Annexes

Annex I
List of contributing authors and organisations

Name	Institutional affiliation	Country	Field of work
Mr. Alan Resture	Lecturer in Marine Affairs, University of South Pacific	Fiji	Fisheries, Socio-economics
Ms. Alena Lawedrau	South Pacific Applied Geoscience Commission (SOPAC)	Fiji	Marine science
Dr. Clive Carpenter	South Pacific Applied Geoscience Commission (SOPAC)	UK/Fiji	Geology, Hydrology
Dr. Joeli Veitayaki	Marine Affairs & IOI-Pacific Islands, University of South Pacific	Fiji	Fisheries biology, Socio-economics
Dr. Kesaia Seniloli	School of Social and Economic Development (SSED)	Fiji	Socio-economics; population
Dr. Peter Heathcote	Regional Maritime Programme, Secretariat for the Pacific Community (SPC)	Fiji/Canada	Maritime law; Ports and shipping
Dr. Susanne Pohler	Earth Science Lecturer, Marine Studies Programme (MSP), University of South Pacific	Fiji	Marine geology
Dr. Than Aung	Physics Department, The School of Pure and Applied Sciences (SPAS), University of South Pacific	Fiji	Physical oceanography
Mr. Iliapi Tuwai	International Marinelife Alliance; University of the South Pacific, Suva.	Fiji	Fisheries biology
Mr. Isoa Korovulavula	Institute of Applied Science, University of South Pacific	Fiji	Environmental biology
Mr. Aaron Jenkins	Wetlands International/PNG	Fiji	Wetlands specialist
Mr. Aisake Batibasaga	Fisheries Division, Fiji	Fiji	Fisheries biology
Mr. Craig Pratt	Vulnerability Impact Officer, South Pacific Applied Geoscience Commission (SOPAC)	Fiji	Earth sciences
Mr. Filimone Mate	Fisheries Division	Fiji	Fisheries
Mr. Francis Areki	WWF-Fiji	Fiji	Environmental studies
Mr. Ganeshan Rao	Coordinator, Pacific Islands Marine Resources Information System (PIMRIS), University of South Pacific	Fiji	Information systems
Mr. Johnson Seeto	Marine Studies Programme, University of South Pacific, Suva	Fiji	Marine biology
Mr. Manasa Sovaki	Director, Department of Environment, Government of Fiji	Fiji	Fisheries, Environmental biology
Mr. Marika Tuiwawa	Curator, South Pacific Regional Herbarium, University of South Pacific, Suva	Fiji	Systematics, Curator of the South Pacific Regional Herbarium
Mr. Posa Skelton	Marine Studies Programme, University of South Pacific	Samoa	Fisheries biology; Systematics of tropical marine algae
Mr. Reuben Sulu	Institute of Marine Resources, University of South Pacific	Solomon Islands	Fisheries biology; Seaweed aquaculture
Mr. Samasoni Sauni	Marine Studies Programme, University of South Pacific; SPC, Noumea, New Caledonia	Tuvalu	Fisheries biology
Mr. Satya Nandlal	Fisheries Division; SPC, Noumea, New Caledonia	Fiji	Aquaculture
Mr. Seremaia Tuqiri	Marine Affairs Programme (MSP), University of South Pacific; WWF Pacific, Suva	Fiji	Marine policy
Mr. Temakei Tebano	Marine Studies Programme, University of South Pacific	Kiribati	Fisheries biologist
Mr. Tevita Vuibau	Lands and Mineral Resources Department, Government of Fiji, Suva	Fiji	Earth sciences
Ms. Aliti Susau	WWF-Fiji, Suva	Fiji	Environment
Ms. Batiri Thaman	Institute of Applied Science, University of South Pacific, Suva	Fiji	Environmental science
Ms. Jese Verebalavu	Marine Affairs Programme, University of South Pacific, Suva	Fiji	Socio-economics; Ecotourism
Ms. Leigh-Anne	Pacific Centre for Environmental and Sustainable Development, University of South Pacific, Suva	Fiji	Marine affairs
Ms. Tracy Berno	Tourism Studies Programme, School of Social and Economic Development (SSED), University of South Pacific, Suva	Fiji	Tourism
Mr. Owen White	South Pacific Applied Geoscience Commission (SOPAC), Suva	Fiji	Earth sciences
Prof. Bill Aalbersberg	Institute of Applied Science, University of South Pacific	Fiji	Marine chemistry; Marine conservation
Prof. Randolph Thaman	Geography Department, University of South Pacific, Suva	Fiji	Geography; Biogeography
Prof. Robin South	Coordinator, Marine Studies Programme & Director, IOI-Pacific Islands; Director, IOI (Australia), Townsville, Qld, Australia	Fiji/Australia/ Canada	Ocean policy; Systematics and ecology of benthic marine algae

