blue Continent relates to the 25 island countries that participate in the Pacific Ocean activities under the Pacific Island Nations of Non-Government Organisations. (PIANGO). The Blue Pacific manages 20% of the world's oceans. The Blue Pacific 2050 initiative describes the 16 (+2) South Pacific countries that have agreed on a shared vision and strategies towards 2050 (Pacific Islands Forum Secretariat, 2022). The themes encompass governance, social inclusion, natural resource stewardship, climate resilience, ocean care, economic empowerment, and technologies.

Twelve countries are members of the Commonwealth. Together, the union has proven a strong force with the International Court of Justice with opinions, ecocide cases, and human rights for future generations. Furthermore, the United National General Assembly in July 2026 determined that countries are liable for harmful emissions decisions. In July, Tuvalu, Samoa, Fiji, Palau, Vanuatu and Federated States of Micronesia enforced fossil-free futures to differentiate countries who benefit from those who pay the social costs of harmful climate practices.



Fig. 1. The Island Countries of the South-west Pacific

The United Nations Framework on Climate Change Convention (UNFCCC) meets annually with countries reporting on performance. However, 2026 is the year of climate action – the Implementation Council of the Parties (COP31) stricter scrutiny and accountability is expected. The Blue Pacific Continent comprises small island states and some larger ones with over the defined 1.5 million population - like Papua New Guinea. Although Turkey is physically hosting the COP, Australia with the Pacific leads the policy and practice negotiations. The Preparatory Leaders Meeting will be held in Vanuatu and Fiji, and the Youth preliminary sessions led by the United Nations Children's Fund (UNICEF). Every year, the Biological Diversity Council of Parties (COP) measures 23 targets (Convention on Biological Diversity, 2022). Because these targets are action-oriented and interconnected, it is difficult to isolate marine targets alone.

So, we need to be clearer about measuring absolutes with 'before and after' evidence.

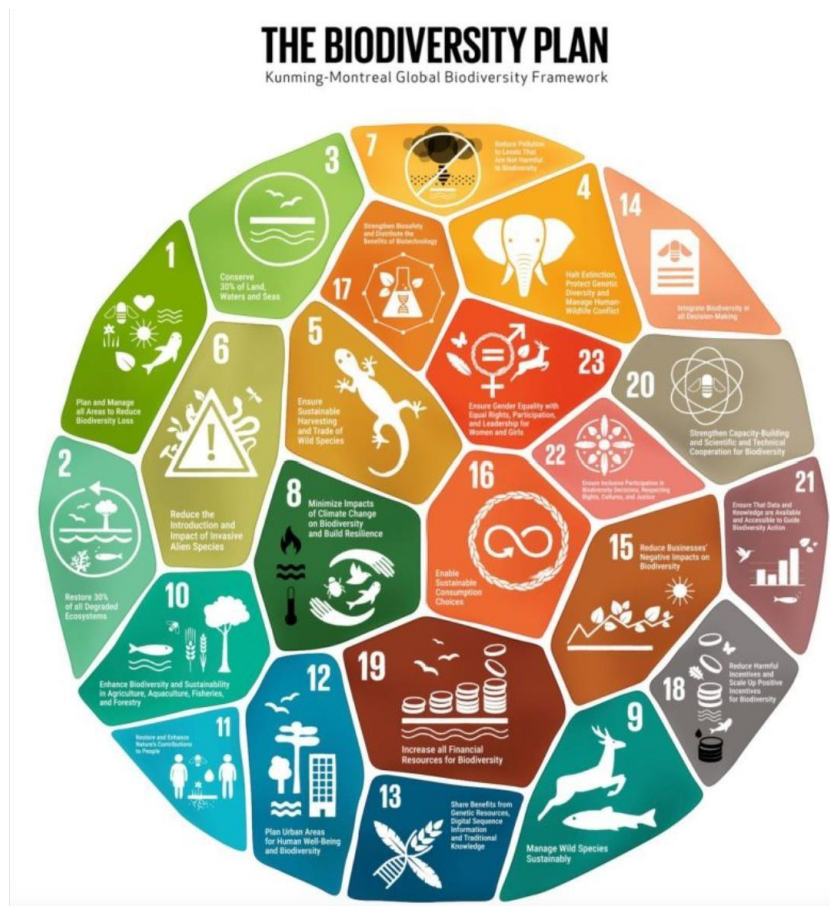


Figure 2 : The 23 biodiversity targets (Convention on Biological Diversity, 2022)

