

**REGIONAL MARINE PLANNING APPROACH - A
PREPARATORY STEP TOWARDS INTEGRATED MARINE
POLICY DEVELOPMENT IN PAPUA NEW GUINEA**

ROBERT SINE

**United Nations –Nippon Foundation Fellowship Programme
2010 -2011**



Oceans and Law of the Sea

Division for Ocean Affairs and the Law of the Sea

**DIVISION FOR OCEAN AFFAIRS AND LAW OF THE SEA
OFFICE OF LEGAL AFFAIRS, THE UNITED NATIONS,
NEW YORK 2010**

DISCLAIMER

The views expressed in this paper are those of the author except where referenced and acknowledged.

The paper does not hold the official views either of the United Nations, The Nippon Foundation of Japan, Gerard J. Mangone Center for Marine Policy, University of Delaware and the Government of Papua New Guinea.

The author is responsible for the flaws and views expressed in this paper. ©2010 Robert De Sine. All rights reserved.

THESIS SUPERVISORS

- (1) Prof. Billiana Cicin-Sain,
Director,
Center for Marine Policy,
University of Delaware, USA.

- (2) Dr. Francois N.Bailet,
Division for Oceans Affairs and Law of the Sea,
Office of Legal Affairs,
The United Nations,
New York, USA.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the UN-Nippon Fellowship Programme for giving me this opportunity to not only learn about global and regional responsibilities to ocean governance but also realize what is expected at the national level.

In particular I would like to thank the Programme Coordinator Dr. Francois Bailet and staff of DOALOS for guiding me through the program. At times when I encountered some difficulties Dr. Bailet was helpful in easing out the situation, which enabled me to complete the program.

At the Center for Marine Policy, University of Delaware, I would like to thank my Programme Advisor, Prof. Billian Cicin-Sain for direction and critical advice on issues regarding national ocean policies and providing me with enormous amount of literature on the subject. I also like to thank Dr. Miriam Balgos, Associate Scientist who has been very kind and supportive to me during my 6 month stint there.

In PNG I would like to acknowledge and thank the Department of Environment & Conservation (DEC) Secretary, Dr. Wari Iamo for nominating me for the UN-Nippon Fellowship Programme.

DEC staff who helped me with much needed information and kept me updated on events back home deserve special mention; Beside Thomas, Gabriel Luluaki, Michael K. Bongro, Richard Balone, Bobby Peruka, Vagi Rei, Job Opu, Herbert Nero, and Juda Nundima.

Finally, I thank the good lord above for keeping me safe as always and watching over my family during my absence.

ABSTRACT

In light of the developmental challenges facing Papua New Guinea's vast marine environment at the domestic level and its struggle to maintain global and regional obligations arise the need for an inter-linkage approach to sustainable development in the marine environment.

At the global perspective UNCLOS provides the legal framework while UNCED provides the human and development dimensions to the overall policy framework. The way forward is the effective implementation of an Integrated National Marine program which hinges on how well PNG can translate formal commitments made at the global and regional level into a detailed national framework of practical implementation actions and measures at the local level.

The Integrated National Marine Program should encompass major players at the national level dealing with marine environment and maritime resources, both living and non-living. Also capacity building and funding support for provincial and local level governments in Maritime Provinces to take ownership of the implementation process is a crucial factor for the integrated marine program.

Also, the contribution and participation of non-government organizations, industry and local community is recognized as a key factor to the integrated policy. This paper provides a comprehensive review of the current implementation programs in place at the National level and links these actions to regional and global strategies and actions; and further tries to identify major constrains to the integrated approach with recommendation for appropriate actions.

TABLE OF CONTENTS

Contents	page(s)
Disclaimer	i
Acknowledgements	ii
Abstract	iii
Table of Contents	iv-x
List of Abbreviations and Acronyms used	xi-xiv
List of Figures and Tables	xiv-xv
INTRODUCTION	1-3
PART ONE: CURRENT DEVELOPMENT CONTEXT IN PAPUA NEW GUINEA	
A. National Setting	4
1.0 Geography.....	4
2.0 Historical Background.....	5
3.0 Demography.....	5
4.0 Climate.....	5
5.0 Natural Hazards.....	6
6.0 Government and Administration.....	6-7
7.0 Economic Profile.....	7-8
8.0 Social Issues.....	8
9.0 Importance of Marine Biodiversity and Maritime Resources.....	8
9.1 Fisheries.....	8
9.2 Marine Tourism.....	9
9.3 Maritime Transport.....	9
9.4 Non-living Resources.....	9
9.5 Marine Bio-prospecting.....	9
9.6 Clean Energy.....	10
B. Overarching National Sustainable Development Strategies	10
1.0 National Development Goals.....	11-12
2.0 National Sustainable Development Strategy (NSDS).....	12-13
3.0 Medium Term Development Strategy (2005-2010).....	13-14
4.0 National Strategic Plan (NSP) – PNG Vision 2050.....	14-15
5.0 Enabling Environment for Implementation of National Development Strategies.....	14-15

C. Overview of Key Economic Sectors Policies and Implementation Programs.....	15
1.0 Agriculture.....	16-18
2.0 Fisheries.....	18-20
3.0 Forestry.....	20-22
4.0 Tourism.....	22-23
5.0 Oil and Gas.....	23-24
6.0 Mining.....	25-26
7.0 Manufacturing.....	26-27
8.0 Environmentally Sustainability.....	27-28
D. Overview of Implementation Programs Under the Expenditure Priority Areas.....	29
1.0 Primary and Preventative Health Care.....	29-30
2.0 HIV/AIDS Prevention.....	30-31
3.0 Basic Education.....	31-32
4.0 Development Oriented Adult Education.....	32-33
5.0 Transport Rehabilitation and Maintenance.....	33-34
6.0 Promotion of Income Earning Opportunities.....	35-36
7.0 Law and Justice.....	36-37
E. Conclusions.....	37-38

PART TWO: CURRENT STATUS OF THE MARINE ENVIRONMENT IN PNG

1.0 Overview of Coastal Marine Environments in PNG.....	39-41
2.0 Distribution of Major Coastal and Marine Habitats.....	41-42
2.1 Coral Reefs.....	42
2.2 Mangroves.....	43
2.3 Seagrass Beds.....	43-44
2.4 Barrier Beaches/Lagoons.....	44-45
2.5 Deltaic Floodplains.....	45
2.6 Rocky Shorelines.....	45
2.7 Sea Mounts.....	45
2.8 Sea Walls.....	46
2.9 Hydrothermal Vent.....	46
2.10 Low and Raised Coral Islands.....	46-47
3.0 Distribution and Status of Species Important to Conservation.....	47
3.1 Sea Turtles.....	47-48
3.2 Estuarine and Coastal Swamp Turtles.....	49
3.3 Dugongs.....	49

3.4 Cetaceans.....	49-50
3.5 Coral Reef Fishes.....	50
3.6 Hard Corals.....	51
3.7 Giant Clams.....	51
4.0 Distribution and Abundance of Commercially Important Marine Resources.....	51
4.1 Tuna Fishery.....	51
4.2 Prawn and Lobster Fishery.....	52
4.3 Live Reef Food Fish Trade (LRFFT).....	52-53
4.4 Subsistence and Small Scale Commercial Fisheries.....	53
4.5 Crocodile Skin.....	54
4.6 Shark Fishery.....	54
4.7 Barramundi.....	54-55
4.8 Beche-de-mer (Sea Cucumber).....	55
4.9 Trochus.....	56
4.10 Crab Fishery.....	56
4.11 Other Fisheries.....	56
4.12 Aquaculture Species.....	56-57
5.0 Marine Priority Areas and Critical Watersheds in PNG.....	57
5.1 Bismarck Sea.....	57-59
5.2 Solomon Sea.....	59
5.3 Coral Sea.....	60
5.4 Critical Watersheds.....	61
6.0 Globally and Regionally Important Ecosystems in PNG.....	61
6.1 Bismarck Solomon Seas Eco-regions.....	61-63
6.2 Identification of Coral Triangle Functional Seascape.....	63-65
7.0 Overview of Marine Protected Areas (MPAs) in PNG.....	66
7.1 Types of Protected Areas	66-67
7.2 Existing MPAs.....	67-68
8.0 Prevailing Threats to Marine Ecosystems.....	68
8.1 Overharvest.....	68
8.2 Climate Change.....	68
8.3 Habitat Destruction.....	68
8.4 Pollution.....	68
9.0 Conclusions.....	69