Annex II
Detailed scoring tables

I: Freshwater shortage

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
1. Modification of stream flow	1	30	Freshwater shortage	1.7
2. Pollution of existing supplies	2	30		
3. Changes in the water table	2	40		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small – Very large 0 1 2 3	2	40
Degree of impact (cost, output changes etc.)	Minimum – Severe 0 1 2 3	2	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Economic impacts		**2.0**	
Criteria for Health impacts	**Raw score**	**Score**	**Weight %**
Number of people affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	40
Weight average score for Health impacts		**2.0**	
Criteria for Other social and community impacts	**Raw score**	**Score**	**Weight %**
Number and/or size of community affected	Very small – Very large 0 1 2 3	1	30
Degree of severity	Minimum – Severe 0 1 2 3	1	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	1	40
Weight average score for Other social and community impacts		**1.0**	

II: Pollution

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
4. Microbiological	2	10	Pollution	2.2
5. Eutrophication	1	5		
6. Chemical	2	20		
7. Suspended solids	2	10		
8. Solid wastes	3	20		
9. Thermal	1	5		
10. Radionuclide	3	20		
11. Spills	1	10		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small – Very large 0 1 2 3	1	40
Degree of impact (cost, output changes etc.)	Minimum – Severe 0 1 2 3	1	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	1	30
Weight average score for Economic impacts		**1.0**	
Criteria for Health impacts	**Raw score**	**Score**	**Weight %**
Number of people affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Health impacts		**2.0**	
Criteria for Other social and community impacts	**Raw score**	**Score**	**Weight %**
Number and/or size of community affected	Very small – Very large 0 1 2 3	1	30
Degree of severity	Minimum – Severe 0 1 2 3	1	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	1	40
Weight average score for Other social and community impacts		**1.0**	

III: Habitat and community modification

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
12. Loss of ecosystems	2	50	Habitat and community modification	2.5
13.Modification of ecosystems or ecotones, including community structure and/or species composition	3	50		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small – Very large 0 1 2 3	2	30
Degree of impact (cost, output changes etc.)	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Economic impacts		**2.0**	
Criteria for Health impacts	**Raw score**	**Score**	**Weight %**
Number of people affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Health impacts		**2.0**	
Criteria for Other social and community impacts	**Raw score**	**Score**	**Weight %**
Number and/or size of community affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	40
Weight average score for Other social and community impacts		**2.0**	

IV: Unsustainable exploitation of fish and other living resources

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
14. Overexploitation	3	20	Unsustainable exploitation of fish	2.3
15. Excessive by-catch and discards	3	20		
16. Destructive fishing practices	2	20		
17. Decreased viability of stock through pollution and disease	1.5	20		
18. Impact on biological and genetic diversity	2	20		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small – Very large 0 1 2 3	2	30
Degree of impact (cost, output changes etc.)	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Economic impacts		**2.0**	
Criteria for Health impacts	**Raw score**	**Score**	**Weight %**
Number of people affected	Very small – Very large 0 1 2 3	2	40
Degree of severity	Minimum – Severe 0 1 2 3	2	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Health impacts		**2.0**	
Criteria for Other social and community impacts	**Raw score**	**Score**	**Weight %**
Number and/or size of community affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	40
Weight average score for Other social and community impacts		**2.0**	

