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REPORT

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REVIVING MELANESIA'S OCEAN ECONOMY

The case for action

in association with

The University Of Queensland AUSTRALIA

gciQ Global Change Institute

BCG The Boston Consulting Group

The **Global Change Institute** (www.gci.uq.edu.au) at The University of Queensland, Australia, is an independent source of innovative research, ideas and advice for addressing the challenges of a changing world. The Global Change Institute works to address the impacts of climate change, technological innovation and population growth through collaborative research across four key themes: clean energy, food systems, sustainable water, and healthy oceans. Professor Hoegh-Guldberg and Dr Tyrone Ridgway also undertake research on coral reef ecosystems and their response to rapid environmental change, and did not receive salary for writing this report.

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WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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Front cover
A child from Tavewa Island, Fiji, holds a recently caught fish. Depleted coastal fisheries could seriously constrain opportunities for Melanesia's children.

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Lead authors: Professor Ove Hoegh-Guldberg and Dr Tyrone Ridgway, Global Change Institute, The University of Queensland, St. Lucia 4072, Australia

The Boston Consulting Group: Marty Smits, Taz Chaudhry, Jamie Ko, Douglas Beal, Camille Astier

Editors-in-chief: John Tanzer and Kesaia Tabunakawai

Managing editor: Paul Gamblin

Contributing editors: Sian Owen, Aimee Gonzales, Sally Bailey, Jackie Thomas, Seema Deo

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About the lead authors:

Professor Ove Hoegh-Guldberg is Director of the Global Change Institute and Professor of Marine Studies at The University of Queensland. His research focuses on the impacts of ocean warming and acidification, where he is one of the most cited authors on climate change and marine ecosystems. Ove has published over 250 peer-reviewed papers and book chapters, including being the coordinating lead author for the regional 'Oceans' chapter for the Fifth Assessment report of the IPCC and chair of the Blue Ribbon Panel for the Global Partnership for Oceans. He is the Chief Scientist of the XL Catlin Seaview Survey and Ocean Agency, a member of the Australian Academy of Science, and was awarded the Prince Albert II of Monaco Climate Change Award in 2014. Ove would like to dedicate this report to Hans Hoegh-Guldberg who authored many WWF reports on the social and economic impacts of climate change.

Dr Tyrone Ridgway is the Healthy Oceans Program Manager at the Global Change Institute at The University of Queensland. His research focuses on the impacts of ocean warming on marine ecosystems, and he is widely published on tropical marine ecosystems. Tyrone manages the XL Catlin Seaview Survey and has experience in research, resource management, science education and communication, and program management.

This report is available at: ocean.panda.org

CONTENTS

FOREWORDS

FRANÇOIS MARTEL
SECRETARY GENERAL
PACIFIC ISLANDS DEVELOPMENT FORUM

It will perhaps come as little surprise that the Pacific Ocean is in peril. Many of us recognize that deep-seated change is required in how humans view and manage the ocean and its rich array of resources that are the foundation of Pacific island livelihoods, economies and cultures. Indeed, over the years, significant efforts have been undertaken to conserve and better manage marine resources in the Pacific. However in most cases, we have been doing this without clear scientific assessments to demonstrate the economic and developmental values of our "ocean assets".

This WWF report helps fill a big gap in knowledge on ocean economics and highlights some alarming statistics about the declining ocean assets – and, potentially, entire ecosystems – in the Melanesian region.

Importantly, the report provides a strong baseline and key guidelines for the Pacific Islands Development Forum to develop innovative solutions that support members in taking action to sustainably manage their valuable ocean resources in the context of the Blue Economy. Specifically, we note the need for committed partnerships between government, business and civil society leaders and for an integrated, cross-sectoral and cross-scale approach to fast track the recovery of the "shared wealth fund" of our ocean and bring it back to sustainable levels.

Finally, with its assessment of Melanesia's ocean resources, assets and threats, and its proposed guidelines for action, this report should help to form the basis for a solid Pacific strategy in view of the high-level United Nations Conference to Support the Implementation of Sustainable Development Goal 14; and help inform leaders and practitioners on how to sustainably use the oceans, seas and marine resources to drive sustainable development in our islands.

Supplied by Pacific Islands Forum Secretariat

MEG TAYLOR, DBE
PACIFIC OCEAN COMMISSIONER

For decades, Pacific leaders have emphasized through regional ocean policy the importance of a secure future, based on sustainable development, management and conservation of the ocean and its resources. This is not surprising given the significant economic, social and cultural benefits derived from Oceania.

While this WWF report looks at the potential implications of current policies and practices in Melanesia on ocean health and presents an economic case for ocean conservation, its perspectives should be carefully considered by the entire region given how our ocean connects our countries.

This connectivity is illustrated by the iconic marine species of tuna, sharks, whales and turtles that traverse our maritime zones and the high seas – biologically important, culturally significant and economically valuable. It is also evident in the threats to our ocean – such as the effects of climate change – that have implications for all of us.

We are all aware that Pacific countries' economies and communities are not the only beneficiaries of our ocean and resources. Our ocean makes very significant contributions to global ocean services and other economies. Therefore, regional and global approaches to good ocean governance and management are essential. But these cannot be at the expense of local and national efforts, as many ocean management and conservation issues are best addressed by local communities and national governments.

If we are to avoid destroying our ocean's assets and rebuild our ocean's capacity to sustain our Pacific way of life, livelihoods and well-being, we all must take action urgently and together across the breadth of ocean-related interests.

Our Sea of Islands, Our Livelihoods, Our Oceania – the Framework for a Pacific Oceanscape (FPO), which addresses the need for broader coordination and implementation of the Pacific Islands Regional Ocean Policy (PIROP), was endorsed by Pacific Islands Forum leaders in 2010. The concept of a Regional Ocean Commissioner, with a dedicated support unit, and a Regional Ocean Partnership/Alliance mechanism were also endorsed by Pacific Islands Forum leaders through the FPO in 2010, and the Secretary General of the Pacific Islands Forum Secretariat was appointed to the role of the Pacific Ocean Commissioner.

Two boys head to Katawaqa Island, Fiji, where turtles nest. Visionary leadership and bold and decisive action are needed to bring about a new era of sustainability and hope for our children.

EXECUTIVE SUMMARY

This report comprises an analysis of the direct economic and societal values of the ocean assets of the Melanesian region (Fiji, New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu) and foreshadows the losses that are likely to occur if the current pressures on the ocean are not addressed. The report outlines a clear series of actions necessary to steer the region towards a sustainable and inclusive blue economy.

US$548BN

THE VALUE OF THE TOTAL OCEAN ASSET BASE OF MELANESIA IS AT LEAST US$548 BILLION

The annual "gross marine product" (GMP) of the Melanesian region – analogous to a country's annual gross domestic product (GDP) – is at least US$5.4 billion, which is broadly equivalent to the combined GDPs of Fiji and Solomon Islands, making it the third largest economy in the region. The total "ocean asset base" of the Melanesian region is currently valued at a minimum of US$548 billion, composed of primary assets (e.g. marine fisheries, coral reefs, mangroves, seagrass) and adjacent or ancillary assets, including productive coastlines and carbon absorption.

The importance of the ocean to the Melanesian region, as for all Pacific island countries, cannot be overstated. These island nations have strong cultural and social dependencies on the sea, with a large part of their food coming from subsistence fishing activities. Values of maritime activities that do not depend on the ecological function of the ocean, such as those from offshore mineral extraction or shipping, were excluded from the estimates presented in this report, as were assets for which data is not yet available. The analysis also did not include economic values for clearly important intangibles such as the ocean's role in regulating the climate, producing oxygen and stabilizing planetary temperatures, or the spiritual and cultural services that the ocean provides. As such, we believe the figures presented in this report are a substantial underestimate, and that the ocean assets at risk are far more than those presented here.

CALL TO ACTION

The precious ocean and coastal assets that have sustained Melanesian communities for millennia now need to be managed with renewed urgency to reflect the era of unprecedented change challenging the region, and the planet. Time is not on our side.

The deep dependence of Melanesians on the ocean is increasingly precarious as the underlying coastal and ocean assets are depleted by local, regional and global pressures. Not to act with resolve is to condemn these essential resources and the people who depend on them to a much poorer future.

This report is a rallying call for the region's leaders who know that action on a scale much greater than ever before is necessary, today. Financial resources, community support, leadership across sectors and whole-of-government implementation at national levels is needed to rebuild the ecosystems and habitats that support fisheries for essential food and income, that underpin valuable sustainable tourism industries, and that secure life for families across the region.

The global spotlight will be trained on the Pacific in 2017, given the region's major role in the UN Ocean Sustainable Development Goal implementation process, providing leaders the chance to show the world how to achieve a sustainable and inclusive blue economy without delay.

Ocean economic value is tied to assets that are in decline

Melanesia's annual economic value, or GMP, is reliant on a healthy ocean asset base. Many of these ocean assets are in decline from a range of local and global pressures. This has implications for the environment, food security, employment and the well-being of human communities within the region and beyond.

THERE IS A REAL CHANCE THAT THE DECLINING OCEAN ASSETS OF MELANESIA WILL CONSTRAIN OPTIONS FOR FUTURE GENERATIONS

The physical and chemical conditions in the ocean are changing faster than at any other point in history, and there is a strong chance that the declining ocean assets of the Melanesian region will constrain options for future generations. Consequently, the region's leaders are faced with a choice between two pathways. The first is the current trajectory of increasing pressure on ocean assets and inadequate policy commitments and/or action. This pathway will lead to a degraded future in which opportunities for the inhabitants of the Melanesian region will be significantly diminished. The second trajectory is to chart a course of policy actions that are based on knowledge and understanding, and which will create a sustainable and inclusive blue economy. A sustainable and inclusive blue economy will ensure that the economic development of the ocean contributes to the true prosperity and resilience of the Melanesian region long into the future.

Six steps to secure the assets of the ocean

The ocean can be seen as a "shared wealth fund", with the principal capital of the Melanesian region being eroded at a rate that undermines the ocean's value for current and future generations. It is time to reset the agenda before this ocean capital base collapses.

The good news is that rapid action on a number of key issues will deliver benefits for ocean systems and the people who depend on them. Some of the benefits could be reinstated in a relatively short period of time. These six essential actions offer a clear path toward reviving the ocean economy and propelling the Melanesian region toward the goal of sustainability.

- ACTION 1 IMPLEMENT THE MELANESIAN SPEARHEAD GROUP INSHORE FISHERIES ROADMAP
- ACTION 2 DELIVER SPATIAL PLANNING AND PROTECTION TO MAINTAIN IMPORTANT RESOURCES
- ACTION 3 APPLY ECOSYSTEM-BASED APPROACHES TO RESOURCE MANAGEMENT
- ACTION 4 SLOW CLIMATE CHANGE AND BUILD RESILIENCE
- ACTION 5 SUPPORT EFFECTIVE PARTNERSHIPS
- ACTION 6 INVEST IN EDUCATION AND GENDER EQUALITY

These actions are particularly important given that humanity is at a watershed moment following the adoption of the United Nations 2030 Agenda (Sustainable Development Goals) and the Paris Climate Agreement in 2015. It is not too late to act – but the time to act is now. Failing to take immediate action will deprive future generations of Melanesian people of the opportunity to gain social and economic benefits from their much-needed and cherished ocean assets. The loss of these assets would also have profound implications for the wider region and beyond.

Erik Koti holds some of his coral pieces. Cultured corals are propagated by cutting fragments of corals from mother colonies or brood stock. These coral pieces are attached to concrete mounts until they grow into new colonies. Western Province, Solomon Islands.

PART ONE

THE IMPORTANCE OF PACIFIC OCEAN ASSETS FOR MELANESIAN WELL-BEING

The livelihoods and future of Melanesian communities are inextricably linked to the health of the ocean waters around them.

The Pacific Ocean is the largest ocean basin on Earth, covering one-third of its surface. In addition to having a major influence on the temperature and climate of our planet, the Pacific Ocean is also home to rich biological resources, and cultures that go back thousands of years. Given that most Pacific communities are entirely island-based, the sea has always been an intrinsic part of life. However, industrialization, urbanization and rapid population growth threaten many of the ecosystems that form the basis of Pacific island life and livelihoods.

MELANESIA COVERS A VAST AREA - AROUND 8 MILLION KM^2. THE COUNTRIES OF THE REGION ARE MORE "LARGE OCEAN STATES" THAN "SMALL ISLAND STATES"

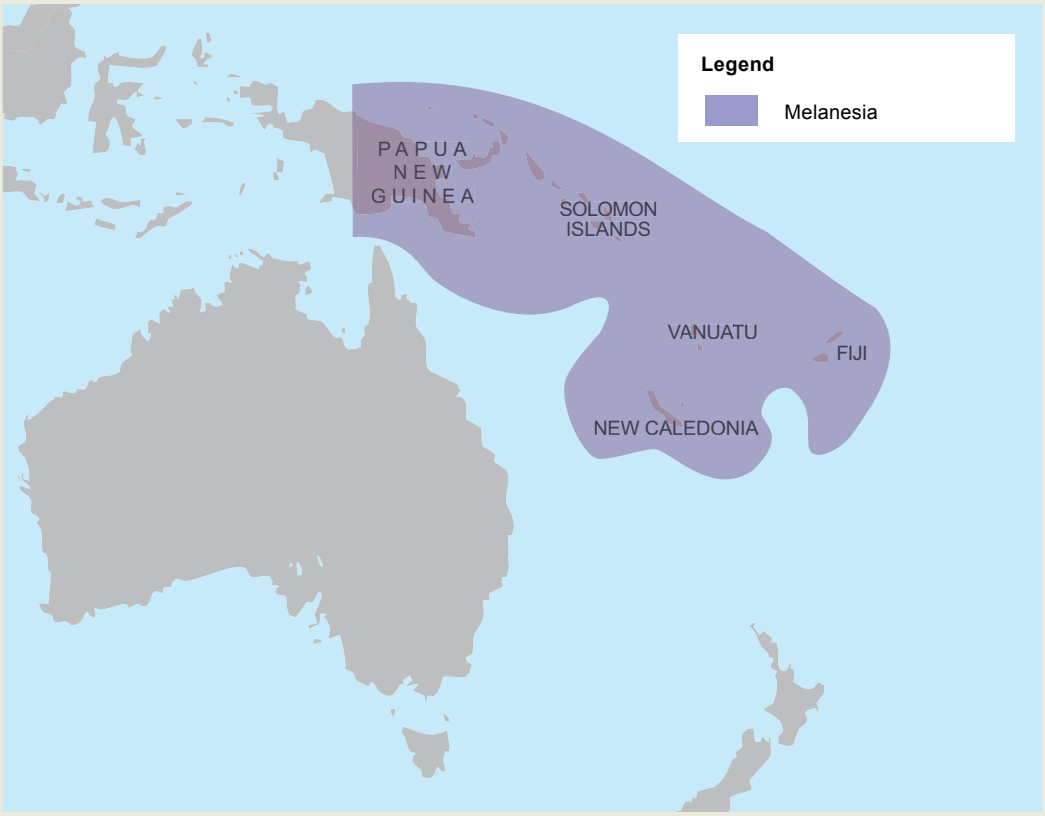
Often referred to as the "sea of islands", the Pacific island countries and territories are divided into three sub-regions: Melanesia, Micronesia and Polynesia. Their cultures have all traditionally emphasized wise resource use, environmental stewardship and the fact that the ocean connects rather than separates them. The Melanesian region forms the focal point of WWF's Pacific activities, and is also the focus of this report. It includes Fiji, New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu. The Melanesian region comprises 98 per cent of the landmass of the Pacific island countries and territories, and ~87 per cent of their population (Box 1). Collectively the exclusive economic zones (EEZs) of the Melanesian region are vast, covering ~8 million km^2 (Govan 2013) which is roughly equivalent to Australia's EEZ. In effect, the countries of the region are more "large ocean states" than "small island states". As these countries are considerably more ocean than land, it follows that prudent management of the associated marine and coastal resources will be vital for their future.