The Oceans Treaty has taken decades to establish, but on 17 January 2026 it was enacted with signatories of 145 countries. Palau from the Pacific was the first signatory on the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement)

From that higher level introduction, the need for measures for the Blue Economy emerged.

The Blue Economy

In 2013, the Commonwealth determined the value of the Blue Economy as \$24 trillion USD for its jurisdictions. So, what do we mean by the Blue Economy? It may be described as the approach to economic security and sustainable development that “does not cost the earth” or the ocean. A formal definition for the Commonwealth is offered by the Royal Society (Voyer, et al., 2022).

Put more simply, the ocean-based activity that balances environmental protection and social equality with economic growth, resilience and consolidation. The original scope was in managed fisheries, eco-tourism, renewable energy, and shipping. More recent additions are aquaculture, bio-technology, carbon credits, leisure industry with coastal development and ecosystems services.

With the majority of Commonwealth Countries being Island Nations in the Pacific, Indian and Atlantic Oceans, in 2013 the Commonwealth introduced the Blue Charter (Commonwealth Secretariat 2021). Based on the International Rule of Law, United Nations Law of the Sea (UNCLOS) and 1400 voluntary commitments, its 16 principles acknowledging:

1. Sustainable development to protect the environment
2. Recognition of small and vulnerable states
3. The importance of young people and civil society
4. Human rights, gender equality, and dignity
5. Good governance, justice and peace.

The Action Groups were established: Clean Oceans Alliance; Coral Reef Protection and Restoration; Mangrove Ecosystems and Livelihoods; Marine Protected Areas; Marine Acidification; Ocean and Climate Change; Ocean Observation; Ocean and Climate Change; Sustainable Aquaculture, Sustainable Blue Economy; and Sustainable Coastal Fisheries.

In 2024, The Commonwealth endorsed the Oceans Declaration in Samoa at the Commonwealth Heads of Government Meeting (CHOGM) (Commonwealth Secretariat, 2025). This captured Key aspects were (1) recognition of national maritime boundaries in the face of sea-level rise (2) protection of at least 30 per cent of the ocean and restoring at least 30 per cent of degraded marine ecosystems by 2030 (3) urgent finalisation of the Global Plastics Treaty (4) ratification of the high-seas biodiversity Agreement on Marine Biodiversity in Areas Beyond National Jurisdiction (known as the BBNJ Agreement or 'High Seas' Treaty) (5) development and implementation of coastal climate adaptation plans and strategies, including vulnerability assessments and nature-based solutions, such as blue carbon (6) more support for a sustainable blue economy with sustainable ocean plans, recognising the need for 100 per cent management of national waters (7) reduction of emissions from global maritime shipping (8) enhanced marine renewable energy targets to meet the global climate goal of tripling renewable energy capacity, agreed as part of the UNFCCC Global Stocktake.

Simultaneously, Island Innovation, a consultancy that works with governments, institutions, and partners worldwide to support island-led sustainable economic development, organises the regular *Island Innovation Summit* which shares knowledge and techniques for better legal, governance, stewardship and sustainable development strategies (Island Innovation, 2026).

In 2026, many Pacific actors are participating in the COP31 negotiations, after enormous efforts internationally to recognise the existential risks. As part of the Pacific, Australia has been elected for presidency of the policy negotiations with agreement that Turkey physically hosts the COP31 in Antalya on the Mediterranean Sea. Without that compromise, the COP would have returned to Bonn in Germany without the experiential learning of leaders.