PART THREE: INTERNATIONAL OBLIGATIONS IN SUSTAINABLE MARINE ENVIRONMENT

A. Global Guiding Principles and Obligations.....	70
1.0 United Nations Millennium Development Goals (UN MDGs).....	70
2.0 United Nation’s Convention on the Law of the Sea (UNCLOS).....	71
3.0 UNCLOS and IMO.....	71
4.0 United Nations Conference on Environment and Development (UNCED)	72
4.1 Agenda 21.....	72
4.2 Chapter 17- The Oceans and Coasts.....	72-73
4.3 Convention on Biological Diversity (CBD).....	73-74
4.4 UNFCCC.....	74
4.5 REDD.....	74
5.0 Implementation of UNCED.....	74
5.1 Global Environment Facility (GEF).....	74
5.2 UN Agreement on straddling and Highly Migratory Fish Stocks.....	75
5.3 The UN Commission on Sustainable Development.....	75-76
5.4 Barbados Program of Action (BPoA) for Sustainable Development of Small Island States (SIDS).....	76-77
5.5 World Summit on Sustainable Development (WSSD).....	77
5.6 Mauritius Strategy (2005-2015).....	77
5.7 Global Programme of Action on the Protection of the marine Environment from Land-Based Activities.....	78
5.8 International Coral Reef Initiative (ICRI).....	78-79
6.0 Other Biodiversity Conventions on Marine Ecosystems and Species.....	80
6.1 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).....	80
6.2 Convention on Wetlands of International Importance (Ramsar Convention).....	80
6.3 Convention on Migratory Species (CMS).....	81-82
6.4 UNESCO World Heritage Convention.....	82
B: Regional Commitments to Ocean Planning and Management.....	82
1.0 Regional Situation.....	82-83
2.0 Key Regional Organizations.....	84
2.1 Pacific Islands Forum Secretariat.....	84
2.2 South Pacific Regional Environment Program (SPREP).....	84
2.3 South Pacific Geoscience Commission (SOAPC).....	84
2.4 South Pacific Forum Fisheries Agency (FFA).....	85
2.5 Secretariat of the Pacific Community (SPC).....	85

2.6 Western and Central Pacific Fisheries Commission (WCPFC).....	86
3.0 Overarching Regional Development Plan and Strategies.....	87
3.1 The Pacific Plan.....	87
3.2 Pacific Islands Regional Ocean Policy (PIROP).....	87
3.3 Council of Regional Organizations in the Pacific (CROP).....	88
4.0 Regional Fisheries Agreements	
4.1 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.....	89
4.2 Nauru Agreement.....	89
4.3 Wellington Convention.....	89
4.4 Palau Arrangement.....	90
4.5 Niue Treaty.....	90
5.0 Regional Conservation Strategies.....	90
5.1 Apia Convention.....	90
5.2 Action Strategy for Nature Conservation and Protected Areas in the Pacific Region 2008-2012.....	90-91
6.0 Regional Marine Pollution Prevention Strategies.....	91
6.1 Noumea Convention.....	91
6.2 1986 Action Plan for Managing the Natural Resources & Environment of the South Pacific Region.....	91
6.3 The Waigani Convention.....	91
C: Bilateral Agreements (Border Agreements).....	87
1.0 Torres Strait Bilateral Treaty (PNG/Australia).....	92
1.1 Consultative Mechanism.....	94
1.2 Management of Shared Rock Lobster Fishery.....	95
1.3 Management of Dugong and Turtle Fishery.....	95-96
2.0 PNG/Indonesia.....	96
3.0 PNG/Solomon Islands.....	96-97
4.0 PNG/ Federated States of Micronesia.....	97
D. Conclusions.....	97-98
 PART FOUR: NATIONAL IMPLEMENTAION PROGRAMS IN SUSTAINABLE MARINE ENVIRONMENT	
 A: Key National Institutions Dealing with Marine Environment and Maritime Resources.....	
1.0 Department of Environment and Conservation (DEC).....	99-103
2.0 Office of Climate Change and Environment Sustainability (OCCES).....	103
3.0 National Fisheries Authority (NFA).....	103-105

4.0. Mineral Resources Authority (MRA).....	100
4.1 International Mandate to Sea Bed Mining.....	103-105
4.2 Policy Options on Sea Bed Mining.....	106-108
4.3 Deep Sea Tailing Placement (DSTP).....	108-110
5.0 Department of Petroleum and Energy.....	111
6.0 National Maritime Safety Authority (NMSA).....	111
6.1 New Marine Pollution Bills and Regulations.....	112
6.2 National Oil Spill Contingency Plan (NATPLAN).....	113
6.3 Search and Rescue/Emergency Response.....	114
7.0 Tourism Promotion Authority (TPA).....	114 115

B: Overview of Provincial and Local Level Government Implementation Structure.....115

1.0 Organic Law on Provincial Governments and Local Level Governments.....	116
2.0 The Political Structure of the Provincial Government System.....	117
3.0 Administration of the Provincial Government.....	117
3.1 Structure of Local-Level Governments.....	117
3.2 District Administration.....	118
3.3 Ward Development Committees.....	119
4.0 Law-making Powers of the Provincial and Local Level Governments.....	119
4.1. Law- Making Powers with regards to Environment and Conservation matters.....	119
5.0 Funding for Provincial and Local Level Governments.....	120
5.1 Sources of funding for Provincial and LLGs.....	120

C: Conclusions.....121

**PART FIVE: CONTEXT FOR AN INTEGRATED MARINE ENVIRONMENT
MANAGEMENT IN PAPUA NEW GUINEA**

A: Integrated Eco-system-Based Oceans Planning and Management Approach.....122

1.0 Regional Marine Planning-Priority Seascape.....	122-124
2.0 Important Steps in Planning and Management.....	124
3.0 Content of Regional Marine Plans.....	124-125
4.0 Structure of Regional Marine Plans.....	125
4.1 Bismarck Sea Regional Marine Plan.....	125-126
4.2 Solomon Sea Regional Marine Plan.....	126 127
4.3 Coral Sea Regional Marine Plan.....	127
5.0 Establishment of Demonstration sites within Seascapes.....	127-129
6.0 Proposed Management Approach.....	129
6.1 Marine Spatial Planning.....	129-130

B: Conclusions.....130-131
PART SIX: CONCLUSIONS AND RECOMMENDATIONS132
A: Conclusions.....132
B: Recommendations.....134
REFERENCES.....135-146
ANNEXES.....147 -162

LIST OF ABBREVIATIONS AND ACRONYMS USED

ADB	:	Asian Development Bank
ARCDM	:	Afforestation and Reforestation, Clean Development Mechanism
AusAid	:	Australian Aid
BPOA	:	Barbados Programme of Action
BSSE	:	Bismarck Solomon Sea Ecoregion
CACC	:	Central Agencies Coordinating Committee
CBD	:	Convention on Biological Diversity
CI	:	Conservation International
CITES	:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	:	Convention on Migratory Species of Wild Animals
CTI	:	Coral Triangle Initiative
DAL	:	Department of Agriculture and Livestock
DEC	:	Department of Environment & Conservation
DFA	:	Department of Foreign Affairs
DF&T	:	Department of Finance and Treasury
DNPM	:	Department of National Planning and Monitoring
DPE	:	Department of Petroleum and Energy
DPLLGA	:	Department of Provincial and Local Level Government Affairs
DPM/ NEC	:	Department of Prime Minister and Secretariat to NEC
DSIP	:	District Support Investment Program
DWFN	:	Distant Water Fishing Nation
EAFM	:	Ecosystem Approach to Fisheries Management
EEZs	:	Exclusive Economic Zones
EIS	:	Environment Impact Statement
EIA	:	Environment Impact Assessment
ELs	:	Exploration Licenses
EPA	:	Expenditure Priority Areas
ESEG	:	Environmentally Sustainable Economic Growth Strategy
EU	:	European Union
FAO	:	Food and Agriculture Organization
FSM	:	Federated States of Micronesia
GDP	:	Gross Domestic Product
GEF	:	Global Environmental Facility
GoPNG	:	Government of PNG
GPA	:	Global Program of Action
HIV/AIDS	:	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICRI	:	International Coral Reef Initiative
IMO	:	International Maritime Organization
IPCC	:	Intergovernmental Panel on Climate Change
ITTO	:	International Tropical Timber Organization
IUCN	:	International Union for the Conservation of Nature
IUU	:	Illegal, Unregulated, and Unreported
JPoI	:	Johannesburg Plan of Implementation