Despite cultural and environmental similarities across the Melanesian region, there are also differences. One of these is the diversity in wealth, with gross domestic product (GDP) per capita ranging from US$2,115 in Solomon Islands to US$37,839 in New Caledonia (Box 1). These differences in wealth generation per head of population feed into many of the challenges faced by these emerging countries, as highlighted at the Third International Conference on Small Island Developing States. This conference called for urgent action and support for Small Island Developing States (SIDS) in priority areas including climate change, given the particular vulnerability of SIDS; the careful management of ocean resources to support poverty-alleviation, culture and identity, and as building blocks of a sustainable ocean-based economy; and securing the right of everyone in SIDS to food and nutrition, and livelihoods, while maintaining marine ecosystem health. The United Nations 2030 Agenda for Sustainable Development provides for actions that integrate economic, social and environmental concerns, and offers the best opportunity yet for making appropriate, diverse, and targeted interventions on matters such as inequality, poverty and environmental degradation.

The ocean is Melanesia's lifeblood, sustaining a diverse range of natural assets such as fish stocks, coral reefs, mangroves, seagrass beds and open ocean ecosystems. Together with the rich resources on land, marine resources also underpin the foundation of economic prosperity and human well-being. Ocean assets provide a range of valuable goods and services, including food and raw materials, income, energy, tourism, recreation, cultural practices, protection from storms, and climate regulation.

BOX 1 MELANESIAN REGION DEMOGRAPHICS

The Pacific islands encompass three major regions: Melanesia, Micronesia, and Polynesia.



Country	Population	Land area (km²)	Population density (per km²)	Exclusive economic zones (km²)	Inshore fishing area (km²)	GDP per capita* (US$)
Fiji	851,745	18,272	46.6	1,290,000	49,424	5,142
New Caledonia	268,767	18,576	13.6	1,740,000	28,666	37,839
Papua New Guinea	6,888,297	462,840	14.9	3,120,000	170,596	2,578
Solomon Islands	553,254	28,370	19.5	1,340,000	55,002	2,115
Vanuatu	251,784	12,190	20.7	680,000	13,986	2,979
TOTAL	**8,797,411**	**540,248**	**n/a**	**8,170,000**	**317,674**	**n/a**

* Population & land area data from Secretariat of Pacific Community (SPC) (www.spc.int.sdp); EEZ from SOPAC (www.sopac.org); Inshore Fishing Areas from Seas Around Us project; Population density – Reefbase (www.reefbase.org); GDP based on 2015 values, IMF World Economic Outlook 2015 and UN country data: New Caledonia UNSD 2016.

However, increasing human-induced pressures – such as the over-harvesting of fish stocks, illegal and unplanned coastal development, pollution from agricultural and mining activities, and climate change – are rapidly degrading and depleting many critical assets within Melanesian waters, putting the benefits that they provide at risk. Understanding the value of what is at stake is an important step in finding solutions and creating the circumstances for better decision-making.

To determine the value of Melanesia's ocean, six categories of assets for which primary analyses existed were assessed. The Boston Consulting Group's assumptions and methodology for this analysis are available at ocean.panda.org.

Four of the six categories are primary assets of the ocean (marine fisheries, mangroves, coral reefs and seagrass) and have a value of US$530.8 billion (Figure 1). The remaining two are adjacent or ancillary assets: productive coastlines (focused on tourism) and carbon absorption, valued at US$17.2 billion.

AT US$5.4 BILLION, MELANESIA'S OCEAN ECONOMIC ACTIVITY WOULD MAKE IT THE THIRD LARGEST ECONOMY IN THE REGION

Based on the total of these six most readily measured asset categories, the value of Melanesia's ocean is US$548 billion. These categories are not exhaustive, but aim to address the main components where primary analysis exists; insufficient data on tidal salt marshes which almost certainly provide enormous value, for example, excludes them from the analysis.

The study further found the minimum annual economic value of ocean-related activities (annual "gross marine product" or GMP) of the Melanesian region to be US$5.4 billion. For comparison, if Melanesia's ocean were its own economy, it would be broadly equivalent to the combined GDPs of Fiji and Solomon Islands and the third largest economy in the region.

The significant value of the Melanesian GMP depends on the health of the region's ocean and coastal assets. Yet, due to insufficient data and a lack of appropriate methods to capture the value of non-market products, these valuations are likely to be major underestimates of the total asset value of the ocean. Benefits that have a less formal economic basis, such as small-scale (non-commercial) fisheries, can be nonetheless enormously important to coastal communities (particularly small island states in the Melanesian region, Gillett 2016), but are often difficult to measure using classical economic analyses.

Beyond the numbers, intangible benefits such as spiritual and cultural enrichment should also be acknowledged and taken into policy consideration, even if they cannot be captured quantitatively in this analysis (Box 2).

BOX 2 VALUING THE INVALUABLE

The economic analysis presented here estimates the value of ocean ecosystems in terms of the value of marketed goods and services produced by industries that are directly associated with the ocean ecosystems of Melanesia. It represents a classical economic analysis of how ocean ecosystems support economic activity and associated benefits for people and industry.

However, many assets defy formal economic analysis and assessment, making it impossible, at present, to place a price on intangibles and non-market products. Intangible benefits include the role that the ocean plays in atmospheric regulation, carbon storage, and ecosystem services such as water filtration by mangroves, seagrass and wetlands, and the value generated by ecosystems in terms of human culture and lifestyle.

Small-scale non-commercial fisheries are a good example of a non-market product that is difficult to cost, but which plays an important role in human well-being, especially in Melanesia. Non-commercial fisheries in the South Pacific are difficult to value in monetary terms, given that most if not all of the products do not pass through commercial markets. Many people depend on fish as a source of protein. Fishing helps people maintain a stable source of income independent of market uncertainty, and is an important factor in social cohesion. Also, because it requires very little initial investment and training, it can not easily be substituted by other sources of income or food.

Local ocean culture and customs are equally difficult to express in monetary units in the Melanesian region. The value that local communities attribute to money, and its function in life, differs widely from common economic assumptions. For example, island societies assign value to items that lack exchange equivalents, or relative prices, and which therefore are difficult to include in a classical economic evaluation.

Communities often attach a high value to preserving ecosystems for use by future generations, independent of their own needs for the ecosystem (bequest value). This may reflect the "duty of care" that underpins the relationship between people and land in many regions (a)*.

While it is very difficult to put a precise dollar value on these benefits, it is indisputable that these important "intangibles" are indeed of great value to people and industries. The economic estimates presented therefore provide a conservative estimate of the true asset value.

**These letters refer to sources that are listed in the literature section at the end of the report.*

© James Morgan / WWF

A local man dives for trochus on Tetepare, Solomon Islands. Healthy and resilient oceans are essential for the sustainable development of Pacific island countries and other Small Island Developing States.

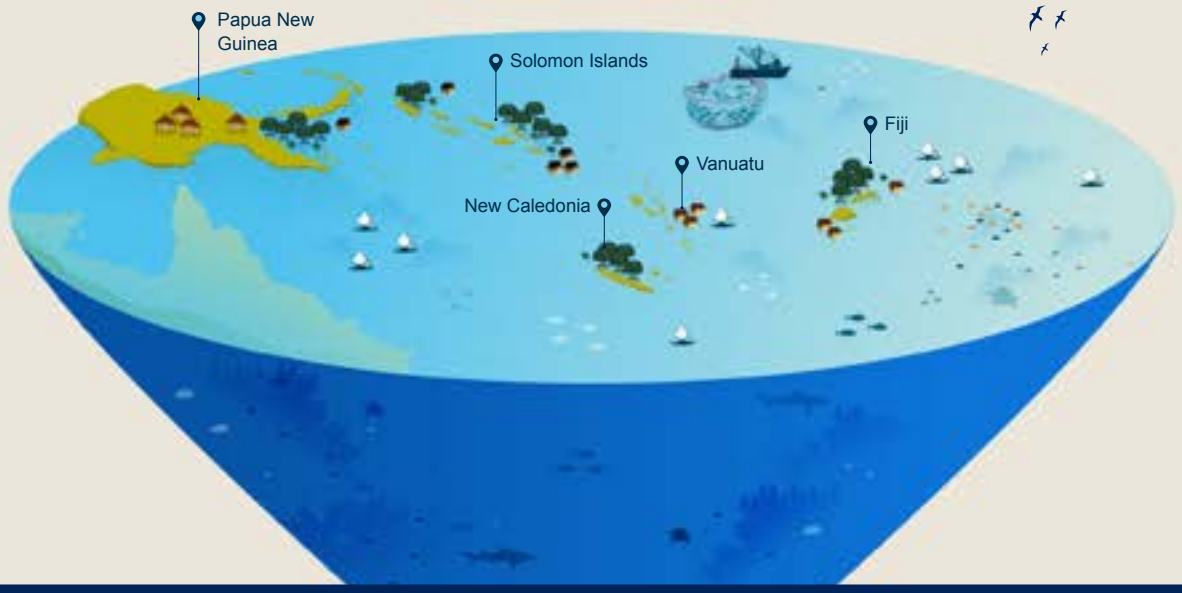
FIGURE 1 WHAT IS THE ECONOMIC VALUE OF MELANESIA's OCEAN?

OCEAN ASSET VALUE IN MELANESIA - SHARED WEALTH FUND

Marine assets in the Melanesian region generate much more value than we are aware of and could provide even more if they are well managed.

US$548 bn

TOTAL SHARED WEALTH FUND ASSET BASE



MELANESIA's GROSS MARINE PRODUCT

(data from 2015)

Gross Marine Product (GMP) is the ocean's annual economic value.

27%

ADJACENT BENEFITS OF THE OCEAN

- **20%** Coastal tourism
- **5%** Carbon sequestration
- **2%** Coastal protection

56%

DIRECT OUTPUT OF THE OCEAN

- **53%** Marine fisheries: Commercial
- **2%** Marine fisheries: Non-industrial
- **1%** Aquaculture / mariculture

17%

DIRECT SERVICES ENABLED BY THE OCEAN

- **9%** Cruise industry
- **8%** Marine tourism

CORAL REEFS, MANGROVES, FOOD SECURITY, LIVELIHOODS, STORM PROTECTION, TOURISM ASSETS — THEY'RE ALL CONNECTED

PRIMARY ASSETS

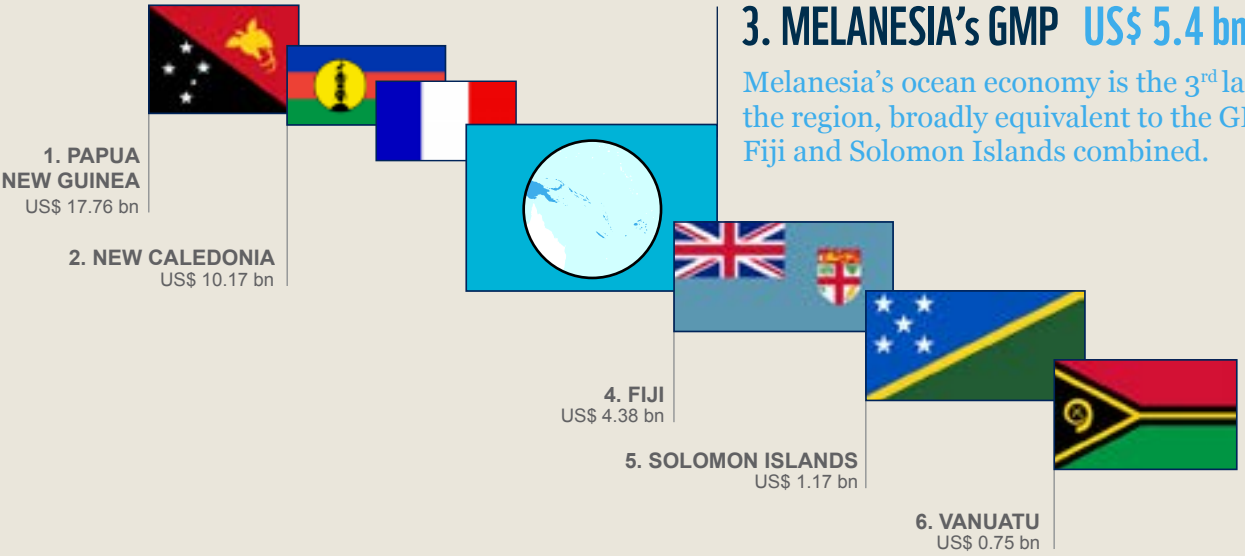
Marine Fisheries	US$ **124.1** bn
Mangroves	US$ **109.6** bn
Coral Reefs	US$ **145.7** bn
Seagrass	US$ **151.4** bn

ADJACENT ASSETS

Productive Coastline	US$ **14.7** bn
Carbon Absorption	US$ **2.9** bn

HOW DOES MELANESIA's GROSS MARINE PRODUCT COMPARE TO REGIONAL GDPs?