What can we learn from COP forum outcomes to determine the impact of a blue economy?

The Nationally Determined Contributions(NDC) under the UNFCCC allows countries to determine how they will address climate change. *'The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.'*

To understand the methods for making important and lasting ethical decisions, the UNFCCC has proformas for countries to adopt ways of presenting empowering information. The following table is an example of how to report on the blue economy attributes under the NDC reporting model

- Energy means fuel and electricity supply
 - FOLU means food and land use
 - Agriculture
 - IPPU means industrial processes and product use
 - Waste relates to byproducts and unusable end results of operations.
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Blue economy
sector:

NDC SECTOR:

ENERGY

FOLU

AGRICULTURE

IPPU

WASTE

Maritime trade, transport and logistics	Port electrification and efficient shipping reduce fuel use and emissions			Cleaner fuels and logistics efficiency cut process emissions	Cleaner port operations and ship discharge recovery
Fisheries and aquaculture	Electrified vessels and energy-efficient cold chains	Mangrove-linked aquaculture reduces land-use pressure	Climate-smart aquaculture and feed-to-harvest efficiency		Processing waste management reduces waste discharge to surrounding water
Tourism	Renewable, low disturbance power generation for coastal tourism	Nature-based tourism supports restoration	Eco-tourism supports the circularity of local food systems (e.g. traditional fishing farms) with tourism activities		Waste management in tourism hubs
Marine conservation and ecosystem services	Coastal restoration supports local energy resilience by protecting critical coastal energy infrastructure	Blue-carbon ecosystem protection (mangroves, seagrass)	Ecosystem management supports coastal farming	Expansion of marine protected areas against sea mining; reducing the environmental impact of sea mining	Management of marine litter and pollution supports ecosystem quality
Marine-based industry	Efficiency upgrades and clean energy in shipyards can reduce cost and pollution			Low-carbon materials and manufacturing	Industrial wastewater treatment
Marine renewables	Offshore wind, tidal, ocean thermal energy conversion (OTEC) technologies			Renewable marine-based energy supply for industry	
Research and development (R&D) and education	R&D in clean-energy tech	Ecosystem (marine) valuation research	R&D on nutrient recycling	Circularity R&D; industrial decarbonisation R&D	Circular economy innovation
Biotechnology and bio-economy	Marine biofuels and biomass energy	Bio-restoration and carbon sequestration biotech	Bio-feed and circular nutrient systems	Bioplastic and bio-material substitution	Waste-to-energy and bio-composting technology

Figure 3: Climateworks: Turning the Tide Report November 2025:

Advancing the blue economy through ocean-based mitigation action.

Given those impacts from this example of the blue economy, there is another layer that has significant contributions to mitigating existential threats. While COP31 might be steering towards the shiny new toys to reduce emissions in our cities, diverse industries and hungry data centres into the future, there is another avenue to examine.

Blue Carbon

In any carbon evaluation there is a need to consider both the reduction in sources of carbon in contrast to the strengthening of carbon sinks. Those sinks are described as the natural systems that sequester carbon from the atmosphere and the oceans. In a recent analysis, the effectiveness of such natural based solutions can be illustrated by the extent and timeliness of sequestration.

The International Panel on Climate Change (IPCC) reported on sequestration including Blue Carbon (1) Mangroves (2) Sea Grasses (3) Coral Reefs (4) Whales (5) Coastal wetlands (see Conservation International, 2019).