km ²	:	Square kilometers
LNG	:	Liquefied Natural Gas
MDGs	:	Millennium Development Goals
MDG7	:	Millennium Goal Number 7
MoA	:	Memorandum of Agreement
MPA	:	Marine Protected Areas
MRA	:	Mineral Resources Authority
MTDS	:	Medium Term Development Strategy
NAC	:	National Aids Council
NADP	:	National Agriculture Development Plan
NAQIA	:	National Agriculture Quarantine Inspection Authority
NBSAP	:	National Biodiversity Strategy and Action Plan
NCC	:	National Coordination Committee
NEC	:	National Executive Council
NFA	:	National Fisheries Authority
NGO	:	Non- Government Organisation
NMSA	:	National Maritime Safety Authority
NSDS	:	National Sustainable Development Strategy
NSP	:	National Strategic Plan
OCCES	:	Office of Climate Change and Environmental Sustainability
OLPLLG	:	Organic Law on Provincial and Local Level Government
PGK	:	PNG Kina
PICTs	:	Pacific Island Countries and Territories
PIP	:	Public Investment Program
PMIZ	:	Pacific Maritime Industrial Zone
PNG	:	Papua New Guinea
PNGeans	:	Papua New Guineans
PNGFA	:	Papua New Guinea Forest Authority
PNGV50	:	Papua New Guinea Vision 2050
RAMSAR	:	Convention on Wetlands of International Importance Especially as
REDD	:	Reduced Emissions from Deforestation and Degradation
SIDS	:	Small Island Developing States
SOPAC	:	South Pacific Applied Geoscience Commission
SPC	:	South Pacific Commission
SPREP	:	South Pacific Environment Programme
TMP	:	Tourism Master Plan
TNC	:	The Nature Conservancy
TSPZ	:	Torres Strait Protected Zone
UN	:	United Nations
UNCED	:	United Nations Conference on Environment and Development
UNCLOS	:	United Nations Convention on Law of the Sea
UNDP	:	United Nations Development Programme
UNEP	:	United Nations Environment Programme
UNFCCC	:	United Nations Framework Convention on Climate Change
UNCCD	:	United Nations Convention to Combat Desertification
UPNG	:	University of Papua New Guinea

VMS : Vessel Monitoring System
WCPFC : Western Central Pacific Fisheries Commission
WHO : World Health Organization
WSSD : World Summit on Sustainable Development
WMA : Wildlife Management Area
WWF : World Wildlife fund

LIST OF TABLES AND FIGURES

List of Figures

Figure 1. Simple Diagram of Decision Making and Implementation Process.....	12
Figure 2. Major Vegetation Types in PNG.....	20
Figure 3. Location of islands, coastlines and major Seas in PNG.....	41
Figure 4. Marine Priority Areas and Critical Watersheds.....	60
Figure 5. BSSE Priority Areas in PNG.....	63
Figure 6. Functional Seascapes in PNG.....	65
Figure 7. South Pacific Region.....	83
Figure 8. Maritime boundaries of PNG.....	92
Figure 9. Boundary Delimitation of the TSPZ.....	93
Figure 10. Diagram of DSTP Operation.....	110
Figure 11. Identification of Regional Seas in PNG.....	123
Figure 12. Regional Marine Planning Process.....	123
Figure 13. Contents of a Regional Marine Plan from the Bismarck Sea.....	125
Figure 14. Maritime Provinces in the Bismarck Sea region.....	126
Figure 15. Contents of Provincial Marine Plans.....	126
Figure 16. Maritime Provinces in the Solomon Sea Region	127
Figure 17. Maritime Provinces in the Coral Sea Region.....	127
Figure 18. Proposed Demonstration Sites within the three regional seas.....	128
Figure 19. Goals of Demonstration sites.....	128
Figure 20. Elements of Marine Spatial Planning.....	130
Figure 21. Overall Policy Implementation and Planning Process.....	132

List of Tables

Table 1. Species Distribution of Seagrasses in PNG.....	44
Table 2. List of Common Cetaceans in PNG Waters.....	50
Table 3. Targeted Species for Live Reef Food Fish Trade and their Size limits.....	53
Table 4. List of Commercial Sea Cucumber species and Size Limits.....	55
Table 5. Marine Priority Areas in the Bismarck Sea.....	57
Table 6. Marine Priority Areas in the Solomon Sea.....	59
Table 7. Marine Priority Areas in the Coral Sea.....	60
Table 8. Critical Watersheds in PNG.....	61
Table 9. Functional Seascapes in PNG’s Coral Triangle Region.....	64
Table 10. List of Existing Marine Protected Areas in PNG.....	67
Table 11. List of Legislations administered by DEC.....	99
Table 12. Madang Guidelines on Deep Sea Mining.....	107

List of Annexes

Annex I. Status of Maritime Boundaries for SOPAC Member Countries.....	155
Annex II. Map of PNG.....	156
Annex III. Preamble – Constitution of the Independent State of PNG.....	157
Annex IV. The Guiding Principles of the Medium term Development Strategy (2005-2010).....	158
Annex V. First LNG Project in the Southern Highlands: Exploration and Production Sites.....	159
Annex VI. Second LNG Project by Interoil Corporation.....	160
Annex VII. Existing and Potential Mines in PNG.....	161
Annex VIII. Coral Triangle Initiative Region.....	162
Annex IX. Marine Protected Areas in PNG.....	163
Annex X. List of IMO Conventions signed by PNG.....	164-166
Annex XI. Declared PNG Fishing Waters.....	167
Annex XII. Designated Maritime Zones in PNG.....	168
Annex XIII. Archipelagic Baseline of PNG.....	169
Annex XVI. Sea Bed Mining (Solwara 1) including potential sites.....	170

INTRODUCTION

Papua New Guinea's (PNG's) ocean ecosystems and their marine biological diversity are important national assets. If their use is well managed, they can meet a broad range of economic, social and cultural aspirations for the present and future generations. Also, they provide a range of essential environmental services that would be extremely costly or impossible to restore or replace if ecosystem functioning was compromised.

Urban and infrastructure development in the coastal regions, together with the development of marine industries, continue to place increasing demands on our coastline and oceans. Past management practices have not allowed us to assess and improve the cumulative impacts of our actions on ocean health and productivity.

If we were to continue without integrating our oceans planning and management we could not be confident that PNG would avoid following so much of the rest of the world in a spiral of marine resource degradation.

The collapse of a number of major marine ecosystems and fisheries resources in the northern hemisphere, with the associated economic damage and social disorder, is a stark warning of the vulnerability of marine systems. In PNG waters, the degrading of our pristine corals, seagrass mats and extensive mangroves and serious declines in stock of important commercial fish species such as tuna, albacore, sea cucumber, giant clams and target live reef food fish species show that we are not immune from such threats.

The National Government has made commitments by ratifying the United Nations Convention on Law of the Sea (UNCLOS)¹ and the outcome Conventions of the Rio Earth Summit for Ecologically Sustainable Development like the Convention on Biological Diversity (CBD)² which is relevant to oceans planning and management and the sustainable use of its resources.

The applications of strategies emanating from these global obligations have not been effectively implemented in achieving its goals as national priorities takes precedence. As such the emphasis to date has been on actions within the separate sectors, such as fisheries, mining, petroleum, transport, and protected areas. While little progress has been made, until now management and decision making have not been integrated across the various sectoral interests.

Management of oceans purely on an industry-by-industry basis will not be sustainable in the long run. Activities such as fishing, tourism, shipping, coastal development, mineral and petroleum exploration and development must be collectively managed to be compatible with each other and with the ecological health of the oceans.

¹ =PNG ratified the UNCLOS on January 14, 1997

² =PNG ratified the CBD in 1993

Identifying the ocean as the common denominating factor promotes an inter-linkage approach which better integrates issues such as poverty, employment and health into sustainable development goals and vice versa at policy, institutional, financial and many other levels. Through this inter-linkage the key to developing a strong integrated approach to sustainable development is the identification of the inherent synergies that exist between different aspects of the marine environment, the economy and social issues and an exploration of the potential for more effective coordination between these issues and their responses.

With an Integrated Marine Policy, the Government of PNG would be introducing a refinement of the commitment to ecologically sustainable development. The Government has shown strong commitment to integrated ecosystem-based planning and management for multiple uses of oceans by the Prime Minister's recent joint declaration at the World Ocean Conference³ in Manado, Indonesia in 2009, and subsequent funding for the implementation of the Coral Triangle Initiative (CTI) National Plan of Action. This signifies key initial steps towards improved coordination between national Government departments and maritime provincial Governments to ensure effective planning and management of PNG's vast marine environment and its resources.

Also the Government must take into consideration the commitments made at the regional, sub-regional and bilateral levels. This enables PNG to develop appropriate national policies to sustainably manage its own EEZ in harmony with neighboring states and regional partners. The 2006 Pacific Island Regional Ocean Policy (PIROP)⁴ endorsed by Pacific Island Forum leaders and the more recent endorsement in Port Vila, Vanuatu of the Pacific Oceanscape Framework⁵ provide regional guiding principles for a nationally tailored action at the local level.