(data from 2015)



3. MELANESIA's GMP US$ 5.4 bn

Melanesia's ocean economy is the 3rd largest in the region, broadly equivalent to the GDPs of Fiji and Solomon Islands combined.

Analysis for this section is provided by:

BCG
The Boston Consulting Group

SOURCES:

IMF World Economic Outlook 2015;
UN country data: New Caledonia UNSD 2016.

1.1 Healthy marine environments are important for the Melanesian economy

THE RELIANCE ON FISH FOR FOOD IN MELANESIA WILL PLACE INCREASING PRESSURE ON COASTAL FISHERIES AS POPULATIONS GROW

Maintaining healthy ocean assets is crucially important to the future of the Melanesian region. In terms of GMP, commercial fisheries are the greatest contributor, followed by coastal tourism, the cruise industry and marine tourism. If the natural assets that underpin these sectors are degraded, the dividends earned will be seriously diminished.

Resource use can have a range of characteristics. Renewable resources can be sustainably managed despite exploitation, as seen in some fisheries or industries such as many carefully managed tourism ventures. By contrast, activities such as mining will lead to depletion of exploited resources over time. Similarly, benefits can be short or long term. Valuation tools such as cost-benefit analyses can help guide communities, governments and businesses in making decisions about resource exploitation, along with governance that provides for the fair allocation of resources. As discussed above, decision-makers need to also appreciate that many aspects of resources may not be accounted for or valued, leading to risks of poor decisions on the use of coastal resources and other assets.

1.1.1 The value of fisheries in Melanesia

Marine fisheries in the Melanesian region have an estimated collective worth of US$124.1 billion, representing ~23 per cent of the total ocean asset base for Melanesia (Figure 1). These numbers are likely to be a major underestimate due to the continuing challenges of collecting catch data, particularly in coastal subsistence fisheries (Box 3).

The majority of the income described above can be attributed to the high value of tuna fisheries. However, the worldwide decline in tuna populations coupled with increasing global demand has resulted in an increase in fishing for tuna by foreign fleets in the Pacific. According to Gillett (2016), foreign-based offshore fishing continues to increase and is responsible for almost all of the regional increase in fish catches in the period 2007-2014. Foreign-owned vessels land an estimated 80-90 per cent of the commercial catches of Papua New Guinea, Solomon Islands and even Vanuatu (extrapolation from Gillett, 2016). As such, the actual realized dollar value from commercial marine fisheries to the Melanesian region's economies is almost certainly less than the ocean asset value calculated here. For example, fishing licences granted under the Parties to the Nauru Agreement (PNA) for access to tuna stocks in the waters of PNA countries provide significant revenues to participating countries including Papua New Guinea and Solomon Islands.

The PNA countries control the world's largest tuna purse seine fishery and around half the global supply of skipjack tuna. They came together in recognition of the need to better manage the tuna resources of the region through their collective power and influence over their respective EEZs. The PNA countries have demonstrated how local control of resources can lead to improved management by the resource owners, with a corresponding economic windfall (Box 4). For example, the PNA and free-school purse seine yellowfin tuna fishery was certified by the Marine Stewardship Council in 2016, which follows on from the Marine Stewardship Council certification of the PNA free-schooling skipjack tuna fishery in 2011.

BOX 3 CATCH RECONSTRUCTION IN ESTIMATING FISHERIES

Fisheries are a vital source of food security and livelihoods, particularly for many of the world's poor coastal communities. Yet their economic importance is often underestimated as many of these fisheries are small-scale in nature, spatially dispersed and therefore poorly documented and/or under-reported.

There is growing recognition of the importance of having accurate data, and many initiatives are under way to improve data collection and reconstruction at both global and regional levels. One such initiative at the global level is the "catch reconstruction" project led by the University of British Columbia (UBC) which, along with its partners, has been compiling official national data and comparing this to data supplied to FAO from 1950 to 2010 (a,b). The method uses a wide variety of data and information sources to derive estimates for all fisheries components missing from the official reported data, and suggests that catches for 25 Pacific island countries and territories (PICT) between 1950 and 2010 were 2.5 times greater than reported to FAO.

With the support of the Department of Foreign Affairs and Trade in Australia, The Pacific Community (SPC) released a report in July 2016 to update existing fisheries data and develop a new baseline to help measure achievements and assess the future of fisheries in PICTs (c). This initiative intends to document the changes in management of Pacific tuna fisheries and address the food security concerns of coastal fisheries in light of growing population and the effect these have on PICT economies. The report highlights the challenges of finding accurate and up-to-date data on the value of fisheries with very poor statistics on coastal fisheries production in most countries.

While there are limitations to both approaches, the UBC catch reconstruction dataset was used in the analysis presented here because it was the most comprehensive publicly available regional dataset for Melanesia. The UBC data was triangulated with the data provided in the 2016 SPC report (c). As with all fisheries datasets, it is likely to underestimate true levels of fishing, particularly with respect to coastal subsistence fisheries.

A fisherman from the M'buke community, Manus, Papua New Guinea, prepares his net to catch bait.

BOX 4 TACKLING THE TUNA PROBLEM HEAD-ON

Often referred to as the "oil" of the western and central Pacific, the tuna fishery is a regional economic powerhouse. In 2014, the estimated tuna catch in the western and central Pacific was ~2.883 million metric tonnes, with an estimated landed value of ~ US$5.8 billion (a). As unsustainable fishing threatens tuna stocks elsewhere and as the global demand for tuna grows, the value of Pacific tuna continues to rise – bringing with it an increase in foreign fishing fleets and increased pressure on local tuna stocks. The Pacific Islands Forum Fisheries Agency (FFA) recently published the first quantitative assessment of illegal, unreported and unregulated (IUU) fishing conducted in the western and central Pacific, discovering an annual net loss of US$616 million from regional fisheries due to IUU fishing (b).

The eight Pacific countries (the Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu) that formed the treaty arrangement called the Parties to the Nauru Agreement (PNA) in 1982, have taken measures to sustainably manage tuna in their waters and increase economic benefits for their peoples.

One such measure, the Vessel Day Scheme (VDS), is a system whereby PNA members agree on a limited number of fishing days for the year, based on scientific advice about the tuna stock status. Fishing days are then allocated by country and sold to the highest bidder. The VDS has also resulted in strong economic benefits to the region, with increased fishing fee revenues, which currently form a large proportion of the landed value of the catch. These gains also represent a substantial improvement in the net economic benefits generated by the fishery for the region.

The PNA has also independently sought and secured Marine Stewardship Council certification of its free-school fishery while advocating for reduced reliance on fish aggregating devices, which are the primary driver in the depletion of overfished bigeye tuna in the region. Certification is helping the PNA countries to access high-value markets for sustainably caught tuna.

In short, PNA countries are implementing novel tools to effectively manage their fishery for the long term. At the same time, they are advocating for similar measures to be taken by the Western and Central Pacific Fisheries Commission to cover the wider region.

The Parties to the Nauru Agreement (PNA) controls the world's largest sustainable tuna purse seine fishery. In 2011, the PNA skipjack tuna caught without using fish aggregating devices was certified by the Marine Stewardship Council as sustainable, thus designating the world's largest sustainable tuna purse seine fishery.

BOX 5 POPULATION GROWTH AND THE INCREASING NEED FOR FOOD

With the exception of Papua New Guinea, Melanesian countries have relatively small land areas yet vast ocean territories. This means that inhabitants are reliant on the sea for a large part of their nutritional requirements. The bulk of coastal fisheries in the Melanesian region are non-commercial and are for local consumption, which makes the value of these activities difficult to assess as data is often not collected or easy to find. However, the relatively small inshore fishing areas are of particular importance, with Vanuatu and the Solomon Islands obtaining most of their animal protein from non-commercial fishing activities (56 per cent and 92 per cent respectively) (a,b). The 2010 population of the Melanesian region was 8.7 million and is projected to be at 12.4 million by 2030.

The coastal fisheries of the Melanesian region are widely assumed to be exploited at or near maximum capacity, with non-commercial and artisanal catches declining by 2-8 per cent per year since 2000 – suggesting that demand will greatly exceed the capacity of coastal systems to produce (a). Recent estimates suggest that by 2030, with a projected population increase of 3.7 million people, 60 per cent more fish will be required compared to 2010 (c). As a result, improving the management of the inshore fisheries is an immediate priority, coupled with the exploration and adoption of approaches such as sustainable aquaculture, agriculture and alternative livelihoods (a,d).

While the Melanesian region faces many challenges in dealing with its changing physical and social environments, unless this projected food gap is addressed, there will be significant negative impacts on local traditions, health and well-being.

The situation in Melanesia is consistent with global perspectives on fisheries. The World Bank, the FAO and World Resources Institute have all concluded that the further significant exploitation of fisheries to feed the Earth's growing population is not achievable. The FAO estimates that 31.4 per cent of fisheries are overfished, 58.1 per cent are fully fished and 10.5 per cent are underfished stocks (e). Given the serious under-reporting of take especially in developing regions, this is likely to be an optimistic analysis.

Massive holds of a tuna fishing ship are filled to the brim with frozen tuna before being unloaded at Levuka's cannery on Ovalau Island, Fiji. The cannery is one of the biggest producers and suppliers of canned tuna products in the Pacific.

1.1.2 The crucial contribution of small-scale fisheries

Globally, small-scale fisheries (which can be a combination of commercial and non-commercial) support the food security of hundreds of millions and employ more than 90 per cent of the world's capture fishers (HLPE 2014). They often involve subsistence fishing or gleaning, with either direct consumption or person-to-person trade (Bell et al. 2009), avoiding market channels. As a result, the scale and structure of the component fisheries is difficult to determine precisely.

At the same time, the importance of small-scale fishing activities in the coastal areas of the Melanesian region cannot be overstated. About 70 per cent of the overall fisheries production from coastal areas of the Pacific islands is estimated to be produced by subsistence fishing (Gillett 2011). Depending on the country, between 50-90 per cent of total animal protein in Pacific regions comes from non-commercial fishing activities (SPC 2015, Gillett 2009, Bell et al. 2009, Govan 2013).

Healthy small-scale fisheries can support good nutrition, increase household income and provide opportunities for casual employment and business. That said, the Melanesian region has some of the highest birth and population growth rates in the world, resulting in a rapidly growing and largely coastal population (Box 5). The reliance on fish for food in Melanesia will continue to place increasing pressure on the coastal fisheries, with implications for food security (Bell et al. 2009).

The declining status of coral reefs, seagrass beds and mangroves in the Asia-Pacific (including Melanesia) region (Alongi 2002, 2008, Bruno and Selig 2007, Chin et al. 2011, Orth et al. 2006, Waycott et al. 2009) undermines the viability of small-scale inshore fisheries, and hence food security, livelihoods and well-being (Box 5). Conserving these habitats will be crucial for the long-term viability of fish stocks and for much of the ocean productivity that generates economic value.

1.1.3 Natural ocean assets support Melanesian economies

COLLECTIVELY, THE CORAL REEFS, SEAGRASS BEDS AND MANGROVES OF THE MELANESIAN REGION HAVE AN ASSET VALUE OF AT LEAST US$406.7 BILLION, AND SUPPORT IMPORTANT MARINE FISHERIES AS WELL AS OCEAN-BASED AND COASTAL TOURISM INDUSTRIES

Productive fisheries and tourism ventures rely on healthy ocean assets in Melanesia. Collectively, coral reefs, seagrass beds and mangroves of the Melanesian region have an asset value of at least US$406.7 billion, and support important marine fisheries as well as ocean-based and coastal tourism industries.

The tourism sector is growing rapidly. Its success will depend largely on the health of the physical assets of the coastline. While tourism can take many forms, Melanesia has natural assets that are ideal for coastal and nature-based tourism. A growing yet sustainable tourism industry, if correctly managed and equitably distributed, can have both substantial economic and conservation benefits (Box 6).

Coastal ecosystems such as mangroves and coral reefs also provide crucial protection against storms and tsunamis (Ferrario et al. 2014, Zhang et al 2012). They break the force of waves as well as stabilize and prevent coastal erosion. The benefits in terms of coastal protection are clear in many regions, although data sets are minimal for many parts of the world, including Melanesia (Marois and Mitsch, 2015).

While not included in the current analyses, there are other emergent industries that will need to be considered when discussing the economic and ecological future of the Melanesian region. For example, oil and gas extraction and seabed mining are under consideration in a number of countries within the ~8 million km² of Melanesia's ocean territory. However, these proposals raise major uncertainties and pose important questions about whether potential short-term gains might incur long-term losses, and would thus need to be assessed carefully and holistically.

Knowledge of the issues and impacts involved with seabed mining activities is at an early stage (e.g. Ahnert and Borowski 2000, Ramirez-Llodra at al. 2011). While

interest is increasing (e.g. SPC 2016), there is relatively limited understanding of the potential impacts of seabed mining on deep ocean ecosystems and food webs, or shallower ecosystems like reefs and near-shore fish populations if mining takes place in close proximity. This is of particular concern in Fiji for example, where exploration leases have been granted close to the Great Sea Reef. While seabed mining is likely to remain on the development agenda of the Melanesian region (SPC 2013, 2016), the precautionary principle should be observed given the paucity of information on potential risks to important ocean assets, industries, communities and national economies (Mengerink et al. 2014, Wedding et al. 2015, World Bank 2016).

The results of the economic analyses presented in this report provide a reminder of the past, present and future importance of the ocean to the inhabitants of the Melanesian region. However, this valuable resource is under threat, with the most recent evidence indicating that the ocean is already producing far less than it could if it were managed in keeping with the principles of sustainable development.

BOX 6 HOW MUCH IS A SHARK WORTH?

Arguments for the conservation of sharks based on their role in the maintenance of healthy marine ecosystems have failed to halt the global decline in the population size of some species. Rather, an increasing global market for shark meat, coupled with the existing shark fin market, has driven a shift in exploitation of sharks, from being largely bycatch to a target fishery. However, shark diving tourism and an emphasis on the economic value of sharks as a non-harvested resource represent an alternative conservation approach.

For example, the value of ~100 sharks interacting with the dive tourism industry in Palau over 16 years (using conservative estimate of the lifespan of common reef sharks) was recently calculated to be ~US$200 million (a). The value of catching and selling these same 100 sharks on the international market would be ~US$10,800 (based on US$20–90 for a set of shark fins and US$2-5 per kg for shark meat, which is considered to be of poor quality).