V: Global change

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
19. Changes in the hydrological cycle	2	10	Global change	2.6
20. Sea level change	3	40		
21. Increased UV-B radiation as a result of ozone depletion	1.5	10		
22. Changes in ocean CO_2 source/sink function	1.5	10		
23. Increase in sea surface temperature	3	30		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small – Very large 0 1 2 3	3	30
Degree of impact (cost, output changes etc.)	Minimum – Severe 0 1 2 3	3	30
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	3	40
Weight average score for Economic impacts		**3.0**	
Criteria for Health impacts	**Raw score**	**Score**	**Weight %**
Number of people affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Health impacts		**2.0**	
Criteria for Other social and community impacts	**Raw score**	**Score**	**Weight %**
Number and/or size of community affected	Very small – Very large 0 1 2 3	2	30
Degree of severity	Minimum – Severe 0 1 2 3	2	40
Frequency/Duration	Occasion/Short – Continuous 0 1 2 3	2	30
Weight average score for Other social and community impacts		**2.0**	

Comparative environmental and socio-economic impacts of each GIWA concern

Concern	Types of impacts								Overall score
	Environmental score		Economic score		Human health score		Social and community score		
	Present (a)	Future (b)	Present (c)	Future (d)	Present (e)	Future (f)	Present (g)	Future (h)	
Freshwater shortage	1.7	2.0	2.0	2.0	2.0	2.0	1.0	1.0	**1.7**
Pollution	2.2	2.0	1.0	2.0	2.0	2.0	1.0	1.0	**1.7**
Habitat and community modification	2.5	3.0	1.0	2.0	2.0	2.0	2.0	1.0	**1.9**
Unsustainable exploitation of fish and other living resources	2.3	3.0	2.0	2.0	2.0	2.0	2.0	2.0	**2.2**
Global change	2.7	3.0	3.0	3.0	2.0	3.0	2.0	3.0	**2.7**

Annex III
List of important water-related programmes and assessments in the region

The Strategic Action Programme (SAP) for the International Waters of the Pacific Small Island Developing States

The 5-year programme, which commenced in July 2000, is implemented by the United Nations Development Programme (UNDP), and executed by the South Pacific Regional Environment Programme (SPREP).

The Global Environment Facility (GEF) has agreed to provide up to 12 million USD to support the programme. In addition, SPREP, together with other partner agencies, the Secretariat for the Pacific Community (SPC) and the Forum Fisheries Agency (FFA), will contribute an additional 8 million USD.

Fourteen small island developing States are participating in the SAP. They are: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

The oceanic component of the SAP, executed by SPC and FFA, will support the work of participating countries in developing management and conservation arrangements for their oceanic fisheries resources. It will be used to build the capacity of Pacific Island States to responsibly manage their tuna resources for sustainable economic benefit and to assist Island States fully participate in a new tuna management organisation that is currently being established for the western central Pacific region. The ocean fisheries management component will target the western central Pacific ecosystem whose boundaries correspond almost precisely with the commercial tuna fishery operating in that area.

The integrated coastal watershed component of the SAP will focus actions on freshwater supplies, including groundwater, marine protected areas, sustainable coastal fisheries, integrated coastal management planning, including tourism development and activities to promote waste reduction in local communities. Activities will concentrate on implementing 14 demonstration projects that demonstrate best practices and provide lessons for community-based management of threatened habitats and promote options for the sustainable use of natural resources. The Project Coordination Unit based at SPREP, in collaboration with the governments of the 14 participating States, will be responsible for the implementation of the demonstration projects.

For more information contact SPREP.

Small Island Water Information Network

The Small Island Water Information Network (SIWIN) aims to improve the quality of life and costs of water projects through an effective collaboration aiming to provide an up-to-date and timely information on the water sector for isolated small island states. This is a cooperative network of institutions and individuals that provide and exchange water related information relevant to small islands all over the world. The initiative was initiated by the Commonwealth Science Council, the British Geological Survey and the UK Department for International Development.

This network serves water professionals, institutions and the populations of small islands. Sources of information generally range from published or unpublished reports, textbooks, manuals, journals, case histories and accumulated experience. Due to the isolation of professionals and civil societies in Small Island Developing States (SIDS), SIWIN endeavours to provide as much detail as possible. SIWIN is a physical (institutions, professionals and society) and an electronic (website, e-mail) form of linking people and institutions across the globe.