The Government recognizes the need to provide for increased capacity to understand our marine environments, through increased scientific effort and institutional capacity building. That understanding is fundamental to the good management of our oceans and the protection of ecosystems and marine biological diversity.

Developing an Integrated National Marine Policy for PNG requires careful planning and assessment of the cultural, economic, social, geographical and institutional settings of the country. That includes a review of global guiding strategies and obligations; regional and bilateral commitments; identification of key Government institutions, non-Government organization, industry, and development partners; gap analysis of existing legislative framework;

³ = World Oceans Conference was held in Manado, Indonesia in 2009, in which six member countries of the Coral Triangle Initiative, (Philippines, Malaysia, Indonesia, Timor Leste, Solomon Islands and PNG) made a Joint Declaration on Oceans.

⁴ = Pacific Island Regional Ocean Policy was endorsed by Pacific Island Leaders in 2006 at the PIF Leaders meeting in Suva, Fiji.

⁵ = The 41st PIF Leaders meeting in Port Vila, Vanuatu in August 2010, supported the call for Oceanscape Available at <http://www.forumsec.org.fj/pages.cfm/newsroom/press-statements/2010/communique-of-41st-pacific-islands-forum.html>

capacity needs assessment of implementing provincial and local level Governments; and knowledge on the status of the marine environment. These are key issue areas that PNG must address before it can venture into any formal ocean policy formulation.

In this paper Part One provides an overview of PNG's current development context, especially the Government's development priorities and the country's socio-economic situation.

Part Two covers the country's current state of marine biodiversity and identifying marine priority areas which will provide the basis for the overall planning and management of the marine environment.

Part Three looks at PNG's international obligations on sustainable marine environment. Discussions cover; global, regional and bilateral obligations.

Part Four covers PNG's national implementation programs on sustainable marine environment. And further discusses current activities as well as new emerging developments influencing the marine environment.

Part Five provides key components for an integrated ocean policy for PNG. And also provides a future plan of action in planning towards an integrated marine policy approach and important management options available.

In the Conclusion, are provided recommendations to expedite progress towards an integrated marine policy for PNG. It is envisage that this paper will stimulate further discussion among key agencies dealing with marine matters to work together towards a common goal of a sustainable marine environment.

PART ONE

CURRENT DEVELOPMENT CONTEXT IN PAPUA NEW GUINEA

A. NATIONAL SETTINGS

A brief background to the country's geography location, environmental conditions, and socio-economic situation is presented here to shed light on the importance of understanding the overall prevailing development context in PNG.

1.0 Geography

PNG is located on the eastern half of the island of New Guinea and shares a land border with the West Papua Province of Indonesia to the West. It also shares sea boundaries with Australia 160 kilometers to the South, Solomon Islands to the East, and Federated States of Micronesia (FSM) to the North⁶.

PNG is the largest country in the Pacific region (excluding Australia and New Zealand), comprise both the mainland and 600 offshore islands with a total land area of 461, 690 square kilometers (km²) which is about 83% of the total land area of the Pacific Island Countries and Territories (PICTs). Its maritime jurisdiction covers in access of 2.4 million km².

The country sits on a geographically complex region, where forces of three tectonic plates (Australian, Pacific and Solomon) come into play. This has contributed to PNG's rich terrestrial and marine biodiversity and high geological activity.

The mainland has rugged terrains, which have led to the relative isolation of many ethnic groups resulting in rich cultural diversity. In the Highlands region, the terrain is extremely rugged with sharp mountain ranges and steep valleys with fast flowing rivers. The coastal areas often have extensive swamps and treacherous coral reefs.

The offshore small islands are widely dispersed. The main islands are: New Britain, Bougainville, New Ireland and Manus. Many of the smaller islands are low-lying coral atolls. A prominent feature of PNG is the vast extent of tropical rain forest and woodlands that cover about 70 per cent of the country's total land area.

The country falls into four political regions: Momase (4 provinces), Papuan (5 provinces), New Guinea Islands (5 provinces), and the Highlands (5 provinces with 2 more proposed provinces). The people are predominantly Melanesians with a minority of Polynesian heritage. The National Capital District (NCD) which has the capital city Port Moresby is regarded as a province of its

⁶ = See Annex I. Regional Map of the South Pacific Region

own and is located on the southwest coast of the mainland⁷.

2.0 Historical Background

European missionaries and traders began to settle on the islands of New Guinea in the mid-1800s, mostly in accessible coastal areas. The colonization process took place in 1884 when Germany claimed sovereignty over the northern part of the country, and 4 years later the British claimed the southern part and governed them as two separate colonies: German New Guinea and British Papua.

At the end of the First World War in 1919, Australia took over the administration of both colonies as the Trust Territories of Papua and New Guinea. Australia continued its administration until 1973 when the two territories became united in preparation for self-Government. In 1975, PNG gained its political independence from Australia.

3.0 Demography

PNG has a total population of 6.5 million people of which about 87 per cent live in rural areas with the remainder in urban areas. The population growth rate is extremely high, with a 3.5 per cent per annum. Other important demographic indicators are as follows: life expectancy of 53.5 years for men and 54.6 years for women. The infant mortality rate per 1000 births is 73. The urban population growth rate per annum is 2.2 per cent⁸.

In the rural areas, much of the economic activities are subsistence and cash agriculture. Most farmers operate in the informal subsistence sector on customary owned land. Common crops are sweet potatoes, sago, yams, bananas, and cash crops are coffee, palm oil, cocoa, copra, rubber, and tea. Similarly, in coastal communities fishing is both for own consumption and local markets.

The people are extremely diverse ethnically, speaking well over 820 different languages and has over 250 different cultures. These can be attributable to the difficult terrain of the country and isolation of many ethnic groups. The official language is English, Pigin and Motu.

4.0 Climate

PNG's climate is tropical and monsoonal, with an average rainfall of 2000 millimeters a year, however does not conform to any standard equatorial type, largely because of the effects of the high mountain ranges. There are distinct wet and dry seasons, which vary from place to place due to the nature of the terrain, but the most common wet season is between November and April with the dry season between May and October.

⁷ = See Annex II. Map of PNG for names of places

⁸ = National Statistical Office of PNG (2000). PNG Census 2000 National Report. National Statistical Office of PNG, Port Moresby, Papua New Guinea.

The temperatures remain fairly constant throughout the year in most parts of the country. The annual day time mean temperature in most of the lowland areas is 27 degrees Celsius with very high humidity, although the capital of Port Moresby is warmer and drier with about 1,230 millimeters of rain a year, as it lies in the rain shadow of the Owen Stanley Mountain Ranges.

Temperatures in the highlands are significantly lower, and in the highland valleys the annual daytime mean temperatures is 20 degrees Celsius with moderate humidity. Drought and frosts are generally common occurrences in the highlands region that have significant impact on the economic and the environment. The influence of the El Nino Southern Oscillation is a contributing factor to the occurrence of frosts and droughts in the country.

PNG is one of the cloudiest places in the world, averaging from half to three quarters cloud cover throughout the year. Relative humidity is uniformly high, about 75-90 per cent.

5.0 Natural Hazards

PNG is prone to many natural-caused disasters including earthquakes, volcanic eruptions, tsunamis, cyclones, river flooding and coastal erosion, landslides, droughts and frost. It ranks in the top 6 countries with the highest percentage of population exposed to earthquake hazards and has the highest percentage of population exposed to severe volcanic risk. Given its topography, high seismicity and high annual rainfall, the country ranked 54th among countries most exposed to multiple hazards based on land area, according to the World Bank's Natural Disaster Hotspot study⁹.

6.0 Government and Administration

PNG is an independent parliamentary democracy within the Commonwealth of Nations. It has a unicameral legislature based upon the Westminster (i.e. British) model. The Head of State is Queen Elizabeth II, who is represented by the Governor-General nominated by the National Parliament for a six-year term according to the Organic Law on the Nomination of the Governor General.

The National Parliament consists of 109 members who are elected every 5 years. Under a recent Parliamentary reform and constitutional amendment, the Governor-General can ask the political party with the majority of elected members, after a general election, to form the Government. The leader of the political party becomes the Prime Minister.

The Prime Minister appoints the Cabinet Ministers, referred to as the National Executive Council (NEC), which is responsible, in accordance with the National Constitution, for the executive Government of the country.

⁹ = Dilley, Maxx, Robert S. Chen, Uwe Deichmann, Arthur L. Lerner-Lam, and Margaret Arnold 'Natural Disaster Hotspots; A Global Risk Analysis' World Bank 2005.

The Constitution of PNG provides for three branches of Government, namely the Executive, Legislative and the Judiciary. The National Government shares power with the twenty (20) Provincial Governments.