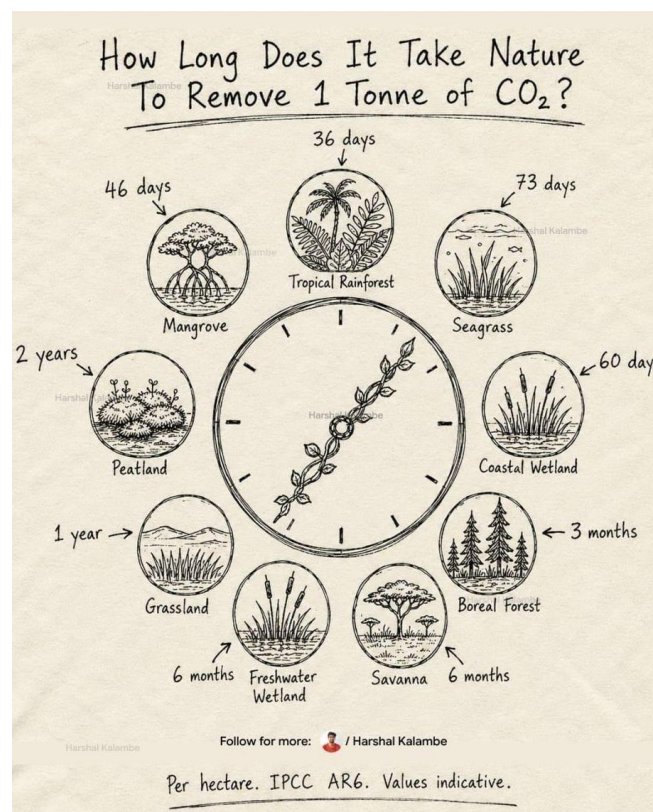


Figure 4 How Long Does Nature Take to Remove 1 Tonne CO₂?

Indicative Values International Panel on Climate Change AR 6 Synthesis 20 March 2023

While the emphasis is on strengthening the carbon sinks, the impact of losing our effective “emission suckers” cannot be ignored. In Asia Pacific, the heat impacts alone decline the effectiveness of our natural ecosystem services, as explained in the heat profiling. The ‘race is on’ between the heating of our environment, especially evident in urban footprints, and the resilience of the natural systems to mitigate those impacts. So timing is imperative for rapid sequestration of emissions.

When learning more about Blue Carbon, there are the following policy and practice considerations. Every country must determine its own approach. The parameters are time, complexity, cost and policy relevance as

well as finance , impacts and co-benefits of taking actions. The following questions help communities and countries to take appropriate action for themselves.

Top ten priority questions in blue carbon science			Time scale	Research complexity	Cost	Policy relevance
	Q1	How can we manage blue carbon ecosystems while supporting the livelihoods of coastal communities?				
	Q2	How can we develop affordable, high-quality methods for implementing restoration?				
	Q3	Can we forecast the future greenhouse gas balance of blue carbon ecosystems in response to global change?				
	Q4	How can we improve estimates of human pressures and management on carbon cycling of blue carbon ecosystems?				
	Q5	How can we advance natural capital accounting in blue carbon ecosystems to include a more comprehensive range of co-benefits and trade-offs?				
	Q6	Which innovative techniques, analytical tools and new data or proxies may improve the accuracy of blue carbon flux estimates?				
	Q7	Can we simplify blue carbon crediting, while maintaining appropriate integrity standards?				
	Q8	Which regions and flux types need priority measurement to improve blue carbon budgets?				
	Q9	How can we enhance the accuracy of upscaling blue carbon estimates across scales?				
	Q10	How can we ensure blue carbon data and communication methods effectively inform climate policy?				
Key  Finance  Crediting  Social and Policy  Prediction  Measurement  Co-benefits			Short/low	Medium/moderate	Long/high	

Figure 6: Top ten research priority questions for scalable, high-integrity management of BCEs. (after Macreadie et al., 2026)

There is good news. Mongabay cited the Science Journal and UNESCO audits on the state of the world's mangroves, and complementary wetland mapping. South East Asia Pacific extracts from the Global Mangrove Alliance reports the performance over the past decades. (Science: 2026)