For more information on this programme in the Pacific region contact:
SOPAC Secretariat
Private Mail Bag, GPO
Suva, Fiji Islands
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SOPAC/EDF Island Systems Management

The goal of the Project is to address vulnerability reduction in the Pacific ACP States through the development of an integrated planning and management system, Island Systems Management initially focusing on eight Pacific States: Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The objective is to strengthen integrated development in Pacific ACP States by concentrating on three key focal areas in the island system: hazard mitigation and risk assessment; aggregates for construction; and water resources supply and sanitation. The project will address problems such as: unavailability of accurate and timely data; weak human resource base; limited resources (money and infrastructure); and lack of appropriate management plans, policies and regulatory frameworks to deal with these three focal areas.

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SOPAC Secretariat
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Pacific Regional Ocean Policy

The goal of the policy is to "ensure the future sustainable use of our Ocean and its resources by Pacific Islands communities and external partners". The goal emphasises the wise use of the Ocean and its resources. At present and in the future, the most pressing threat to Pacific Island countries will be from outsiders who ship oil and nuclear materials or fish in the Pacific Ocean. In addition, as marine resources in many parts of the world are fully utilised or are no longer available, Pacific Islanders and their partners will need to formulate effective policy and strategies for ensuring the future sustainability of their own resources.[1]

The guiding principles to the policy reflect the most important features of the Ocean and its use. These principles are purposely kept at a high level with general and encompassing statements that highlight the importance of the Ocean to Pacific Islanders and emphasise why it must be properly managed. It was determined early in the policy development process to elevate the Policy in this way to maximise the likelihood of reaching concurrence on its content. Moreover, there is now a period of reflection for the countries and people to consider the types of actions that can be pursued to deliver on the Policy's vision. These general statements therefore serve as the basis for all types of activities that are undertaken in the Ocean, coasts and islands in the future.

Principle 1- Improving our understanding of the Ocean

Understanding the Ocean is a huge call for humanity let alone the developing Pacific Island countries. However, Pacific Islanders need knowledge of the Ocean, how it functions and how its is affected by the changes caused by human activities. This knowledge will provide the basis for planning "sustainable uses of the Ocean and its resources, for the amelioration of pollution and harmful practices and for the prediction of weather, climate and ocean variability".

Effective resource management principles should be applied at all levels using all available methods. While the local communities should be involved in these management exercises, there also are specific roles for the district, national and regional stakeholders and institutions. The multiple uses of the Ocean require collaboration and partnerships between the users. Integration of traditional knowledge with contemporary scientific information is critical if the decision-makers of the region are to have a better understanding of ocean processes and ecosystems. This critical knowledge is "dependent on access to science and technology, to enable research, exploration and development of both living and non-living marine resources, and of long-term monitoring and observation".

To provide effective solutions, Pacific Island countries need to understand the threat of pollution from all sources and the best ways of addressing them. With increased human activities, pollution is likely to worsen. This poses threats to the long-term health of coastal systems and ecological processes, public health and the social and commercial use of Ocean resources.

Principle 2 – Sustainably developing and managing the use of Ocean resources

Pacific Island communities are heavily reliant on their marine resources and the services that the Ocean provides. The resources include the extractive uses of living and non-living resources as well as the non-extractive uses such as transport and communication, waste disposal, recreation, cultural activities and life support systems. Research and modern technology are expected to create new opportunities for developing Ocean resources and managing the impacts of natural and human activities in the Ocean. The future of Pacific Island communities is dependent on how the people maintain the health of the Ocean. It is therefore imperative that principles such as the precautionary approach, integrated development and adaptive management are articulated and implemented to ensure the sustainable use of the Ocean and its resources.