Shark diving not only has the potential to provide significant economic revenue to local communities, but provides incentives for the conservation of reefs and associated shark species through systems of traditional ownership. If carefully managed, shark diving can potentially provide a model for the non-extractive use of reef resources for the benefit of both local people and the reef ecosystem itself. The potential for this benefit in the Melanesian region is great, given that dive tourism is well established and projected to increase. The shark-diving industry in Fiji, for example, was estimated to contribute US$42 million to the Fijian economy in 2010, of which US$4 million went directly to local communities through salaries and community levies (b).

Grey reef shark, New Britain, Papua New Guinea. Shark-diving tourism has the potential to generate much-needed economic returns and at the same time contribute towards conservation efforts for these marine species.

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PART TWO

KEY DRIVERS OF CHANGE FOR MELANESIA'S OCEAN ASSETS

Unprecedented change within the Pacific and beyond is the hallmark of our time. Rapidly increasing populations, climate change and technological advances are dramatically ratcheting up the pressure on ocean systems, undermining the natural assets upon which the Melanesian region depends.

Understanding how Melanesia is changing is important to finding solutions and a prosperous pathway forward. This section looks at the drivers of change to Melanesia's marine resources in order to understand how the future might unfold for the people of Melanesia.

2.1 Accumulating risks are challenging ecosystems and people

Despite the close relationship that Melanesians enjoy with their marine resources, current trends indicate that these resources are under increasing threat from local and global human activities. Habitat destruction together with overexploitation of river catchments and coastal areas, the impact of chemical and plastic pollution, and the overexploitation of key fisheries are placing the ocean asset base in many parts of the Melanesian region under significant pressure. Changes are also arising from rapidly rising greenhouse-gas concentrations (Hoegh-Guldberg et al. 2014). Adding CO_2 to the atmosphere is warming and acidifying the ocean, increasing sea level, inundating coastal areas, salinifying coastal water supplies, and changing weather patterns, among many other changes (IPCC 2013).

The drivers are diverse and include pressures from rising consumption as well as greater numbers of people seeking livelihoods, food, housing, and building materials from coastal areas. Urban expansion, port construction and commercial development have led to the destruction of mangroves and other coastal ecosystems. At the same time, overseas demand for Pacific goods and services has increased rapidly over the past few decades, increasing pressure on high value export species such as tuna and sea cucumber (*bêche-de-mer*). Pressures have also increased on coastal ecosystems as the infrastructure for tourism and shipping has expanded.

The impacts of other drivers are less direct, but equally important. The failure to adequately recognize the crucial role women play in the management and sustainable use of inshore fisheries resources, for example, has limited the implementation of solutions (SPC 2015). Women are critical to a nation's socio-economic development, and improved gender equality in fisheries is inextricably linked to poverty reduction and development (Harper et al. 2013). Women's participation is integral to successful coastal fisheries management, however, their role is often overlooked or diminished (SPC 2015). In the Pacific region, women account for 56 per cent of the annual small-scale catches, resulting in revenue of US$110 million and a total economic impact of US$363 million. Recognizing and quantifying the role of women in fisheries has profound implications for poverty alleviation and development. (Harper et al. 2013)

2.1.1 Implications of population trends for nutrition from fishing

Increases in human population size and urbanization are fundamental challenges for the 21st century. Countries have to accommodate this growth while at the same time conserving the natural ecosystems and resources their inhabitants depend on. Papua New Guinea, Solomon Islands and Vanuatu have among the highest birth rates in

PAPUA NEW GUINEA, SOLOMON ISLANDS AND VANUATU HAVE AMONG THE HIGHEST BIRTH RATES IN THE WORLD

the world (Govan 2013), which highlights the need to address concerns around food security in the Melanesian region in the near future (Bell et al. 2009, 2015).

A recent paper has drawn attention to the link between dwindling fish catches and increasing malnutrition, particularly in developing countries (Golden et al. 2016). There is growing evidence that nutrition in some regions is already under significant pressure and is affecting people's well-being. For example, 32 per cent of children under the age of five in Solomon Islands, and 26 per cent in Vanuatu, were recently found to have stunted growth relating to malnutrition (AusAID 2012). Poverty and the disparity in supply of, and access to, resources from island to island (or state to state, or amongst different groups – with women and children suffering the most) represent significant challenges that must be solved. These trends in nutrition and population growth indicate that resources in the Pacific are already overstretched, and strongly indicate that adequate quantity and quality of nutrition cannot be taken for granted in the Melanesian region, or indeed in other Pacific island countries and territories.

Coastal fisheries are already at the limit of exploitation as populations continue to grow rapidly

COASTAL FISHERIES IN THE MELANESIAN REGION ARE WIDELY REPORTED TO BE AT OR NEAR MAXIMUM CAPACITY, SUGGESTING THAT GROWING DEMAND WILL GREATLY EXCEED THE CAPACITY OF COASTAL SYSTEMS TO PRODUCE ENOUGH FOOD

The coastal fisheries in the Melanesian region are widely reported to be at or near maximum capacity, suggesting that growing demand will greatly exceed the capacity of coastal ecosystems to produce enough food (Govan et al. 2013). Recent studies report that 16 out of 22 Pacific island countries and territories (which include Papua New Guinea, Solomon Islands and Vanuatu) are likely to fall significantly behind the projected demand for protein from fisheries (Bell et al. 2015). It has been estimated that an additional 100,000 tonnes of fish will be needed by 2030 for good nutrition across Melanesia; the shortfall to be exacerbated by the predicted decline in coastal fisheries (SPC 2015). These problems will become increasingly challenging as the impacts of climate change shift the distribution of tuna eastward, with declining catches predicted for Papua New Guinea and the Solomon Islands by 2035 (Bell et al. 2013).

The crucial importance of small-scale fisheries for food security amplifies the need to stabilize and rebuild coastal fisheries in Melanesia, especially in light of the lack of alternative protein sources. Improving the management of the coastal fisheries needs

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Recent estimates suggest that by 2030, 60 per cent more fish will be required, compared to 2010. Unless this projected food gap is addressed, there will be significant negative impacts on local traditions, health and well-being.

to be an immediate priority (Bell et al. 2015, Gillett 2016). Redirecting increasing percentages of the tuna catch into the domestic food supply – 12 per cent by 2020 and 25 per cent by 2035 – has also been recommended (Bell et al. 2015).

Aquaculture is another option for increasing food security. However, the pursuit of aquaculture can distract from the management of existing resources and as such, any development plans should not be made at the expense of, nor replace, urgent current and potential investment in coastal fisheries management. In addition, aquaculture development needs to be planned and managed carefully as it can have negative impacts on habitat integrity and coastal water quality.

Coastal people, who are most vulnerable to the impacts of declining marine ecosystem health, need help to rebuild their fisheries, including strategic government support to reinforce their traditional tenure rights and enforce local management of coastal fisheries resources. This characteristic feature of Melanesia has been recognized globally by the broader term "governance of tenure", which relates to securing "tenure rights and equitable access to land, fisheries and forests as a means of eradicating hunger and poverty, supporting sustainable development and enhancing the environment" (FAO 2012).

2.1.2 Tropical coastal assets under pressure

Small-scale fisheries are closely dependent on the state of other coastal assets such as coral reefs, seagrass beds and mangroves (Bell et al. 2011). There is consequently an urgent imperative to ensure the health of these important ecosystems in order to secure the livelihoods of the inhabitants of the Melanesian region. Unfortunately, increasing human activities such as coastal development, port expansion and fishing have begun to degrade these valuable assets, with major ramifications for coastal livelihoods (Halpern et al. 2008).

Coral reefs face a barrage of threats

An assessment of the status of coral reefs found that 57 per cent of South Pacific coral reefs were threatened by human activities at medium to very high levels (Chin et al. 2011). The reefs of the Melanesian region face a number of natural and anthropogenic threats which include tropical cyclones, crown-of-thorns starfish outbreaks, pollution, over-exploitation, coastal development, and declining water quality as a result of poor land management practices (Chin et al. 2011). Moreover, the local pressures on coral reefs cannot be considered in isolation from the serious long-term threats of ocean warming and acidification, with 100 per cent of coral-dominated reefs likely to be lost by 2040-50 if climate change is not drastically reduced (Hoegh-Guldberg 1999). In fact, the combination of local stressors and ocean warming and acidification threatens to tip the balance of tropical reefs (Box 7) from being coral-dominated to being dominated by a range of other less productive and less valuable organisms as tourism-related economic assets. This scenario will place downward pressure on the asset value of coral reefs, which is currently estimated at US$145.7 billion for the Melanesian region.

BOX 7 A PACIFIC WITHOUT CORALS?

Recent studies indicate that at least 50 per cent of reef-building corals have disappeared from tropical reefs over the past 30 years (a). While declining water quality and over-exploitation represent serious short-term threats to coral reefs, ocean warming and acidification from rising CO_2 are widely seen as the greatest threats to reefs in the long term.

Mass coral bleaching and mortality of coral reef ecosystems is one of the most visible impacts of climate change, and warns of the dangerous world that we are entering as our climate warms. Serious coral bleaching events have been seen in Fiji (1998, 2000, 2016), in eastern Papua New Guinea and Solomon Islands (early 2015) and in New Caledonia (2016). At current rates of temperature rise, the possibility exists that the world's oceans will become too warm for coral reefs by 2050, resulting in the loss of the world's most biologically diverse marine ecosystem (a).

Fortunately, coral reefs have been given a lifeline by the Paris Climate Agreement in 2015. This agreement aims to keep a global temperature rise this century well below 2˚C in the short term and 1.5˚C in the longer term, relative to the pre-industrial period (prior to 1870). This mirrors the calls from the International Society for Reef Studies consensus statement on climate change (a). However, it will be imperative for world leaders to strengthen their commitments made in Paris to reduce CO_2 concentrations to the levels that are necessary to save coral reef ecosystems in the Pacific, and worldwide.

Soft corals, hard corals and anthias fish in Fiji. The Pacific islands are famous throughout the world for spectacularly rich and vibrant soft coral reefs. Fed by food laden currents, these soft coral gardens are havens and food sources for thousands of species of fish and invertebrates.

FIGURE 2 STATE OF MARINE ASSETS IN MELANESIA

Across Melanesia, overfishing, climate change, resource development projects and other pressures threaten food security, coastal protection and long-term economic opportunity.

COASTAL FISHERIES

POPULATION GROWTH [1]

2010

8.7 million

60%

MORE FISH NEEDED TO FEED COMMUNITIES BY 2030.[2]

70% of all coastal fisheries production in the Pacific islands is for subsistence use.[3]

2030

12.4 million

CORAL REEFS ARE THREATENED

57%

OF SOUTH PACIFIC CORAL REEFS THREATENED BY HUMAN ACTIVITIES AT MEDIUM TO VERY HIGH LEVELS.[4]

By 2030, 100% of coral reefs in PNG will be at risk from local human impacts and climate change, up from 55% in 2012.

Overfishing and destructive fishing affect more than 65% of reefs in the Solomon Islands and 50% of reefs in PNG.[4]

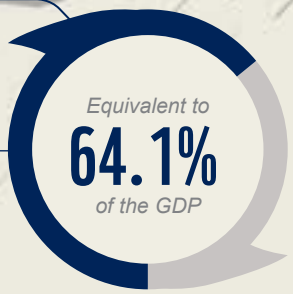
SOURCES: **1.** UNDESA 2015 **2.** Bell et al. 2009 **3.** Gillett 2011 **4.** Burke et al. 2012, Chin et al. 2011, Hoegh-Guldberg et al. 2014 **5.** Government of Vanuatu 2015 **6.** Clarke, 2011 **7.** IPCC 2013 **8.** Harley et al. 2014 **9.** Carleton et al. 2013

EXTREME WEATHER

CASE STUDY: VANUATU [5]

US$450 mill

APPROXIMATE COST OF IMPACTS OF CYCLONE PAM, 2015.

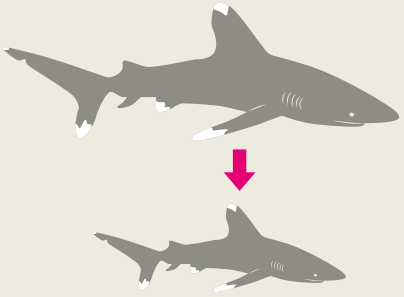


>95%

OF AGRICULTURAL SECTOR DESTROYED, DEVASTATING FOOD SECURITY AND LIVELIHOODS.

SHARKS IN DECLINE

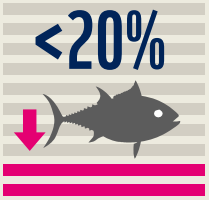
STEEP DECLINES IN OCEANIC WHITETIP OBSERVATIONS AND IN THEIR LENGTHS INDICATE A MAJOR FALL IN THE POPULATION. [6]



(Size comparison for illustrative purposes)

TUNA UNDER THREAT

BIGEYE TUNA - WHICH HAS BEEN A MAJOR SOURCE OF FOOD AND REVENUE - HAS BEEN REDUCED TO LESS THAN 20% OF ITS UNFISHED STOCK SIZE, REPRESENTING AN UNACCEPTABLE RISK. [8]



SEA LEVEL RISE

3-4x

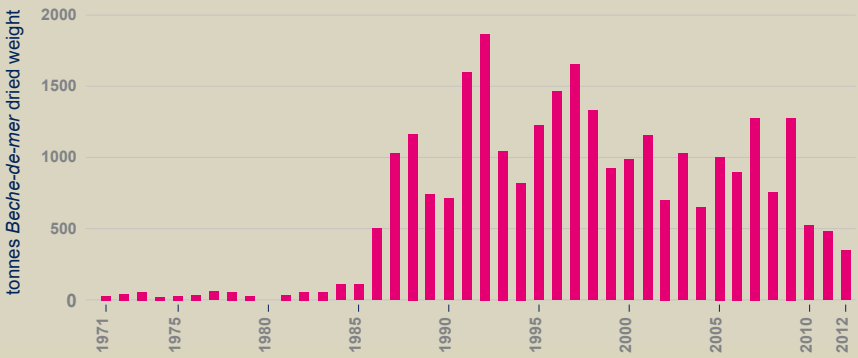
COASTAL AREAS IN MELANESIA HAVE RATES OF SEA LEVEL RISE 3-4 TIMES THE GLOBAL AVERAGE OF 3.2MM/YEAR. [7]

SEA CUCUMBER UNDER PRESSURE

YEARS OF OVEREXPLOITATION OF SEA CUCUMBERS AND A BOOM-BUST APPROACH TO MANAGEMENT HAVE WEAKENED POPULATIONS' ABILITY TO FULLY RECOVER. [9]

CASE STUDY: SEA CUCUMBER EXPORTS

Exports of beche-de-mer from Fiji, Papua New Guinea, Solomon Islands, Tonga and Vanuatu from 1971 - 2012



Capacity of mangroves to support and protect communities is decreasing

THE DESTRUCTION OF MANGROVES IN THE MELANESIAN REGION THREATENS ECONOMIC OPPORTUNITIES AND BIODIVERSITY, AS WELL AS REDUCING COASTAL STABILITY AND PROTECTION, AND FOOD SECURITY

The present study estimates the asset value of mangroves in the Melanesian region at US$109.6 billion. These important ecosystems provide habitat for thousands of species, while safeguarding lives through coastal protection from storms as well as providing nurseries for fisheries that ultimately produce food and livelihoods to millions of people. Unfortunately, the value of mangroves is often not widely appreciated, which is part of the reason for mangroves being cut down at a rate that is three to five times greater than the global average loss of forests (van Bochove et al. 2014).