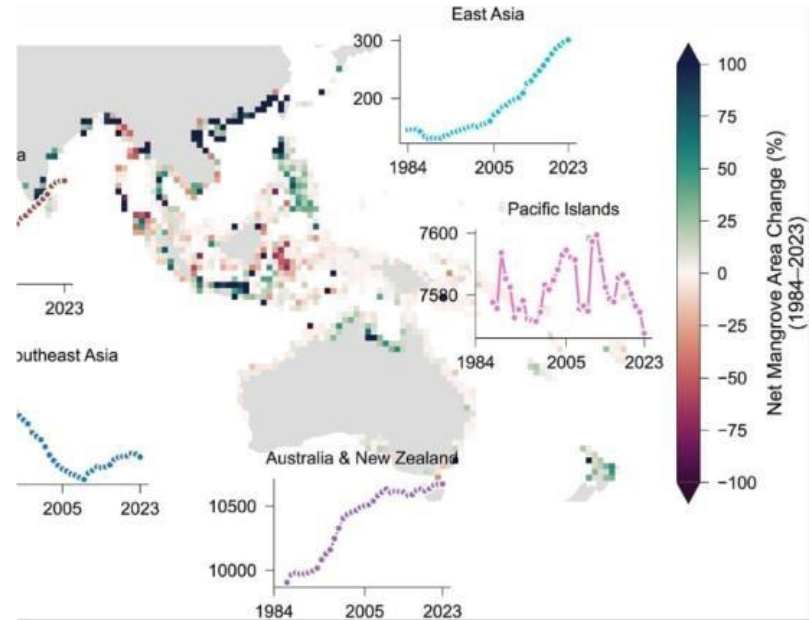


Figure 7: Global patterns and regional trajectories of mangrove area change (1984–2023).

Colours indicate net percentage change in mangrove area at the 1° grid cell scale. Insets show regional mangrove area trajectories at annual frequency.

In reflection, Australia and New Zealand and parts of the Pacific have increased their investment in mangrove forests to 75% to 100%, while in Asia there have been variable losses of coastal natural infrastructure, in some cases up to 100%. Thus, our region has mixed outcomes that benefit only some local communities.