The legislative assembly in each province is headed by a Governor who is elected to represent the whole province in the National Parliament. Under the 1995 Organic Law on Provincial Governments and Local level Government¹⁰, each provincial Government is devolved with powers to make laws on decentralized functions, such as primary and secondary education, rural health community, urban and rural development, agriculture and fisheries, transportation and facilities and a limited range of financial and taxes collection powers.

The administrations of the provinces are headed by Provincial Administrators, who are charged with the responsibility to oversee the delivery of Government services in the provinces in line with the *Provincial Government Administration Act 1997*¹¹. They are supported by District Administrators at the district level under the *Local-Level Government Administration Act 1997*¹². The provincial administrations structure will be discussed further in detail in Part Four of this paper, due to its importance in the overall implementation of national policy driven projects.

The national Government is responsible for macroeconomic management and other national functions, such as police, defense, foreign relations, immigration, trade, higher education and other reserved sectors.

7.0 Economic Profile

The major economic sectors in PNG are: Agriculture and Livestock, Forestry, Mining and Petroleum, Tourism and Hospitality, Fisheries and Marine resources, Manufacturing, Retailing and Wholesaling, Building and Construction, Transport and Telecommunications, and Finance and Business Trade (Further discussion on Economic sectors in Section C below).

PNG's major exports are gold, silver, copper, crude oil, logs and timber, coffee, palm oil, cocoa and copra. PNG has experienced a relatively even balance of trade over the last five years, with exports marginally more than imports.

The waters around PNG are rich in marine life and are virtually well stocked. Within the 200 mile exclusive economic zone are large varieties of fish, including migrating schools of tuna. On land, forest products are one of PNG's major exports with vast amount of timber resources still remaining untapped because of inaccessibility due to the ragged topography.

¹⁰ =Independent State of Papua New Guinea (1996) Organic Law on Provincial Governments and Local level Government (Consolidated to No.29 of 1998)

¹¹ =Independent State of Papua New Guinea (1997). Provincial Government Administration Act, No.7 of 1997

¹² =Independent State of Papua New Guinea (1998). Local-Level Government Administration Act, No.33 of 1997, Certified on 22nd January 1998

PNG's main imports are sourced from Australia, Japan, the United States of America, Singapore, New Zealand, the United Kingdom, China and Hong Kong. The main destinations of PNG exports are Australia, Japan, South Korea, China, Germany, the United States of America, the United Kingdom and Singapore.

8.0 Social Issues

The status of social development in PNG is characterized by a lack of social infrastructure and basic services, unhygienic and unhealthy environments, lack of empowerment, unequal distribution of resources, and poor accessibility.

Combinations of such factors have exacerbated the poor living conditions of the people. As a result, poverty is now becoming an issue of concern together with HIV/AIDS, population growth, law and order, and other associated socio-economic consequences.

A notable statistic of concern is that about 45% of the population belong to young dependent age group (<16 years) posing many social and economic implications for the country now and in future¹³. Thus education and training of young people has very high priority and has been the focus of much attention in the development strategies over the last decade (Further discussion on Social Issues in Section D).

9.0 Importance of Marine Biodiversity and Maritime Resources

Out of the twenty provinces in the country, fourteen of them are connected to the sea. These maritime provinces comprise of a large rural population that depends heavily on agriculture, fisheries and tourism for income earning opportunities and subsistence needs. These activities may also contribute significantly to the national purse in terms of foreign exchange earnings. Some important aspects of the marine environment are:

9.1 Fisheries

There are two types of fisheries: (1) export-driven oceanic fisheries which are usually large scale and use high technology. Mostly exploited by distant water fishing nations (DWFN); and (2) Nearshore or coastal fisheries which are usually, small scale and use low technology, often for subsistence with increasing demand for local and export markets.

Apart from the fees collected by the National Fisheries Authority (NFA) from large scale fishing vessels, direct economic benefits provided to the local community are; servicing of the foreign vessels; provision of goods and services, employment on vessels, and employment in fish processing plants.

¹³ =Ibid

Coastal fisheries are critically important to food security and improvements of living standards. Besides fishing for own consumption, it also provides income earning opportunities at the local markets to cover cost of essential needs like health care and education. Aquaculture holds great potential in PNG, however currently only barramundi farms are in operation while feasibility for prawns, giant clams, oysters and seaweed farms are either been explored or trialed.

9.2 Marine Tourism

Tourism based on the pristine marine environment and cultural activities of coastal areas like, game fishing, diving, surfing, shark calling, crocodile festival, mask festival, canoe racing, trade winds festival, etc. can generate enormous domestic earnings and provide employment to many coastal communities. Thus, the future of this industry depends heavily on the pristine state of the coastal environment. (Further discussion in Section C).

9.3 Maritime Transport

Maritime transport plays a vital role in local and international trade and features prominently in the Government's development strategy under Transport Rehabilitation and Maintenance. As seen around the world, catastrophic damage and cost of oil pollution on the marine environment can be devastating. With the recent amendments of Marine Pollution laws in PNG, the National Maritime Safety Authority (NMSA) has provided a flat form for safe and environment friendly maritime transport system if implemented.

9.4 Non-living Marine Resources

Non-living marine resources can contribute significantly to the GDP in PNG in the coming years. Deep sea mining in the Bismarck Sea has been approved by the national Government for operation whilst exploration is still on-going in other areas. Sand and gravel mining is important for local construction, while some sand have been found to contain chromite, which can be smelted and exported. Off shore hydrocarbon developments are also important contributors to the country's GDP and major provider of employment for nationals.

9.5 Marine Bio-prospecting

Bio-prospecting for compounds of pharmaceutical and industrial value offers significant potential in PNG. As already proven, many valuable compounds extracted from marine organisms have been used for medical and biotechnological research. For example, in 2006 samples taken from sponges in Milne Bay Province have been used for cancer research by the US Institute of Cancer Research¹⁴. However, there still remains enormous untapped potential in

¹⁴ = Author was involved in the assessment of the research proposal to undertake this bio-prospecting

the vast sea waiting to be explored.

9.5 Clean Energy

Potential of wave, wind and geothermal energy conversions looks promising for PNG if explored. Especially, geothermal energy conversions in the Bismarck Sea area where there is high geological activity. For example, the geothermal power plant on Lihir Island, New Ireland Province produces 56 megawatts which runs the operation of the mine and services the entire island. Many other areas on the island of New Britain have similar potential, thus requiring feasibility studies¹⁵.

B. OVERARCHING NATIONAL SUSTAINABLE DEVELOPMENT GOALS AND STRATEGIES

Any development policies and strategies put in place by the National Government, including the ocean policy must be aligned to these important development guidelines discussed here.

1.0 National Development Goals

Since gaining independence in 1975, the PNG Government adopted the 5 National Goals and Directive Principles as its vision to guide development. The Five Goals (See Annex III for full description) are:

1. Integral Human Development;
2. Equality and Participation;
3. National Sovereignty and Self Reliance;
4. Natural Resources and the Environment; and
5. Papua New Guinean Ways.

All development strategies that followed as reflected in the Government's priority expenditure areas is aimed at achieving the 5 Goals and catching up with the rest of the world in terms of social and economic development.

Beginning in 1976 to the 1980s, the Government's priority was to link the country through all three forms of transport networks, thus creating an infrastructure base for social and economic development activities. For example, one of the major achievement was funding and construction of the Okuk Highway (formerly Highlands Highway) linking up seven highlands provinces with two coastal provinces. This opened up the highlands region to export its major agriculture products like; coffee and tea. For coastal provinces ports were built in strategic locations to link all outer islands with the mainland.

In the 1990s there was a need for the Government to promote private sector growth to support the Government's social and economic development agendas. Priority for health care, education,

¹⁵ = Personal observation by author

transport maintenance, and economic growth orchestrated the progress towards medium term planning process. Also, the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 further encouraged medium term development planning with the sustainable development agenda becoming an important proposition¹⁶.

2.0 National Sustainable Development Strategy (NSDS)

The National Government encouraged a Post Rio Seminar to design a strategy to implement the sustainable development action programme or Agenda 21. In response the University of Papua New Guinea (UPNG) organized the 20th Waigani Seminar on Environment and Development in 1993¹⁷.

Participants invited to the seminar covered all sectors of society, including representatives from districts, provinces, private sector, non-Government organizations (NGOs), churches, industry, academics, bureaucrats and politicians. This open forum provided an avenue for everyone to express freely the need for the Government to redefine development in a more sustainable manner with full stakeholder participation. The seminar subsequently led to:

- (i) The recommendations for developing a National Sustainable Development Strategy (NSDS) in 1993;
- (ii) Drafting of PNG's NSDS in 1994;
- (iii) Endorsement of the NSDS in 1994;
- (iv) Establishment of the National Task Force on Sustainable Development in 1994; and
- (v) Creation of the National Commission for Sustainable Development and housed in the Prime Ministers' Office in 1994¹⁸.