Mangroves in the Melanesian region face similar challenges to those seen worldwide. This includes deforestation for agriculture, coastal tourism development, port development and urban expansion, with consequential decreases in coastal water quality. In addition, rising sea levels as well as an increased number of heatwaves are reducing the distribution of mangroves along coastlines in the Melanesian region, and the Pacific in general (Mills et al. 2015). The destruction of mangroves in the Melanesian region, as elsewhere, threatens economic and biodiversity losses, and reduces coastal stability and protection, and food security (Alongi 2002, 2008).

Valuable seagrasses in Melanesia face serious challenges

Seagrasses build beds that occupy shallow (0m, low tide) to relatively deep (~20m) habitats along coastlines throughout the Pacific. Like mangroves and coral reefs, seagrass beds are important habitat for many important species (and life history stages) growing along tropical and subtropical coastlines. Seagrass beds support fisheries, are the feeding grounds of threatened species such as dugongs and green turtles, enhance water quality and improve coastal stability, and provide building materials (e.g. mats for building houses). Their estimated asset value in Melanesia is US$151.4 billion. However, Melanesian seagrass communities share the same challenges as their global counterparts, which are under significant pressure from coastal development, declining water quality, increased boat traffic and climate change (Orth et al. 2006, Waycott et al. 2009).

Coral reefs, seagrass beds and mangroves are among the most prominent coastal ecosystems in the Melanesian region. However, it is important to also recognize the fundamental importance of other coastal ecosystems, such as sandy beaches, mudflats and inter-reefal areas, which did not form part of the present economic analysis. The evident value of clean beaches to tourism, for example, underlines the fact that the conservative economic analysis employed in this report underestimates the value of Melanesia's ocean assets.

2.2 Balancing short-term gains versus long-term losses

2.2.1 Seabed mining: a new resource frontier?

FUTURE SEABED MINING REPRESENTS ADDITIONAL AND POTENTIALLY SERIOUS RISKS TO IMPORTANT ECOSYSTEMS, POSING SIGNIFICANT POLITICAL AND REGULATORY CHALLENGES

The potentially substantial marine mineral reserves of the Melanesian region might make these states attractive for foreign investment for resource extraction. However, both coastal and deep-sea ecosystems are highly vulnerable to the physical disturbances that mining is likely to cause, due to fragile habitat structures, slow recovery rates and the interconnected nature of the ocean environment (Smith et al. 2008). As such, future mining in coastal areas or in the deep ocean represents additional and potentially significant risks to important habitats and ecosystems, posing significant political and regulatory challenges (Wedding et al. 2015) for the Melanesian region (Box 8). Melanesian society and its leaders will need to balance the often short-term gains from activities such as mining against the potential long-term impacts and costs of these industries. While it is well established that there are multiple, intricate ecological linkages between the deep and shallow parts of the ocean,

BOX 8 CONSIDERATIONS AROUND SEABED MINING IN MELANESIA

The Melanesian region has attracted significant interest from the nascent seabed mining industry, reflected by the many exploration leases granted to private companies and joint-venture initiatives with national governments. While proponents argue that mining would contribute to national revenues, the Melanesian region has several examples of land-based mining that offer cautionary tales of the risk of a "resource curse" scenario (a). This is where great riches accrue to a select few while many more people bear the environmental and social costs of development. While the short-term attractiveness of the possible accrual of wealth might motivate support for this new industry, there are many concerns about its risks and whether seabed mining is likely to hold significant net socio-economic promise for the region (b).

The potential direct environmental impacts from seabed mining are numerous and could carry profoundly negative consequences for both food and livelihood security derived from healthy coastal and marine ecosystems. Plumes of suspended sediment and particles can smother sensitive ecosystems across wide areas. Chronic, intensive noise pollution is another major concern. The cumulative impacts of several commercial-scale seabed mining operations underway in the same region could be severe.

The advocates of seabed mining assert that conventional land-based mining operations and recycling will not be sufficient to meet demand for metals, and that a significant part of the shortfall can be extracted from the ocean. Many of these claims are contested (c). While the debate ensues, there is growing concern that development of this untested extractive industry is fast outpacing both scientific understanding and appropriate governance systems.

There is considerable scientific uncertainty in the understanding of seabed ecosystems, and their connectivity with wider ocean ecosystems. The current seabed mining proposals are also far ahead of prudent processes that governments have committed to under CBD Aichi Target 11, to conserve marine and coastal areas in ecologically representative systems of protected areas which will include the seabed.

Furthermore, there are currently major regulatory, legal and governance gaps for seabed mining in the Melanesian region (and across the world), particularly in the area of environmental protection. Initial steps are under way to develop regulatory frameworks at national, regional and international levels, but these are still very much in development and are years away from implementation. It will be imperative that any regulatory control includes monitoring and enforcement measures to ensure transparency, accountability, appropriate liability, and civil society oversight and participation.

Loading up nickel in New Caledonia for export to Canada and China. The Melanesian region has several examples of land-based mining that offer cautionary tales of the risk of a "resource curse" scenario. This is where great riches accrue to a select few while many more bear the environmental and social costs of the development of these resources.

current knowledge of the issues and impacts involved with seabed mining activities and the wider implications remain relatively poor (e.g. Ahnert and Borowski 2000, Ramirez-Llodra et al. 2011, Schlacher et al. 2014). Consequently, most experts recommend a precautionary approach (Mengerink et al. 2014, Wedding et al. 2015, SPC 2016, World Bank 2016).

2.2.2 Coastal areas under pressure

CURRENT LEVELS OF INTENSIVE AGRICULTURE AND DEFORESTATION HAVE ALREADY RESULTED IN THE EXPORT OF SEDIMENTS, NUTRIENTS AND AGRICHEMICALS INTO NEAR-SHORE ENVIRONMENTS, WHICH HAS SIGNIFICANTLY REDUCED WATER QUALITY AND RESULTED IN THE DECLINING HEALTH OF MANGROVES, SEAGRASS BEDS AND CORAL REEFS

Well-managed coastal and estuarine ecosystems support livelihoods and income from fisheries and tourism in the long term. Wetland and marine environments (including coral reefs and seagrass) are less vulnerable to decline when the quality of the water within and around them remains high (i.e. low in sediments, nutrients and agrichemicals). Changing land-use practices (deforestation, agriculture, land-based mining) in the Melanesian region are shifting the balance, however, with declining coastal water quality already affecting coral reefs, seagrass beds and other important ecosystems, with correspondingly negative impacts on tourism and fisheries (Lovell et al. 2004). Equally, the unmanaged growth of tourism could pose its own threats to the health of coastal areas, and hence fishing and tourism, as seen in many parts of the Western Pacific (Chin et al. 2011).

Understanding the linkages between how coastal land is used and the resulting water quality outcomes is especially important in Melanesian countries, given their comparatively larger landmass than those of Micronesia and Polynesia. These larger islands can better sustain intensive agriculture and may have sizable rivers discharging into coastal ecosystems. However, current levels of intensive agriculture and deforestation have already resulted in the export of sediments, nutrients and agrichemicals into near-shore environments, which has significantly reduced water quality and resulted in declining health of mangroves, seagrass beds and coral reefs (Albert 2007; Chin et al. 2011). Adopting practices that reduce the flow of land-based effluents and sediments into this region will reduce the rate of destruction of these valuable coastal assets (Tuivavalagi and Morrison 2004).

Striking a balance between short-term gain and long-term losses, whereby ocean assets are maintained over time, is paramount. Getting this right is a core challenge that Melanesian leaders must face. Leaders will need to have accurate information and understanding available in order to make the right decisions for the long-term prosperity of their people.

2.3 Coping with a warming and acidifying ocean

2.3.1 Turning up the heat

Human activities such as burning fossil fuels and deforestation have increased the Earth's average surface temperature by 0.85°C during the period 1880 to 2012 (IPCC 2014). The upper layers of the ocean have absorbed around 93 per cent of the extra heat, and as a result, the average sea surface temperature has increased in the world's three ocean basins by 0.31°C to 0.65°C over the past 60 years (Hoegh-Guldberg et al. 2014). While Melanesian fossil fuel emissions are small by comparison to most other countries, the vulnerability of Melanesian people to the resulting impacts of ocean warming and acidification is disproportionately high.

The reefs of the Melanesian region have evolved to cope with impacts of cyclones and severe storms. Rising sea temperatures, however, are projected to increase the number of more intense cyclones in the tropical Pacific (Australian Bureau of Meteorology and CSIRO 2014). The warming of the ocean is driving impacts across a wide array of ocean habitats and ecosystems through changes in weather patterns and the frequency of extreme events, as well as sea level rise (IPCC 2013).

More intense storm systems will increase the energy of waves and winds in some regions, and consequently the stress on coastal ecosystems. This is particularly evident in Melanesia, where the devastating impacts of Tropical Cyclone Pam in Vanuatu in March 2015 and Tropical Cyclone Winston in Fiji in February 2016 are a stark reminder of the growing climate crisis. Besides the direct loss of life and infrastructure associated with these increasingly strong storm systems, cyclones also cause direct physical damage to coral reefs, seagrass beds and mangroves, which in turn produces serious impacts on fisheries, food availability and coastal protection. Reef recovery from such severe storms is slow, and will be further challenged by an increase in severe cyclones as the time between disturbance events is likely to be reduced. Rates of recovery are also reduced by ocean acidification, which reduces the growth and calcification rates of centrally important organisms such as reef-building corals.

Melanesia bearing higher-than-average sea level rise

COASTAL AREAS IN THE MELANESIAN REGION ARE EXPERIENCING RATES OF SEA LEVEL RISE WHICH ARE THREE TO FOUR TIMES THE GLOBAL AVERAGE

As the temperature of the surface layers of the ocean has risen, the volume of the ocean has also increased due to thermal expansion and the contribution of water from the increased melting of glaciers and landlocked ice sheets. As a result, the sea level has risen by ~20cm since the late 1800s (IPCC 2003). While the average global rate is 3.2mm per year, there are big differences in the rate of sea level rise between regions due to local oceanography and long-term climate variability and trends. Coastal areas in the Melanesian region are experiencing rates of sea level rise which are three to four times the global average (IPCC 2013, Albert et al. 2016). The increases in sea level will also challenge seagrass beds and mangroves, as these ecosystems will increasingly be pushed shoreward by rising seas – in many cases being squeezed up against coastal infrastructure and human communities (Saunders et al. 2013, van Bochove et al. 2014). Such changes not only decrease the ability of these ecosystems to provide ecosystem goods and services, but they also threaten to eliminate many low-lying Pacific island countries and territories (IPCC 2013, 2014).

Mass coral bleaching and mortality

Mass coral bleaching and mortality of coral colonies (as exemplified in the Melanesian region in 2000, 2002, 2010 and 2016) is one of the most visible impacts of increased sea temperatures as a result of climate change. These massive changes to reef health warn us of the dangerous world that we are entering, with predictions of more frequent bleaching events in the future (Hoegh-Guldberg 1999, Chin et al. 2011, Hoegh-Guldberg et al. 2014). These predictions were unfolding as this report was being written, with serious ramifications for coral reefs in the Melanesian region – most recently in Fiji and New Caledonia in April 2016.

Mass coral bleaching events first appeared in the early 1980s and have steadily grown in size and intensity. The first global bleaching event was recorded in 1998, during which the world lost 16 per cent of its coral reefs (Hoegh-Guldberg 1999). A second global event was recorded 12 years later in 2010, with a third global event underway in 2016, with serious impacts on many Pacific nations including Fiji, New Caledonia, Australia and the USA (Hawaii). At the time of writing, this event was a consequence of exceptionally warm sea temperatures and climatic variability, e.g. El Nino (NOAA 2015).

AT CURRENT RATES OF TEMPERATURE RISE, THE WORLD'S OCEANS WILL BECOME TOO WARM FOR CORAL REEFS BY 2040-50

The frequency of global bleaching events appears to be on the increase, and at current rates of temperature rise the world's oceans will become too warm for coral reefs by 2040-50 (Hoegh-Guldberg 1999). This would be a catastrophe for the Melanesian region, with serious ramifications for regional food security.

Changes in ocean temperature are also altering the timing and location of key life history events such as plankton blooms, and the spawning and migratory behaviour of turtles, fish and invertebrates (Poloczanska et al. 2013, 2014) – including shifts in

the distribution of tuna stocks eastward in the Pacific (Bell et al. 2013). Sea turtles, for example, already under direct threat from human activities, are facing inundation of nesting sites by a rising ocean, as well as skewed sex ratios arising from increasing nest temperatures (Hamman et al. 2007, Fuentes et al. 2009). The combination of direct human pressures and rising sea temperatures presents potentially overwhelming challenges for marine wildlife, such as sea turtles, seabirds, and whales and dolphins – which are extremely important for tourism and Melanesian cultures.