Pacific Island countries are responsible for the sustainable management of the world's largest tuna resources. These resources now supply an estimated one-third of all landed tuna, 40-60% of total supply to tuna canneries, and 30% of tuna to the valuable Japanese sashimi market.[2] Yet Pacific Islands countries are receiving less than 10% of the value of the tuna that is fished from their waters. In addition, Ocean resources management is based on to the maximum sustainable yield, which risks overexploitation if harvests are beyond this level (either due to poor enforcement of regulations or a lack of information on what the maximum sustainable yield is). Pacific Island countries need to explore new and suitable ways of getting a better return from the use of their tuna fisheries. For instance, it has been argued that the maximum economic yield (the harvest rate that maximises economic returns

[1] *The experience of another developing part of the world (the Caribbean) and its quest for sustainable oceans use is described in Miller, M. (2000)."Third world states and fluid sovereignty: development options and the politics of sustainable ocean management" Ocean and Coastal Management 42, 235-253.*
[2] *Gillet, R. M.McCoy, L.Rodwell and J.Tamate (2001). Tuna: A key economic resource in the Pacific, Asian Development Bank, Manila.*

from the fishery) is almost always less than the maximum sustainable yield (the most that can be harvested without reducing long-term stock size) and therefore should used in the management of the region's fisheries.[3] According to these experts, economic returns to the countries will increase and its sustainability better protected if the resources are managed according to their maximum economic yield.

Principle 3 - maintaining the health of the Ocean

The health and productivity of the Ocean is dependent upon the preservation of its ecosystem and the minimisation of the impact of human activities. The health and integrity of the marine ecosystem should be maintained so that it continues to provide the life support services it performs. In addition, the Ocean is the final repository of all the substances that enter the environment. In trying to maintain the health of the Ocean, Pacific Island countries need to have policies and strategies that address the threats from all their activities whether these are land-based, air-borne or in the high seas.

Ocean and coastal systems must be protected from degraded water quality caused by "accidental and deliberate dumping of fuels, chemicals and ballast water from ships, aircraft and satellite launches, and non sustainable resource use". Pacific Island countries must also guard against resource depletion that threatens the natural state of equilibrium in the world's Ocean.

Pacific Island countries must effectively control outsiders' activities in the region. This may require innovative policies and strategies that pass more responsibility for surveillance and control to their external partners.

Principle 4 – Promoting the peaceful use of the Ocean

Peaceful uses of the Ocean "means discouraging unacceptable, illicit or criminal activities' that contradict regional and international agreements". Pacific Island countries have to exercise control and enforcement over their maritime zones. They must also seek the support of other users such as the shipping nations, distant water fishing nations and naval powers. Again, it will not be possible to do this alone. International collaboration and partnership will be required. The uses of technology such as satellite monitoring system that is now used by the FFA will provide more effective options.

Educating the people to support the policies and strategies can be a useful tool. People will act properly if they know what is occurring and understand what they need to do. The peaceful use of the Ocean can be a polemic debate to settle but the strategies should spell out the appropriate course of action in a given situation.

Principle 5 – Creating partnerships and promoting co-operation

Pacific Island countries have demonstrated effective partnerships and cooperation in the sustainable management of the Ocean. This should be strengthened and extended to include new and emerging partners from outside the region. Partnership and cooperation are emphasised in UNCLOS and Agenda 21 but need to be specifically articulated in the Policies, Strategies and Action Plans of Pacific Island countries. Joint development and joint ventures are examples of partnerships that have been attempted in the past and can be the basis for future collaboration.

Pacific Island countries need to "maintain sovereign rights and responsibilities in managing, protecting and developing the Ocean". This is complex and requires innovative and creative ideas that should be transformed into policies and strategies. The countries must work with reputable international organisations to assist in capacity building and creating fundamental databases.

Strategic Actions

The policy lists the strategic actions that Pacific Island countries can undertake under each of the guiding principles. There is no sequence or order but the Strategic Actions present some of the activities that can be undertaken to achieve the policy's vision.

The strategic actions are directly related to the guiding principles and should provide guidelines for regional and national activities. Pacific Island countries can identify and prioritise their needs and then identify their appropriate action plans.

For more information contact
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JohnL@forumsec.org.fj

[3] *Petersen, E. (2002). Economic policy, institutions and fisheries development in the Pacific. Resource Management in Asia-Pacific Working Papers No.31:33*