As a result, the Commission for Sustainable Development and the National Task Force on Sustainable Development was created within the Prime Minister's Office. However, the years following from 1995 to 2002 saw constant changes to the political and bureaucratic leadership which adversely affected the implementation of the sustainable development strategy.

Despite these political instabilities, the Government of the day adapted the first Medium Term Development Strategy (MTDS) 1997-2002 describing it as the 'Bridge into the 21st Century'. This MTDS reflected key elements of previous plans including further infrastructure development, in particular transport infrastructure as a precondition to accelerate economic growth. It recognized private sector-led economic growth as the engine for broad-based social and economic development¹⁹.

Environmental sustainability and sustainable development did not feature prominently in the MTDS, nor was any programme designed to promote sustainable development apart from the

¹⁶ =Gladman, D., D. Mowbray and J. Duguman. 1996. From Rio to Rai: Environment and Development in Papua New Guinea. Six volumes. Port Moresby: University of Papua New Guinea Press.

¹⁷ =Ibid

¹⁸ =Ibid

¹⁹ =Department of National Planning (1998). Medium Term Development Strategy 1997 –2002. Bridge into the 21st Century. Port Moresby:

stalled NSDS of 1994²⁰. Despite these shortcomings, the MTDS 1997-2002, the Charter for Reconstruction and Development in 1999, the PNG Human Development Report of 1999 and the National Poverty Reduction Strategy of 2002 were positive developments in favor of Agenda 21²¹.

In 2002, the incoming Government announced the Programme for Recovery and Development (PRD). The Government wanted continuity to be maintained from programs initiated under MTDS 1997-2002 and these were reflected under the PRD including: export-driven economic growth, rural intervention and poverty reduction, and good governance. These objectives are carried forth under the MTDS 2005-2010 which clearly reflects elements of the UN Millennium Development Goals (MDG)²².

3.0 Medium Term Development Strategy (2005-2010)

The Medium Term Development Strategy (MTDS) covers PNG's overarching plan for economic and social development²³.

The three functional roles of the MTDS are:

- (i) To articulate a core development strategy that provides the guiding framework for the Government's expenditure program;
- (ii) To identify the supporting policy framework that will help put in place the enabling conditions for recovery and development; and
- (iii) To strengthen PNG's Public Expenditure Management system to foster sustainable improvements in the quality of life of all PNGans.

For the period 2005-2010, the overarching development strategy is defined as export-driven economic growth, rural development and poverty reduction, through good governance and the promotion of agriculture, forestry, fisheries and tourism on a sustainable basis. The strategy will be realized by empowering PNGans, especially those in rural areas, to mobilize their own resources for higher living standards²⁴.

Based on the development strategy, and consistent with the requirement to empower PNGans to drive the development process, the mutually supporting expenditure priorities under the MTDS are:

- (i) Rehabilitation and Maintenance of Transport Infrastructure;
- (ii) Promotion of Income Earning Opportunities;
- (iii) Basic Education;

²⁰ =Ibid

²¹ =Ibid

²² =UN Millennium Development Goals Available at <http://www.un.mdg>

²³ =Department of National Planning and Rural Development. 2004. Medium Term Development Strategy 2005–2010. Our Plan for Economic and Social Advancement. Port Moresby: Papua New Guinea

²⁴ =Ibid

- (iv) Development-oriented Informal Adult Education,
- (v) Primary Health Care;
- (vi) HIV-AIDS prevention;
- (vii) Law and Justice.

The Medium Term Development Strategy (MTDS) charts the course of reforms in the public sector in the 21st Century under ten guiding principles (Annex IV). The MTDS translates the means to overcome ineffective governance and bring about development as defined under export-driven economic growth, rural outgrowth and poverty reduction. The resource owners in PNG are encouraged to mobilize their resources, including land, to drive the development process to achieve higher standards of living²⁵.

4.0 National Strategic Plan (NSP) -PNG Vision 2050

The National Strategic Plan (NSP) 2010-2050 now called PNG Vision 2050²⁶ was initiated in early 2008. The plan seeks to address PNG's low social and economic indicators despite being blessed with abundance of wealth in natural resources. The seven pillars identified are:

- (i) Strategic Planning, Integration & Control;
- (ii) Institutional Development & Service Delivery;
- (iii) Human & Social Capital Development;
- (iv) Wealth Creation;
- (v) Security & International Relation;
- (vi) Climate Change & Environmental Sustainability; and
- (vii) Churches & Development

It is envisaged that the seven pillars will become the foundation of which development plans from 2010 to 2050 will be anchored. The first pillar on strategic planning and integration becomes the central and coordinating body to be developed into a secretariat.

After the nationwide consultation and the Leaders' Summit in August 2009, PNGV50 now focuses on three core areas to be at the head of the whole program. These core areas are Service Delivery, Wealth Creation and Human Capital Development. All other NSP pillars critically support these three core development areas.

Under service delivery, the focus is on developing better platforms to ensure services are directly delivered to the people. Wealth creation will ensure that 70% of the country's incomes derived from renewable resource areas in Agriculture, Fisheries, Forestry and Tourism as opposed to reliance on the non-renewable resource sector. Human Capital and Entrepreneurial Skills Development will also be focused and when developed will boost knowledge and productive human resource.

²⁵ =Ibid

²⁶ =The National Strategic Plan or PNG Vision 2050 was launch in December 2009 by the National Government

All on-going and new projects that relate to institutional development and service delivery, human resources development and wealth creation would be aligned and implemented under the auspices of PNGV50 over the medium to long term. The reforms to the three-tier Government system, piloting and development of an appropriate Service Delivery Mechanism Model (SDMM) focusing at the ward and district levels are first initiatives to be implemented under PNGV50 framework which started in 2010²⁷.

5.0 Enabling Environment for Implementation of National Development Strategies

The National Executive Council (NEC) and hence the Parliament remain the highest decision making bodies in the country. The Department of Finance and Treasury (DF&T) and the Department of National Planning and Monitoring (DNP&M) are the control center for the Government’s planning and budgetary processes. All sectorial and provincial plans enter the national planning, monitoring and selection process where they are screened and funded accordingly. Further, all foreign aid (both grants and loans) enters the country through DF&T through which aid is disbursed either through the annual budgetary process, the Public Investment Program (PIP) cycle or directly into prioritized recurrent costs. However, the DF&T relies on other line agencies of the Government to input sectoral plans and budgets into the decision-making process. The information provided is very important in devising strategies to address development goals of the country (Figure.1). In fact the MTDS 2005-2010 reflects this process.

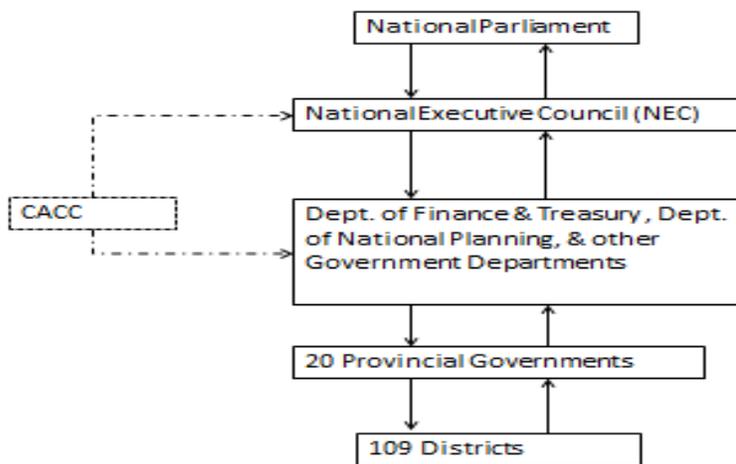


Figure. 1. Simple Diagram of Decision-making and Implementation process (Source: This author)

Despite the passage of the *Organic Law on Provincial and Local-level Government* in 1995 (OLPLLG) and amended in 2006 to facilitate ‘bottom-up’ planning, it is practically difficult to implement projects at the provincial level. Successful implementation will require cooperation

²⁷ = Department of Prime Minister & NEC. (2009) Available at www.publicsectorreform.gov.pg

and coordination between key national departments and agencies (horizontally) and between different levels of Government (vertically).

The ability of the Central Agencies Coordinating Committee (CACC)²⁸ to coordinate development programs of national significance is critical. The CACC reports directly to the NEC on the progress of different activities stipulated under the MTDS. Also important in designing and implementation of the MTDS are Departments of Provincial and Local-level Governments, Foreign Affairs and Immigration, Health, and Education, and all economic sector departments.