2.3.2 Driving down ocean pH

In addition to increasing temperatures, CO_2 has flooded into the upper layers of the ocean where it has reacted with water to form a dilute acid, carbonic acid. As this dilute acid has formed, the average pH of the ocean has decreased by 0.1 units since the beginning of the pre-industrial period, which is equivalent to an increase in total acidity (protons) of 26 per cent (IPCC 2013). In addition to increasing the acidity of the ocean, the influx of CO_2 has driven a decrease in the concentration of important dissolved compounds such as carbonate, which is a substrate for building the calcium carbonate skeletons and shells of many marine organisms. According to scientific consensus, the speed at which these changes are occurring in the ocean has no parallel in the last 65 million years, if not the last 300 million years (Hönisch et al. 2012, IPCC 2013).

Our understanding of ocean acidification is in its infancy, being only identified as a potential problem 17 years ago (Kleypas et al. 1999). It takes at least 10,000 years for the ocean to recover from acidification via natural weathering processes (Hönisch et al. 2012), so understanding this fundamental change to the chemistry of the ocean (and its implications for regions such as Melanesia) is of great importance. Thus far, a large number of responses to ocean acidification have been reported, with fundamental processes such as growth, reproduction, settlement of fish larvae, neurophysiology, foraging behaviour, bioerosion and calcification being affected (Munday et al. 2009a, 2009b, Kroeker et al. 2013, Poloczanska et al. 2013, Hoegh-Guldberg et al. 2007, 2014) (Box 9). For example, even relatively small increases in ocean acidity have been shown to decrease the capacity of corals to build skeletons. Coupled with an increase in severe storms and temperatures that cause coral bleaching, the potential for decreased coastal protection by coral reefs in the Melanesian region becomes a distinct possibility in the future. Some organisms appear more sensitive than others. Most corals, for example, show significant changes and calcify less when exposed to warm and acidified conditions (Dove et al. 2013) while seagrasses may show an increase in biomass (Kroeker et al. 2013). These differences, however, do not negate the potential seriousness of these changes to ocean conditions (Hoegh-Guldberg et al. 2014).

BOX 9 OCEAN ACIDIFICATION – FURTHER WEAKENING RESILIENCE OF COASTAL ECOSYSTEMS, FISHERIES AND RELIANT COMMUNITIES

An increasing amount of CO_2 has entered the ocean as concentrations have increased in the atmosphere. Once it has entered the water column, carbon dioxide reacts with water to form a dilute acid (carbonic acid) which is one of the causes of ocean acidification (a). As the water column decreases in pH, so does the concentration of key chemical compounds such as carbonate, which are the chemical building blocks needed to build the skeleton of corals and other organisms, and consequently coral reef ecosystems. Over the past 100 years, the acidity of the upper layers of the ocean has increased by approximately 26 per cent (equivalent to a pH decrease of 0.1). A failure to restrain emissions of CO_2 from the burning of fossil fuels will see further decreases in pH (0.2 to 0.4). Already, conditions are well outside those seen in ocean waters for tens of millions of years (b).

There is growing evidence that this is having an adverse effect on a growing list of species and ecological processes. Ocean acidification, for example, has the potential to weaken the skeletons of marine organisms, as well as affect a wide array of processes from the reproduction of oysters and other shellfish, to the sensory perception of fish (c). This reduces the 'resilience' of these organisms to disturbances that may or may not be due to climate change. The net effect of increasing numbers of impacts and reduced resilience is that reef structures are likely to diminish over time. While our knowledge of the impacts of ocean acidification is growing rapidly, our understanding is not as developed as that for heat stress (e.g. mass coral bleaching and mortality events). The issue is increasingly being studied by countries across the Indo-Pacific and Caribbean.

A recently released report by the Secretariat of the Pacific Regional Environment Programme (SPREP) identifies Solomon Islands and Papua New Guinea as being among the top three Pacific countries with "reef-dependent communities with the highest relative vulnerability to ocean acidification impacts on reefs and their fisheries" (d). The SPREP report further notes that most Pacific islands have limited ability to adapt to such changes, and will need targeted assistance to adapt as ocean acidification accelerates. It identifies the need for a focus on significantly improving the management of the coastal zone and coastal fish stocks (with the aim of closing the gap between what is needed for food and what the reef can sustainably provide); and developing practical ways to fill the food gap with tuna.

Mass coral bleaching and mortality of coral reef ecosystems are among the most visible impacts of climate change. They warn of the dangerous world that we are entering as our climate warms.

BOX 10 THE FIVE MAIN DRIVERS OF CHANGE FOR MELANESIA'S OCEAN ASSETS

Population growth, ecosystem health, fisheries governance and management, resource exploitation in coastal catchments, and climate change are five major drivers that will ultimately determine the pressure on the ocean assets of the Melanesian region, and hence the future livelihoods and well-being of its people (a).

Population growth: Current rates of population growth within the Melanesian region are relatively large when compared to the rest of the world. Given that domestic sources of nutritional protein are unlikely to grow at similar high rates, adding more people is likely to create greater insecurity when it comes to food and nutrition. In the best-case scenario, the Melanesian region might focus on managing population growth in order to help reduce the widening gap between the demand for resources and the ability of the region to provide them.

Ecosystem health: Fortunately, many of the ocean assets within the Melanesian region are not as degraded as those in many other parts of the ocean. That said, the region stands at a key decision point in terms of maintaining rather than degrading assets as pressures increase. Adopting and implementing a range of measures and strategies, while at the same time carefully managing the development of coastal areas, river catchments and logging and mining activities, could ensure that Melanesia's valuable ocean assets will continue to deliver benefits time and time again.

Fisheries governance and management: The coastal and offshore fisheries of the Melanesian region are increasingly over-harvested and there is growing evidence that current practices will need to be reassessed in order to avoid the overexploitation of these key assets. In this regard, stronger management (using a combination of input and output controls) will almost certainly be needed in the near future. Small-scale coastal fisheries, in particular, are under serious threat and are generally overexploited except in the case of very remote areas. These fisheries, however, have potential for providing greater amounts of food for coastal people if they are repaired and managed sustainably and have effective governance systems in place.

Resource exploitation in coastal catchments: Agriculture, forestry and mining in the catchments of Melanesian coastal areas represent an opportunity in terms of national revenue and development. These resources have the potential to reduce poverty and malnutrition while increasing access to health and education. However, if shortcuts are taken in the rush to exploit these resources, the potential short-term gains will not compensate for the long-term losses, which could come from coastal development and mining operations. For example, increasing the amount of sediment and nutrients flowing into coastal areas from poorly conceived mining activities can lead to the loss of important ecosystems such as coastal coral reefs and associated tourism and fisheries earnings. For these reasons, Melanesian leaders need to operate cautiously and not be pushed along pathways where their children's futures are leveraged for short-term gains.

Climate change: The Intergovernmental Panel on Climate Change (IPCC) has come to the consensus that pushing average global surface temperature to 2°C or beyond will result in unmanageable and dangerous climate change. With this in hand, the Paris Climate Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) process gained unanimous agreement among the international community that it will hold "the increase in the global average temperature to well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change".

THERE IS LITTLE DOUBT THAT WE ARE SEEING STRONG CLIMATE CHANGE IMPACTS ON THE OCEAN ECOSYSTEMS WITHIN MELANESIA

There is little doubt that we are seeing a strong climate change influence and impact on the ocean ecosystems of Melanesia (IPCC 2014, Leisz et al. 2009). The scale at which these changes develop depends on how the world embraces and takes action on the commitments made during the COP21 in December 2015 (Paris Climate Agreement). To avoid "dangerous climate change" (as defined by the UNFCCC) the world must rapidly decarbonize (i.e. bring greenhouse-gas emissions to zero over the next few decades) and keep the average increase in global surface temperatures well below 2°C (and preferably below 1.5°C in the long term). On the other hand, if we continue on our current pathway of emitting massive amounts of greenhouse gases such as CO_2 into the atmosphere, global temperatures will rise beyond 4-5°C above the pre-industrial period with ocean acidification reaching levels unlike anything seen in tens of millions of years (IPCC 2013, Hoegh-Guldberg et al. 2014).

2.4 Ocean asset depletion: two pathways, one decision

The analysis presented here shows how dependent the Melanesian region is on the health of the ocean. That said, there is clear evidence that the ocean assets of Melanesia are already under significant pressure, and this will only increase as populations grow and climate change intensifies (Box 10).

In some isolated circumstances, changing conditions in the Melanesian region may lead to short-term benefits for certain places and people. However, any positive changes are likely to be short-lived and country-dependent, with declining catches for some species of tuna already predicted for Papua New Guinea and Solomon Islands by 2035 (Bell et al. 2013). Moreover, future climate projections for the Melanesian region provide additional challenges, and include rising air and sea surface temperatures, increases in annual and seasonal rainfall (including more extreme rainfall days), increasing intensity of tropical cyclones, rising sea levels and an increasing acidity level of the ocean (Australian Bureau of Meteorology and CSIRO 2011, 2014, IPCC 2013, 2014).

Humanity is at a critical point: if we continue on the current pathway of polluting, over-exploiting, warming, acidifying, and destroying habitats, we will seriously diminish the ocean's considerable shared wealth fund for Melanesia over the coming decades.

Fortunately, it is not too late to reverse the trends and solve many of the problems. The UN 2030 Agenda for Sustainable Development and Paris Climate Agreement in 2015 could not be more important for the future of the Melanesia. The integration of environmental considerations with social imperatives, around crucial issues like poverty alleviation, gender equality and food security, provides the basis for coordinated investment and action to 2030 and beyond. Notably, Fiji ratified the Paris Climate Agreement ahead of signing (22 April 2016) and was the first country in the world to do so (Hansard, 2016).

The Melanesian region is faced with two pathways for the management of its marine resources. The first is the current pathway of increasing pressure on ocean assets, and policy commitments and/or actions that will not meet the demands of a more challenging future. This approach will lead to uncertainty and risk, where important marine resources are degraded and opportunities for Melanesians diminished. The second is carefully charting a course of sound policy and management based on knowledge, understanding and new resolve. This will lead to a sustainable blue economy where wise stewardship of ocean assets contributes to the long-term economic growth, prosperity and resilience of the Melanesian region.

PART THREE

THE TIME TO ACT IS NOW: WORKING TOWARDS A SUSTAINABLE AND INCLUSIVE BLUE ECONOMY

Choosing a healthy ocean and a sustainable and inclusive blue economy will require investment, effort, and leadership. This will, however, be repaid many times over through increased productivity, stability and security.

Expert scientific consensus tells us that we are entering a worrying period of change and uncertainty for the ocean. We are drawing down too much on our primary assets, which directly threatens the value of the annual dividend from the ocean. Pacific governments have generally acknowledged the importance of regional approaches and have made various regional and international commitments related to sustainable use of the ocean and its resources (Box 11). These commitments and initiatives demonstrate official recognition that we need to do things differently. We must now take greater concerted action, both nationally and regionally, if we are to meet the challenges of a rapidly changing world and bring about a new era of sustainability and hope for Melanesia's children. It is not too late to act – but if action is delayed, future generations of Melanesians will lose significant opportunities to gain the social and economic benefits from their much-needed and loved ocean assets (Figure 3).

Applying the principles of a sustainable and inclusive blue economy would provide social and economic benefits for current and future generations in the Melanesian region by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity and political stability. Travelling down this pathway would restore, protect and maintain the diversity, productivity, resilience, core functions and intrinsic value of marine ecosystems – the natural capital upon which its prosperity depends. Further, it is based on clean technologies, renewable energy and circular material flows to secure economic and social stability over time, while keeping within the limits of one planet (WWF 2015).

Melanesian leaders need to be acknowledged, encouraged and supported in their adoption of the concept of a sustainable and inclusive blue economy, such as through implementation of the Melanesian Spearhead Group (MSG) Roadmap for Inshore Fisheries Management and Sustainable Development. In so doing, leaders stand to alleviate one of their defining obstacles to sustainable development: a narrow resource base.

Moreover, the path toward a sustainable and inclusive blue economy will incorporate and build strategies that are important to meeting the UN 2030 Agenda for Sustainable Development – especially the goal on the ocean (SDG14): which has at its core to "conserve and sustainably use the oceans, seas and marine resources for sustainable development". It will further contribute toward other key international priorities, such as the 2015 Paris Climate Agreement.

Interest in these opportunities is high, as evidenced by SIDS advocating for blue economies in the lead-up to the Rio+20 Summit in 2012, and Pacific nations committing to the Pacific Oceanscape Framework (Pratt and Govan 2010). Many nations are already making progress toward adhering to the principles of a blue economy although full implementation will require commitment and action at both national and regional levels.