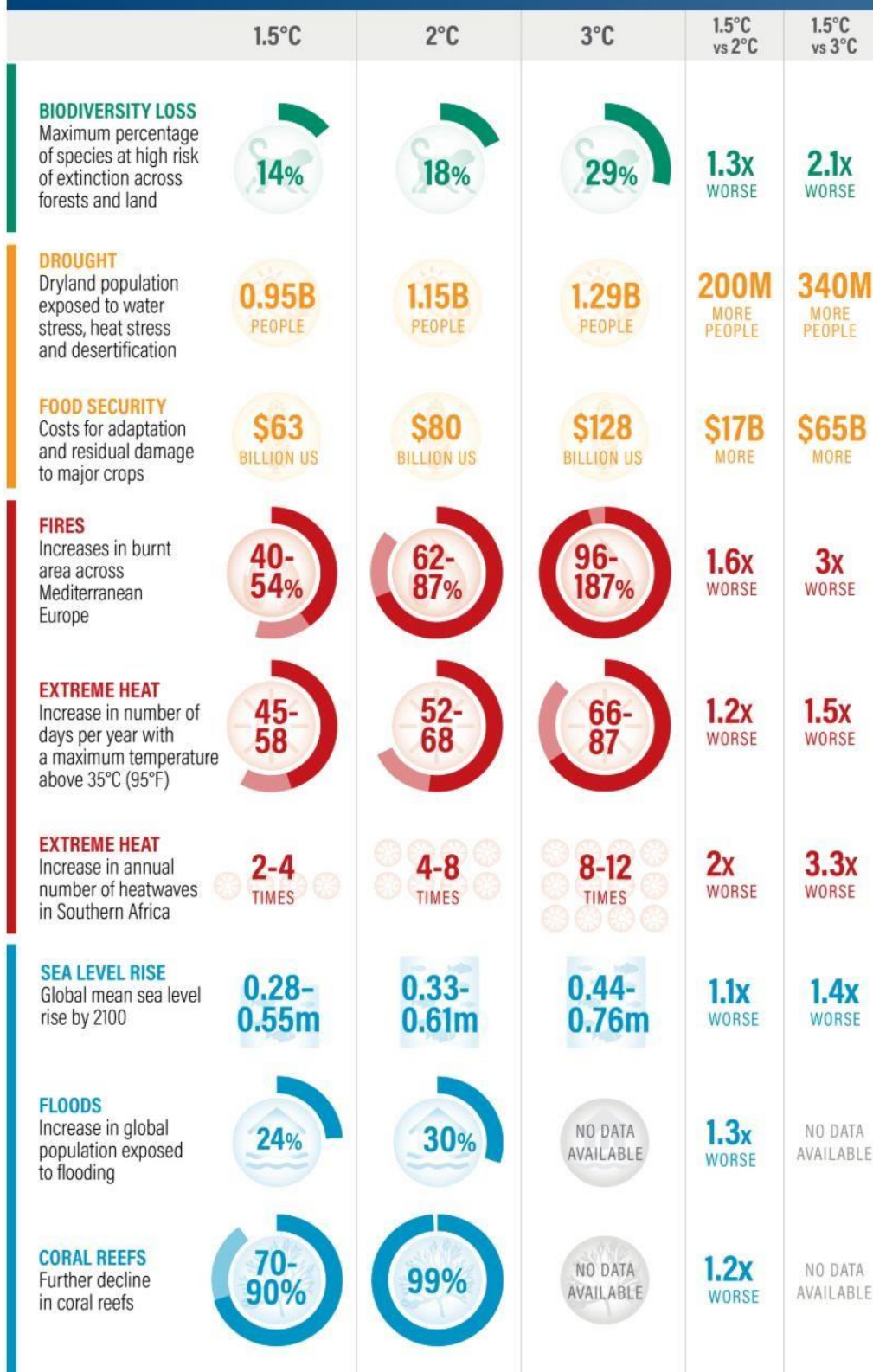
So, in the current situation, we need to consider the 'Pressure, state and response' of our natural systems in the 2026 experience of climate change.

- The pressure on our natural systems especially in the tropics includes increasing heat and overall average temperature rise, especially night temperatures.
- The state of our natural systems determines the resilience factors for successful survival and recovery
- The response to these challenges might require human positive interventions with the long term horizon in mind.

The vulnerability calculations are interpreted by Johan Rockstrom as (1) exposure to hazards (2) susceptibility to harm (3) coping capacity (4) adaptation governance also determines the preparedness for doing the right things at the right times. (Potsdam: 2016) Otherwise, any human intervention might be throwing good effort after a bad situation that may never recover. So, preparing and building coping capacity might be the first step before investing in some innovative engineering solution.

The range of risks and implications are summarised below for the impacts of changes in our lives when limited to 1.5 degrees, 2 degrees, and 3 degrees.

COMPARING RISKS FROM RISING TEMPERATURES:



Note: For climate risks with projected ranges, we used the midpoint of the ranges to compare risks at different temperature thresholds. Sea level rise projections correspond to SSP1-1.9, SSP1-2.6, SSP2-4.5, which are roughly approximate to global warming of 1.5°C, 2°C, and 3°C, respectively. Source: IPCC Working Group II Report (AR6).

Figure 8 - Extract from IPP AR6 (2023) In conclusion:

The Blue Pacific is the hotspot for international scrutiny and lessons learned. The union of countries has paved the way for international laws and policies on Ecocide, Human Right to a Safer Future (intergenerational equity), the UN resolution to make responsible countries liable for loss and damage when making harmful climate decisions, and for enacting the Oceans Treaty.

The Blue Economy potential is yet to be realised. However, the opportunities are evident for countries to be empowered for their desirable futures - that do not cost the earth.

The Blue Carbon systems underpin ethical choices for countries to harvest natural solutions to healthy lifestyles now and for future generations. This brave new world is within reach of our Blue Pacific peoples. The future is looking brighter in Blue.

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