Identifying these key agencies does not necessarily imply that their horizontal linkages and working relationships are well developed. In fact it is important to point out that the working relationship between the key agencies (horizontal) has not always been sound. It seems they require specific tasks defined by specific terms of reference to ensure effective coordination among these line agencies. In the absence of clearly defined roles and responsibilities, problems of duplication of effort, resource wastage, nepotism, and bad advice usually occur.

Furthermore, there is often a conflict of interest between related agencies. Their roles and responsibilities are compartmentalized in ways that complimenting and supporting MTDS strategies between and within sectors is constrained. The MTDS would deal with many cross-cutting priority issues which often require inter-agency commitment. For example, in mining projects, the Department of Environment and Conservation (DEC) is responsible for environmental impact monitoring therefore require coordination and collaboration with agencies implementing resource development projects. The Mineral Resources Authority (MRA) views its role as a developer while it views the role of the DEC as an environmental manager. The perceived views of these agencies make inter-agency linkages difficult. If the horizontal linkages between centrally-based line agencies are poorly developed, then vertical linkages between the central agencies and the rest of the provinces remains unclear.

C. OVERVIEW OF KEY ECONOMIC SECTOR POLICIES AND IMPLEMENTATION PROGRAMS

The important economic sectors contributing to the country's overall economic development is discussed here with a focus on policy initiatives undertaken within each sector. Non-renewable resource development continues to account for a larger proportion of the PNG's GDP while also contributing to much of the environmental degradation in the country. Thus, maintaining a balance between the industry and the environment is considered by the Government as an important agenda for all sectors. Both land-based and offshore economic activities are covered here to provide an insight into the importance of regional planning and management approach from the industry perspective.

²⁸ = CACC comes directly under the Prime Minister's Department

1.0 Agriculture

The earliest form of agricultural practice in PNG was traced back to 40,000 years ago by archaeologist at the Kuk World Heritage Site in the Western Highlands²⁹. At present, the agriculture sector still continues to play a significant role in providing income earning opportunities to the rural areas, which accommodates more than three quarters of the country's population. Apart from employment, income generation and subsistence consumption, the sector also generates significant revenue for the country from its commodity exports. The main export tree commodities are oil palm, rubber, coffee, cocoa and copra. The sector contributes around 25 per cent to GDP³⁰.

Key objectives of the MTDS 2005-2010 are the promotion of export-driven economic growth, rural development and poverty reduction. In particular, the economic growth generated must benefit the majority of people who live in rural areas in terms of both income earning opportunities and also improved basic services. The agriculture sector is a critical sector in achieving these goals and improvements in the sector are important in order for many rural communities to benefit. Improvements can be achieved through enhanced coordination of agencies in the sector, increased access to farming information and improved access to credit and markets.

To achieve the above objectives and recognizing the potential of agriculture to sustain the basic livelihoods of the rural majority, the Government, through the Department of Agriculture & Livestock (DAL), has formulated the National Agriculture Development Plan 2007-2016 (NADP)³¹.

The NADP aims to sustainably transform the country's agriculture sector into a vibrant and productive economic sector that contributes to economic growth, social wellbeing, national food security and poverty alleviation. To achieve this vision, the NADP is targeted to stimulate sustainable economic growth in the agriculture sector through the development of a well-coordinated planning and implementation strategy that are interactive and effective, involving the full participation of all stakeholders. The key priorities of the NADP include: research and extension; training and information; industrial tree crops, food and horticulture; spices and minor crops; livestock, apiculture and aquaculture; gender and social issues and HIV/AIDS; regulatory and technical services; and strengthening of the NADP management³².

²⁹ = Kuk World Heritage Site is the first for PNG declared by UNESCO in 2009

³⁰ = Department of Agriculture and Livestock (2007). National Agriculture Development Plan (2008-2016), Port Moresby

³¹ = Department of Agriculture and Livestock (2007). National Agriculture Development Plan 2007-2016. Also available at www.dal.gov.pg

³² =Ibid

Through an NEC decision, K100 million was committed to fund the NADP annually between 2007 and 2016. The NADP was implemented by DAL in 2007 and 2008 with funding of K100 million in both years. In 2009 the program was implemented by Department of National Planning and Monitoring³³. Of the K100 million allocated in 2009, K20 million was allocated to National Development Bank for the provision of a credit facility for private ventures involved in agriculture and K80 million was for the purpose of funding agricultural projects in line with NADP submitted to DNPM. Submissions for NADP funding were high, highlighting the high demand for assistance with agricultural projects. The majority of the projects (over 70 per cent) receiving funding disbursed by DNPM were in the cocoa and coffee subsectors. In total, 43 projects were funded in 2009. In 2010, K89 million was allocated to District Support Investment Program for agricultural development, with K1 million earmarked for each district.

Factors like fluctuations in world commodity prices, natural disasters, climate change and crop diseases which can adversely affect crop yields. Considerations of how to manage these risks are contained in the NADP. The important role of the National Agriculture Research Institute (NARI) in addressing these risks through innovative research and development such as preparation for droughts, insect and pathological studies, post-harvest and processing research and development, and smallholder livestock production is acknowledged through funding support. Also funds were allocated to the National Quarantine Inspection Authority (NAQIA) for the control and management of the cocoa pod borer infestation and other invasive species.

In addition, there are other major constraints in the agricultural sector, including poorly developed infrastructure such as roads and telecommunication systems that can be the source of information dissemination on agriculture and that will also assist producers bring their crops to the markets. Poor road conditions significantly hampered the delivery of agricultural goods in 2009, such as palm oil, from the fields to the processing mills.

To address these issues in 2010, the Government has invested significant resources into transport infrastructure and into the agricultural sector, through NADP and also through funding research programs under NARI. A new high impact program in 2010 is the Large Plantation Rehabilitation Program. This program has been allocated K26 million and aims to rehabilitate plantations that could contribute significantly to growth and employment in the sector as well as improve income earning opportunities for rural areas. Other opportunities include the production and sale of fresh produce to meet local demands due to the development of the Liquefied Natural Gas (LNG) project. This will require significant efforts from the sector to coordinate and step up to the challenge.

2.0 Fisheries

PNG has abundant marine resources with the largest fisheries zone in the Pacific, covering an area of 2.4 million square kilometers. The fisheries sector is extensive and includes inland river

³³ =Ibid

fisheries, aquaculture, coastal bêche-de-mer, reef fisheries, prawn trawl and large-scale deepwater tuna fisheries. The sector ranges from artisanal communities to medium sized domestic prawn and tuna longline operators to large international purse seine fleets in the deepwater tuna fishery³⁴.

The fisheries sector supports the livelihoods of communities from 14 maritime provinces in PNG. It is difficult to quantify the contribution of the fisheries sector to the national economy, as subsistence consumption and transactions at local markets make up a significant factor within the sector, for which there is no reliable data available³⁵.

Although it is difficult to obtain information on the true value of fisheries sector, this is estimated to be around K350 million to K400 million per annum. The value of marine exports, however, shows an increasing trend with K136.4 million projected in 2010 compared to only K69.4 million in 2005³⁶. The development of the fisheries industry is a priority for Government, as outlined in the MTDS and the Government is committed to ensuring that the potential of the sector is realized and managed in a sustainable manner, which will significantly benefit the local maritime communities.

PNG signed the Interim Economic Partnership Agreement (IEPA) with the European Union (EU) in July 2009. The signing of the IEPA implies that fish and fisheries products are afforded preferential market access to the EU. PNG's fish and fishery exports will enter the EU market duty free and quota free³⁷. Having the preferential market access under these conditions into the EU is significant for PNG. However, compliance of quality, standards, sanitary and phytosanitary measures (SPS), rules of origin, Illegal, Unregulated and Unreported (IUU) fishing practices, is stringent and meeting the EU market requirement is costly for PNG.

The NFA has started compliance by updating the list of tuna fishing vessels on Western Central Pacific Fisheries Commission (WCPFC)³⁸ registry which are operating in PNG's exclusive economic zone. This will effectively track every tuna fishing vessel in PNG waters using the vessel monitoring system (VMS). The updates are being done on both the domestic vessels which bear the PNG flag, and the domestically-based foreign vessels. These vessels bear the flags of their respective originating countries and under the NFA licensing requirement, the vessels have to offload their catch at processing plants in PNG for processing as export loins or canned fish. IUU regulation 1005-08 is aimed at improving traceability of all fishery products traded with the European Union (EU) which took effect in January 2010³⁹.

³⁴ =Papua New Guinea National Fisheries Authority (2004) Corporate Plan 2005-2007, Port Moresby

³⁵ =Ibid

³⁶ =Ibid

³⁷ =Ibid

³⁸ =Additional information on WCPFC Registry at www.wcpfc. Kumoru L. and Koren. L. 2006. Tuna Fisheries Report. Papua New Guinea National Fisheries Authority, Port Moresby, PNG July 2006.