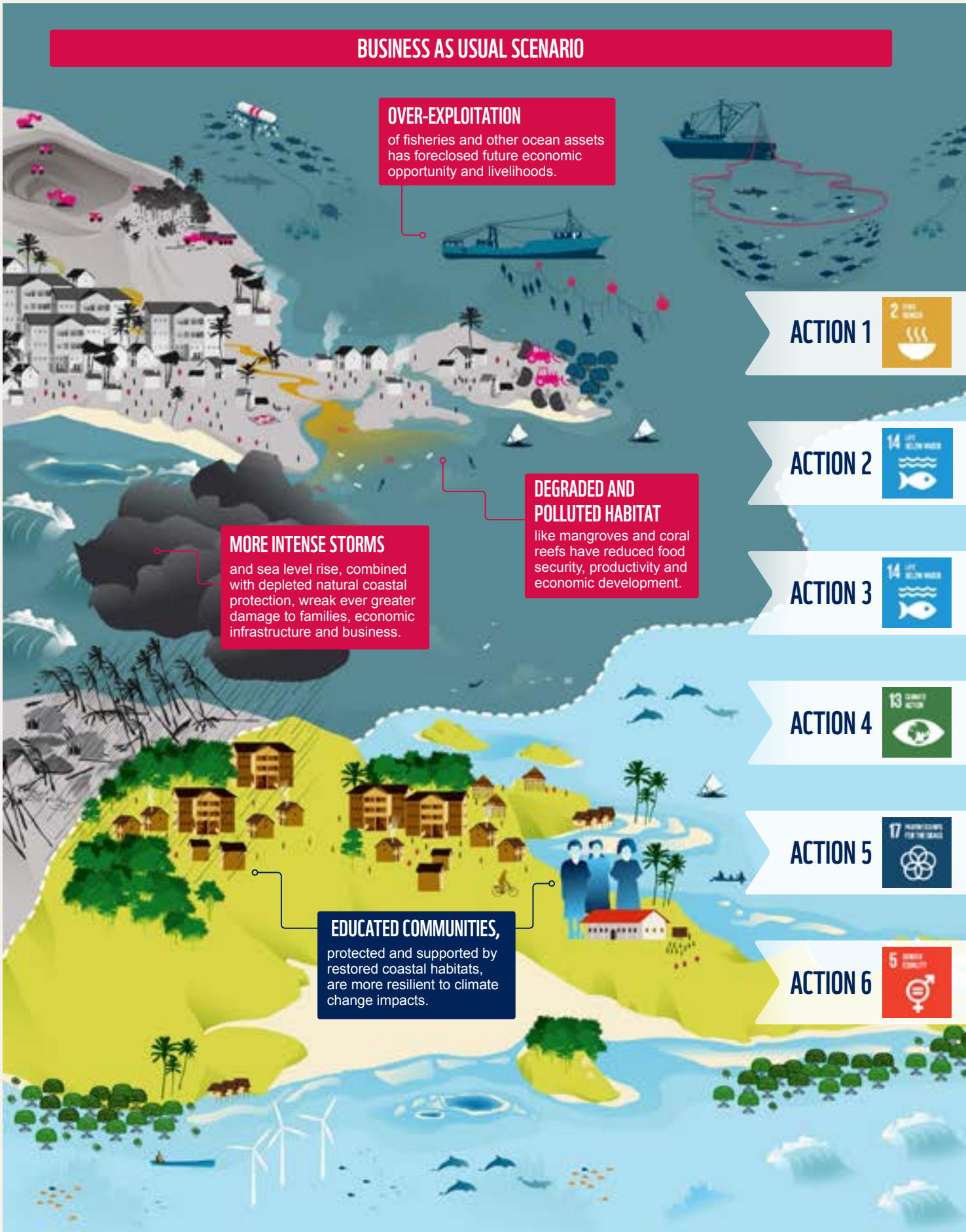
Melanesian governments, neighbours and partners should urgently take the following six actions towards securing a sustainable and inclusive blue economy:

BOX 11 COMMITMENTS TOWARDS A SUSTAINABLE AND INCLUSIVE BLUE ECONOMY

1. Solomon Islands and Papua New Guinea are part of the **Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF)** (a) – a multilateral non-binding partnership agreement established to successfully achieve sustainable managmeent of marine and coastal resources for current and future generations.
2. **Framework for a Pacific Oceanscape 2010 and the Pacific Islands Regional Ocean Policy (PIROP) 2005** – an agreement to coordinate and collaborate on common resources shared among countries.
3. **Melanesian Spearhead Group Roadmap for Inshore Fisheries Management and Sustainable Development (2015-2024)** (b) – toward a vision to create well managed, sustainable inshore fisheries, using community-based approaches that provide long-term economic, social, ecological and food security benefits to communities (See Box 12).
4. **A New Song for Coastal Fisheries – pathways to change: The Noumea strategy** (c) – an innovative approach to dealing with declines in coastal fisheries resources and related ecosystems, based on a return to community-based ecosystem approaches to fisheries management, and complementing the Melanesian Spearhead Group Roadmap.
5. **Future of Fisheries: A regional roadmap for sustainable Pacific fisheries** (d) – sets 11 clear goals for oceanic and coastal fisheries and indicators to measure progress for the next 10 years, requiring facilitation through Forum Fisheries Agency and the SPC working together with high level political commitment and direction, and whole-of-government implementation at national level.
6. **SIDS Accelerated Modalities of Action (SAMOA) Pathway** (A/Res/69/15; UN 2014) – the outcome of the third International Conference on Small Island Developing States, reemphasizing the need for integrated development for sustained and sustainable, inclusive and equitable economic growth with decent work for all, focusing on 30 priority areas, which include oceans, food security, climate change, biodiversity, sustainable tourism, gender equality and women's empowerment, water and sanitation, sustainable transport, partnerships and financing.

The traditional sailing canoes of M'Buke Islanders. Manus, Papua New Guinea. Commitments by Melanesian leaders acknowledge the need to create well-managed sustainable inshore fisheries through community-based approaches.

FIGURE 3 TWO FUTURE SCENARIOS FOR MELANESIA




SUSTAINABLE BLUE ECONOMY SCENARIO
PROTECTED, HEALTHY HABITATS
are generating food, livelihoods and new economic opportunity through equitable access and benefit sharing.
LOCALLY MANAGED MARINE AREA (LMMA)
Implement the Melanesian Spearhead Group Inshore Fisheries Roadmap
Deliver Spatial Planning and Protection to Maintain Important Resources
Apply Ecosystem-Based Approaches to Fisheries Management
Slow Climate Change and Build Resilience
Support Effective Partnerships
Invest in Education and Gender Equality
ALL FISHERIES ARE WELL-MANAGED AND MONITORED,
providing long-term economic and food security benefits at the national level.

ACTION 1 IMPLEMENT THE MELANESIAN SPEARHEAD GROUP INSHORE FISHERIES ROADMAP

The Melanesian Spearhead Group Roadmap for Inshore Fisheries Management and Sustainable Development 2015–2024 was initiated at the request of the countries' prime ministers (Box 12). It derives from the concern for community livelihoods and in response to the recognition that inshore (i.e. small-scale) fisheries – upon which the majority of Melanesia's coastal populations depend – are unsustainable.

Immediate priorities for inshore fisheries management should include focused efforts on effective policies, legislation, management frameworks and financing mechanisms, coupled with capacity-building initiatives, improved data collection and resource mobilization. Budget lines and staffing of government fisheries agencies need to be specifically redirected toward improving inshore and coastal fisheries management in addition to improving management of offshore fisheries. Development partners need to support Melanesian countries to develop their institutional and human capacity to develop better management frameworks for small-scale fisheries.

Collaboration from the start with departments of environment and other sectoral stakeholders will ensure that ecosystem and biodiversity conservation aspects are fully integrated in fisheries development towards achieving holistic coastal management systems and in a truly Melanesian model of ecosystem-based management. This management will provide a basis for many other livelihood and sustainable development aspirations for coastal communities.

BOX 12 MELANESIAN LEADERS' INSHORE FISHERIES ROADMAP

At their March 2012 special summit, Melanesian leaders highlighted that inshore (i.e. small-scale) fisheries, upon which the majority of their coastal populations depend, are generally fully exploited, or in some cases overexploited. As a result, the leaders agreed to develop the Melanesian Spearhead Group Roadmap for Inshore Fisheries Management and Sustainable Development (2015-2024). This roadmap has been further strengthened and extended by the SPC's New Song for Coastal Fisheries – pathways to change – The Noumea strategy (a). The MSG vision is for "sustainable inshore fisheries, well managed using community-based approaches that provide long-term economic, social, ecological and food security benefits to our communities" (b). The roadmap encompasses key ecosystem approaches, calls for approaches that are feasible and draws on the successes of local management (e.g. Locally Managed Marine Areas (LMMAs)) within the existing context of community resource rights and the governance challenges of implementation over huge geographic areas.

The roadmap outlines three key objectives and a commitment to implementation over a 10-year period from 2015 to 2024:

- Implement effective policies, legislation, management frameworks and financing mechanisms that ensure suitable capacity-building for all stakeholders to restore and sustainably manage coastal resources, as well as effective collaboration amongst all stakeholders;
- Conduct education, awareness-raising and the provision of information on the importance and management of inshore fisheries to all stakeholders; and
- Manage, maintain and restore fisheries' stocks to secure long-term economic and social benefits to coastal communities from the sustainable use of inshore resources.

Countries have already taken positive steps. The Solomon Islands, for example, is using the roadmap as the basis for drafting its new Coastal Fisheries Policy, and Papua New Guinea is developing a national roadmap for Coastal Fisheries and Marine Aquaculture Management for 2016-2026. Taken together, these plans provide a clear path towards a sustainable and inclusive blue economy.

ACTION 2 DELIVER SPATIAL PLANNING AND PROTECTION TO MAINTAIN IMPORTANT RESOURCES

Melanesian leaders need to prioritize ocean protection and deliver evidence-based policy to achieve a sustainable and inclusive blue economy that safeguards vital resources such as tuna and other important fish for food, and acts with suitable caution when it comes to potential new resource extraction activities, such as seabed mining. Successes in zone-based management at the sub-regional level such as the PNA Vessel Day Scheme initiative, and collaboration and widespread adoption of community coastal resource management, such as locally managed marine areas (LMMAs), help guide spatial planning to integrate conservation and sustainable use of marine resources.

Spatial planning through inclusive and multi-sectoral processes, such as the Marine and Coastal Biodiversity Management in Pacific Island Countries project (MACBIO), will help ensure that present and future uses are considered and that sustainable development is built on a solid basis of integrated ocean management. Establishing active, far-sighted marine spatial plans will allow the emerging management systems to assess gaps and ensure that protected areas are prominently represented.

Provided adequate management systems are in place, networks of marine protected areas (MPAs), marine managed areas (MMAs) and LMMAs can emerge as one set of management options, which will need to be assessed to ensure they are comprehensive, adequate and representative of marine ecosystems. Strategically positioned, they can also be cost-effective solutions for assisting with climate change adaptation, mitigation and disaster risk reduction.

MPAs have been seen as incompatible with traditional use patterns and marginalizing people dependent on these areas for food and income (White et al. 2014). However, there is now ample evidence that, provided the needs and rights of local communities are respected, MPAs, MMAs and LMMAs have positive impacts on ecosystems and fisheries, translating into tangible benefits for people and livelihoods and increased resilience (Box 13). LMMAs range from strictly protected areas to areas in which particular activities are permitted and regulated. Communities need advice and support to design and develop LMMAs for social and ecological benefits, in partnership with government and non-state actors.

Widespread community management and networks of MPAs, MMAs and LMMAs are essential for protecting important habitat for food security and livelihoods. They are also key to achieving various international commitments, including SDG14, Aichi Target 6 on sustainable harvest of coastal fisheries, Aichi Target 11, which aims to conserve and effectively manage at least 10 per cent of the coastal and marine areas by 2020, and the IUCN World Parks Congress goal of protecting 30 per cent of the ocean by 2030. These targets need to be considered in the light of a recent review (O'Leary 2016) that suggests that a 10 per cent target is insufficient to protect biodiversity, preserve ecosystems and achieve associated socio-economic priorities.

An adequate increase in protected area coverage will likely only be achieved through a combination of government-managed MPAs, collaborative fisheries management areas, private initiatives, MMAs and LMMAs, all nested in resource management systems proposed under Action 1. There is also a requirement for resourcing and long-term support systems for coastal resource management. Several mechanisms may be available here, such as user fees (demonstrated at local district levels) or Financing for Development possibilities under the Addis Ababa Action Agenda, which provides a foundation for implementing the SDGs.

BOX 13 LOCALLY MANAGED MARINE AREAS

In response to the challenge of meeting local food and income requirements in the face of resource decline and few options for alternative livelihoods, the Locally Managed Marine Areas (LMMA) Network was founded in 2000. It was originally driven by a group of practitioners involved in community-based marine conservation projects around the Indo-Pacific.

Starting in a few villages across the Indo-Pacific, LMMA approaches steadily spread, encouraging locally-led solutions to improving the state of coastal resources across the region. LMMAs have grown rapidly in Melanesia. More than 450 communities now form part of Fiji's LMMA network, which covers around 70 per cent of the inshore fishing areas, while hundreds of LMMAs or the local equivalent exist in Papua New Guinea and the Solomon Islands (a). Melanesian communities are using a suite of management tools in their LMMAs, including limiting destructive fishing gear, reducing land-based threats, and establishing protected areas.

The success of the LMMA Network was recently celebrated when one of its founders, Alifereti Tawake from Fiji, was awarded the 2015 Duke of Edinburgh Conservation Award (b). Its innovative approach to marine conservation has served as a model for community-based resource management globally with hundreds of LMMAs replicated in Madagascar and East Africa, for example (Roclife et al. 2014). Working with local fishers and coastal communities, and integrating cultural tradition with best practice fisheries management, Alifereti's work has advanced the practice of community-based marine resource management and conservation in Melanesia.

Accepting the award on behalf of Pacific communities, Alifereti said, "This award ultimately recognizes globally the power of a growing network of communities that are meeting their basic needs through effective local management and it recognizes that their cumulative efforts make vital contributions to global conservation efforts and targets."

Countries should also consider legally enshrining customary tenure rights as a key community management tool (Techera 2009). Cost-effective monitoring at the community level is important to improve the effectiveness of marine management measures. Given the interconnectedness of the land and sea ("summit to seabed"), coastal fisheries management and community-based management, including the establishment of new LMMAs, should happen in conjunction with effective land management reforms (in line with SDG15). This will require decisively linking impacts of rights-holding communities inland with effects on coastal areas, ideally within a natural resource management strategy, which provides simple and strong policy guidelines that can be implemented at provincial level (e.g. transparent and robust approval processes, mandatory reporting, monitoring). Such a framework should be oriented toward climate change mitigation and adaptation as well as the development of a blue economy.

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Historically, local tribes and kinship groups in the Melanesia region have provided the management regimes for inshore and coastal resources through customary tenure and community governance. This approach continues to provide the core of inshore resource management in Melanesia today.

ACTION 3 APPLY ECOSYSTEM-BASED APPROACHES TO RESOURCE MANAGEMENT

Fisheries must be harvested at a sustainable rate if they are to remain as a resource (FAO 1997). As such, fisheries management must ensure that Melanesian fish stocks do not decline over time (and are recovered and rebuilt where possible) and that the wider ecosystem impacts are deemed acceptable, following rigorous assessment. Pushing a fishery beyond the sustainable rate of harvest may yield short-term benefits, but will eventually run the fishery down to a point where productivity decreases, and the fishery eventually collapses.

Ecosystem-based approaches to resource management provide an integrated approach that considers all ecosystem components and human activities. Managing only for the sustainability of individual target stocks is an outdated approach to fisheries and resource management, because unsustainable land-based and marine resource use have wider impacts on habitat and other species, including those already in a seriously depleted state. An important part of an ecosystem approach for fisheries is conservation of habitat and key nursery areas. This is especially true of inshore fisheries. Where possible, management measures should be combined with spatial conservation measures, such as LMMAs, MMAs and MPAs (see Action 2), integrated watershed management and investment in sustainable land use measures.

The use of spatial planning through inclusive multi-sector consultation processes is a key tool in the ecosystem-based management approach that supports the implementation of the MSG's Green Growth Framework for sustainable development. This framework recognizes green growth (or the 'green economy') as a way to achieve sustainable development with equal consideration for economic growth, environmental quality and social well-being (MSG 2013).

ACTION 4 SLOW CLIMATE CHANGE AND BUILD RESILIENCE

Leaders must join and urge the international community to take the urgent action required to fulfill and exceed the climate change actions committed to in the 2015 Paris Climate Agreement. Successive assessment reports from the Intergovernmental Panel on Climate Change, involving thousands of experts, have established an urgent global consensus on the need to keep average global surface temperature increase to well below 2°C (equivalent to 450ppm CO_2) above the pre-industrial period, and preferably closer to 1.5°C. This is essential if we are to avoid an unmanageable and dangerous climate in which ecosystems like coral reefs disappear and catastrophic storms like Tropical Cyclone Winston (Box 14) become frequent events. These recommendations formed the basis of the 2015 Paris Climate Agreement.

The expert consensus of the international community, including Melanesia, is that we must rapidly decarbonize energy systems and reduce deforestation and other land-use sources of greenhouse gases to zero over the next 20-30 years (IPCC 2013, IPCC 2014) while at the same time increasing our efforts to manage non-climate-change threats. Regionally, the SAMOA Pathway (UN 2014) outlines that the dependence on imported fossil fuels has been a major source of economic volatility and vulnerability, and is a key challenge for SIDS. Clean energy, including enhanced access to modern energy services, energy efficiency, and economically viable and environmentally sound technology, will play a critical role in ensuring sustainable development in Melanesia. The SAMOA Pathway therefore suggests the need to develop a strategy and targeted measures to promote energy efficiency as well as energy systems, in particular renewable energy sources, and to facilitate access to existing financing mechanisms to implement renewable energy and energy efficiency projects (UN 2014).

A whole-economy perspective that rates carbon neutrality highly will help to foster growth through accessing climate finance, and through investment in new renewable technologies. Such actions will be essential to safeguard the economic and social well-being of future generations of the Melanesian region. All of these actions are required if Melanesia and the international community are to achieve the commitments of the Paris Climate Agreement and address SDG13 on climate change.

Climate change and sea-level rise pose a very significant risk to the Melanesian region, including immediate climate threats to Pacific fisheries and coral reefs. Direct action on climate change mitigation and adaptation is required to ensure that Melanesian countries reduce their vulnerability to climate change. An overall climate strategy for Melanesia should include the development of regional plans for climate-smart fisheries; dynamic, locally appropriate spatial planning and management including LMMAs, MMAs and MPAs; low-footprint aquaculture; efficient fishing vessels; and research on climate-tolerant species.

BOX 14 IMPACTS OF TROPICAL CYCLONE WINSTON ON COASTAL AREAS OF FIJI

On 20-21 February 2016, Tropical Cyclone (TC) Winston, a category 5 cyclone with wind gusts of up to 306km/hour caused severe and widespread damage across Fiji. In the wake of the cyclone, a 60-day state of emergency was declared. TC Winston is reported to be the strongest tropical cyclone ever recorded to make landfall in Fiji, causing 44 deaths and damaging or destroying 31,200 homes (a).

The cyclone affected up to 540,414 people – or 62 per cent of Fiji's population (a). When the cyclone hit, Fiji was already suffering from the impact of a strong El Niño event, which had caused drought and water shortages and, according to relief organizations, many of the communities most severely affected were also hit hard by TC Winston.

The agricultural damage has been estimated at around US$264 million (FJ$542 million) with 100 per cent of crops destroyed in the worst-affected areas (a). Much of people's subsistence crops were ruined and community markets were either destroyed or inaccessible.

The government of Fiji estimates the total damage bill from TC Winston to be more than US$1 billion (FJ$2 billion), with affected people left in need of shelter, healthcare, food, water, sanitation and hygiene, education and protection (a).

Damages for fishers and aquaculture farmers were estimated to be nearly US$850,000 (FJ$206.5 million) (a).

According to the Wildlife Conservation Society, which carried out marine surveys after the cyclone, TC Winston also caused significant damage to coral reefs up to 20-30m below the surface in the Vatu-i-Ra Seascape (b). While no data was collected on reef fish, there are likely to be changes to fish species composition and biomass, especially in the most damaged areas. The loss of corals and damaged reef structure will also reduce available habitat for many species that are important to fisheries and human livelihoods.

The remnants of Qalivakabau District School, Sinuvaca village, Koro Island. Impact of the combined force of winds and tidal waves during tropical cyclone Winston in February 2016.

ACTION 5 SUPPORT EFFECTIVE PARTNERSHIPS

People, ecosystems and industry must be considered as integrated elements when making decisions about ocean systems. Similarly, it is no longer feasible to consider ocean protection and restoration as simply a matter for government. Local communities and responsible businesses must be engaged as well; this collaboration is the basis for the approaches called for in the MSG Green Growth Framework, for instance. Solutions must involve holistic thinking that includes natural, social and economic needs and limits, and recognizes the institutional and governance context of Melanesia.

Melanesian leaders should embrace these principles, which form part of the region's traditional heritage, and take them forward to build partnerships to ensure that people and ecosystems are not disadvantaged (Box 15). As such, partnerships should be encouraged and supported to identify, develop and implement innovative, appropriate technologies and solutions for engaging market forces that protect people, fisheries and ecosystems while enabling businesses to develop sustainable solutions in economically important industries such as fishing, tourism, shipping and transport. Melanesian leaders must also ensure that they develop effective policy that is well resourced and implemented, and capable of regulating diverse sectors such as mining, tourism and agriculture.

Solutions that are limited to one or two sectors and that do not take into account the full spectrum of social, political and ecological relationships are likely to deliver fragmented improvements that do not match the scale and urgency of the challenges confronting the ocean. The Blue Ribbon Panel of the World Bank's Global Partnership for Oceans (Hoegh-Guldberg et al. 2013), the SAMOA Pathway (UN 2014), and regional agreements such as the Framework for Nature Conservation and Protected Areas in the Pacific Islands Region 2014-2020, all emphasize the need to ensure that sustainable livelihoods, social equity and food security are central tenets of these types of partnerships. They seek to ensure a healthy ocean within a setting of effective governance, long-term viability, and an atmosphere of innovation and capacity-building.

Moreover, new knowledge and solutions are vital to any effort to protect the Melanesian region's ocean assets. A mechanism for sharing ideas and solutions between the respective countries and other Pacific island countries and territories is needed to achieve consistency and economy of effort and achieve stewardship at scale. This is outlined in the 2010 Framework for a Pacific Oceanscape (Pratt and Govan 2010) and the MSG Inshore Fisheries Roadmap. Such a mechanism would also help eliminate the disadvantages some countries experience when it comes to accessing advice and training capacity.

Establishing a platform for ocean knowledge and solutions would help disseminate and transfer skills and capacity across all Pacific island nations and across sectors. Such a platform would involve a network of universities, research institutes and other expertise providers, including non-governmental organizations and government agencies. A combination of new technologies and traditional practice can foster the development of common economic, scientific and social methods and tools for use across different countries and sectors facing similar problems. By working together, industry, experts, academia, policy-makers, local communities and civil society can transcend the boundaries of language, culture and institutional structure to achieve greater conservation and development outcomes (Box 16).

In addition, the net can be cast wider and include partnerships with leading institutions in the Asia-Pacific region. Relevant areas for collaboration include food security, the empowerment of women, gender equality, poverty alleviation, health and land management. There is also great potential for innovation when this capacity is brought together to work on solutions for people and ecosystems.

BOX 15 IMPROVING LIVELIHOODS OF COASTAL COMMUNITIES IN THE SOLOMON ISLANDS THROUGH PUBLIC-PRIVATE PARTNERSHIPS

In the Solomon Islands, WWF is working with partners on sustainable financing mechanisms such as micro-savings and loans to help develop small business opportunities for local fishing communities. The project, co-funded by the Australian government and corporate partner John West Australia, aims to improve the livelihoods and food security of the coastal artisanal fishing communities in the Ghizo Islands region (a).

A key focus has been around the introduction of inshore fish aggregating devices, locally known as "rafters." The devices, constructed and deployed by community members, help reduce fishing pressure on overfished and overexploited coral reef ecosystems. The work community-based fisheries groups includes a strong focus on women's economic empowerment, recognizing that this can help to address some of the underlying socio-economic drivers of unsustainable practices. Since its establishment in November 2013, the micro-savings scheme now has a membership of 725 women who have saved over US$30,000.

Women from the Vorivori Community in Solomon Islands participate in a micro-financing workshop. Improved household financial management as well as improving freshness of fish and its dollar value through post harvest handling help reduce fishing pressure.

BOX 16 BUILDING CAPACITY

Access to the Internet has revolutionized the spread of knowledge, information and training opportunities. Massive open online courses (MOOCs) are free courses with unlimited participation through open access (a). In addition to traditional course materials, many MOOCs facilitate user forums that develop and support an interactive community of students, experts, teachers and tutors. This approach to teaching and learning has triggered a revolution in the way that institutes of higher learning are able to engage globally. The combination of technologies has come of age, and the ability to offer effective teaching and training to large numbers of students simultaneously suggests an opportunity to build capacity in a range of essential knowledge areas required to tackle the problems of a changing ocean.

In addition, initiatives to share traditional knowledge and increase local action on marine protection are expanding (b,c). In the Pacific, more than 500 communities in 15 countries manage 12,000km^2 of coastal resources. Social networks or support "umbrellas" have been crucial in establishing and underpinning communities and agency programmes involved in setting up LMMAs. Operating at sub-national, national and international levels, these networks provide more flexible learning opportunities than do formal methods. They also allow communities to establish links that may promote both ecological and cultural resilience (a).

Fishermen from Ghizo Islands try to identify local fish species as part of the Spawning Per Recruitment methodology training. The methodology is a new method for determining if local reef fish populations are healthy or in need of management. This technique is being piloted in the Solomon Islands by WWF with the aim of providing a simple, low-cost method for communities to assess the health of their reef fish stocks and develop appropriate management plans for their fisheries.

ACTION 6 INVEST IN EDUCATION AND GENDER EQUALITY

Gender equality and the empowerment of women have been shown to contribute to economic growth, sustainable development and the stability of countries. As such, one of the most important opportunities for building capacity lies in investing in women, youth and children. Consequently, there is an urgent need for Melanesian leaders to invest resources into addressing gender equality and ensuring access to education for women, youth and children and their inclusion in decision-making on natural resource management.

Reducing gender inequality in education is now viewed as a vital part of promoting development. The failure to educate girls limits economic growth in the developing world by wasting human capital. As a result, the United Nations has set education (SDG4) and gender equality (SDG5) as two of the 17 SDGs.

In 2012, Pacific leaders committed to a Declaration on Gender Equality, and in 2015 they noted progress in gender-responsive policies and programmes, gender parity on education and ending violence against women. That said, there has been less progress on women's economic empowerment, and sexual reproductive and health services. As such, although many commitments to achieving gender equality have been made by Melanesian governments at global, regional and national levels, progress remains poor to date.

CONCLUSION

The ocean is Melanesia's lifeblood. It is now time to chart a clearer course towards a sustainable and inclusive blue economy, as the region prepares to withstand greater pressures than ever before.

The leaders of the Melanesian region are poised to demonstrate renewed commitment and resolve to ensure that their people continue to gain the full suite of benefits from their cherished and fundamentally important ocean assets.

Melanesians share a strong social and cultural dependency on the sea, making it hard to overstate the importance of the ocean to the region as a whole. With an estimated annual economic value of US$5.4 billion and an ocean asset base of approximately US$548 billion, the ocean's productive potential in Melanesia is greater than the economy of several of its members. Even so, this estimated value of this vast ocean resource is undoubtedly lower than its true asset value. The monetary values are based on a classical economic analysis of how ocean ecosystems support economic activities and associated benefits for people and industry, and exclude both important intangible benefits and non-market products which are currently difficult to measure.

Despite clear evidence that the ocean assets of Melanesia are already under great and growing pressure, the potential for the Melanesian region to prosper from a healthy ocean is high. However, ocean resources are now suffering under the current adherance to business-as-usual. This is no longer a feasible option and Melanesian leaders must seek a new pathway where resource use becomes sustainable once again. Through strong leadership and wise management, the leaders of the Melanesian region can deliver policy actions that will create a sustainable and inclusive blue economy. Such a pathway will ensure that the ocean assets are maintained and that the economic development of the ocean contributes to the true prosperity and resilience of the Melanesian region long into the future.

Achieving sustainability will require visionary leadership, and the countries of the Melanesian region will need to take bold and decisive action. The good news is that such action will deliver benefits for the ocean systems and the people who depend on them. The actions identified in this report will help the people of the Melanesian region to protect and revive their ocean economy to maximize the long-term potential of their ocean resources, and their well-being.

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ACRONYMS

CBD	Convention on Biological Diversity
CBM	Community Based Management
CO_2	Carbon Dioxide
COP	Conference of Parties
CTI-CFF	Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security
EBM	Ecosystem-Based Management
EEZ	Exclusive Economic Zone
FAO	UN Food and Agriculture Organization
FFA	Forum Fisheries Agency
GDP	Gross Domestic Product
GMP	Gross Marine Product
IOM	Integrated Ocean Management
IPCC	Intergovernmental Panel on Climate Change
ISA	International Seabed Authority
IUU	Illegal, Unreported and Unregulated
LMMA	Locally Managed Marine Area
MMA	Marine Managed Area
MPA	Marine Protected Area
MSG	Melanesian Spearhead Group
MOOC	Massive Open Online Course
NGO	Non-Government Organization
PNA	Parties to the Nauru Agreement
RFMO	Regional Fisheries Management Organization
SAMOA	SIDS Accelerated Modalities of Action
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
SPC	The Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
TC	Tropical Cyclone
UBC	University of British Columbia
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VDS	Vessel Day Scheme

Melanesia's ocean in numbers

100% RECYCLED

60%

By 2030, 60% more fish will be required for domestic food consumption than in 2010.

US$548 BN

The overall value of ocean assets in Melanesia is more than US$548 billion.

3-4X

Coastal areas in the Melanesian region are experiencing rates of sea level rise three to four times the global average.

3RD

The economic output of the ocean in Melanesia makes it the third largest economy in this region.

WWF

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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