³⁹ =The National Newspaper, 25 November 2009

PNG has the potential to benefit greatly from fisheries sector by further developing onshore downstream, and product diversification processing facilities for fish and fisheries products. This would add significant value to the sector and also increase employment and income earning opportunities for rural people. Recent studies have highlighted that license fees have brought in only K25 million annually⁴⁰. PNG would benefit substantially from export driven downstream processing, for which the value added is much higher than catching fish offshore. It is estimated that about 400,000 metric tonnes of tuna is caught annually in PNG's fishing zone, of which an estimated 100,000 metric tonnes is processed onshore. Currently the fisheries industry is characterized by a large number of purse-seine catch and transshipment with some domestic contract loining like South Seas Tuna Company and combined domestic catching and canning undertaken by RD Tuna Cannery⁴¹.

Currently there are only three commercial canneries and processing plants in PNG that are engaging in onshore downstream processing. One reason for the relatively high volume of transshipment of PNG tuna to offshore processors is the lack of processing facilities onshore. Therefore the GoPNG is committed to improving onshore downstream processing facilities to enable the fisheries sector to reap these potential benefits. A number of initiatives have been pursued in 2010. The Pacific Marine Industrial Zone (PMIZ) in Madang has been designed to facilitate the growth of the onshore downstream processing tuna industry in PNG, with Parties to the Nauru Agreement (PNA)⁴² having the option to participate as counterparts in the project.

The PMIZ project components include procurement of land adjacent to RD Tuna Cannery, and also provision of utilities and other services with the relevant authorities such as water, power, roads, postal and banking services. The objective is to establish an enabling environment for international tuna canning companies to establish their operations in PNG. This will create more employment and income earning opportunities in PNG as well as increased tax revenue for the Government. Implementation of the project has been slow, but a prefeasibility study has been conducted and work on next phase has is continuing in 2010. The project is fully funded through a concessional loan from the Chinese Government.

Other projects include the development of a tuna processing facility in Lae, Morobe Province. A Memorandum of Understanding has been executed between the investors and National Fisheries Authority (NFA) and the facility is currently in the planning stage. In addition, plans are underway to build a cannery in Lae with a 350 metric tonnes daily processing capacity by a company from the Philippines.

⁴⁰ =Ibid

⁴¹ =World Fishing and Aquaculture 18 August 2009. PNG Purse Seiners Certified Friends of the Sea. Available at [http:// www.worldfishing.net/](http://www.worldfishing.net/)

⁴² =Parties to the Nauru Agreement are; PNG, Solomon Islands, Nauru, Fiji, FSM, Palau, Kiribati and Tuvalu. Also available at www.oceanlaw.net/texts/nauru.htm

The Government is supporting the sector through the funding of the Coastal Fisheries Development Project (K10 million), the Wewak Fish Market & Jetty Project (funded through JICA – K7.6 million), which has opened in 2010⁴³.

3.0 Forestry

It is estimated that two thirds of PNG’s total land mass is forested⁴⁴, making PNG host to the world’s third largest rainforest after Amazon and Congo. Of this, it is estimated that 15 million hectares is rich in timber species that is acceptable and accessible for development. About 34 varieties of forest types have been identified (Figure 2). This places ongoing challenges and responsibilities on the country for more effective planning, coordination and management of its forest resources to derive the maximum sustainable benefits while minimizing, any detrimental impact to the environment and society at large.

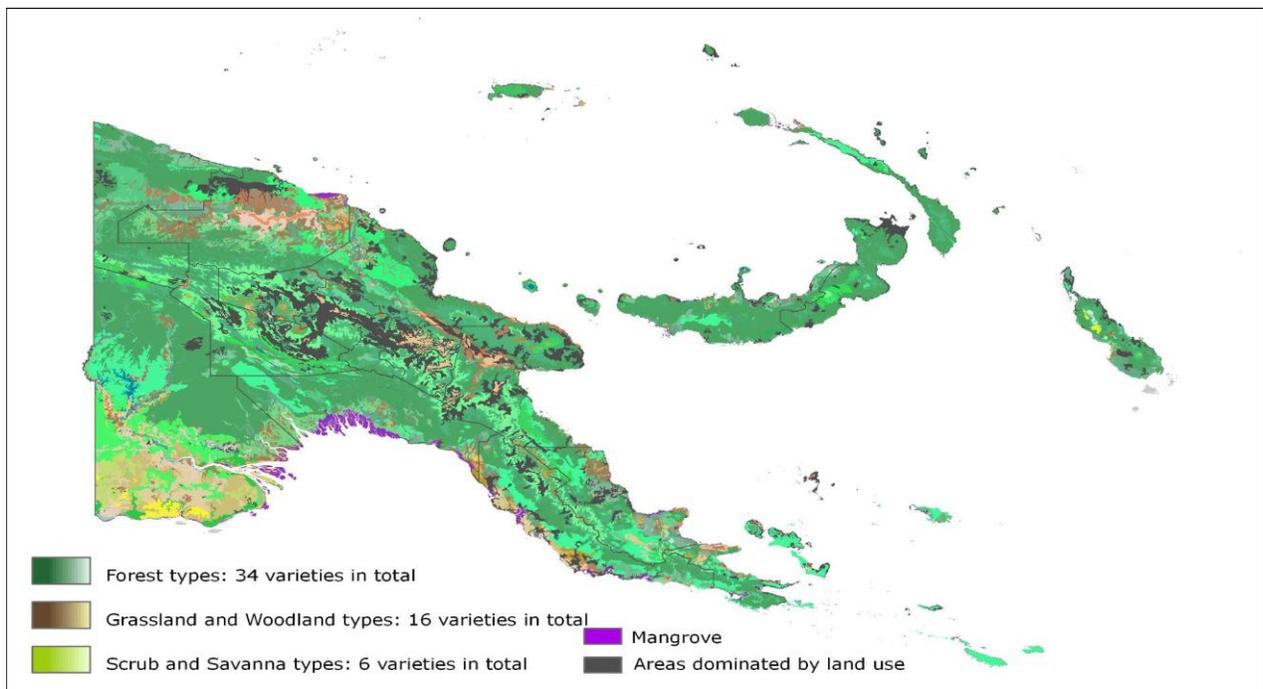


Figure.2. Major Vegetation types in PNG using FIMs (Source: Lipsett-Moore et.al, 2010)

These challenges has led the GoPNG to maximize the value of our natural resources and environment, through sustainable primary production and downstream processing. The main thrust of the 1991 National Forest Policy⁴⁵ is to manage the forest resource in a sustainable way

⁴³ =Department of Finance and Treasury (2010) National Budget 2010, Port Moresby.

⁴⁴ =Shearman, P. L., Bryan, J. E, Ash, J., Hunnam, P., Mackey, B., and Lokes, B. (2008). The State of the Forests in PNG: Mapping and condition of forest cover and measuring the drivers of forest change in the period 1972-2002. Port Moresby: University of Papua New Guinea

⁴⁵ =PNG Forest Authority. (1991), National Forest Policy. Available at www.pngfa.gov.pg

to achieve economic growth, to create employment opportunities in the industry for PNGans, and to encourage and increase domestic processing. The application of the National Forest Policy and the *Forestry Act* has seen the development of existing systems and practices. Various amendments have been made to the *Forestry Act* (1993, 1996, 2000, 2002, and 2007)⁴⁶ to improve service delivery and enhance implementation to sustain the forestry sector.

The PNG Forest Authority (PNGFA) is the Government's Regulatory Agency responsible for overseeing the implementation of the sustainable forest management principle. In its efforts to achieve sustainable forest management PNGFA has developed a Logging Code of Practice⁴⁷ in 1996 and other supportive tools and processes to enhance sustainable forest management in PNG. As a member country to the International Tropical Timber Organization (ITTO), PNG has adopted and applied the ITTO set of criteria and indicators of sustained forest management of natural tropical forests, and reports on its progress towards achieving sustainable forest management.⁴⁸

Since 1995, PNG has made some progress in sustainable forest management of natural tropical forest, however, there have been two major constraints hampering progress: lack of capacity and lack of funding. In 2009 the performance by PNGFA was identified as sound, but limited with not enough capacity to fulfill the objectives under the *Forestry Act*. Most of the structural policy and legislation requirements have been achieved while some other important provisions of the Forest Policy have not been implemented due to constraints such as equipment, infrastructure and technology.

Forest cover in PNG is vulnerable to drivers of deforestation such as unsustainable logging, shifting cultivation, bush fires, forest clearance for agriculture, mining, oil exploration/extraction and fuel wood collection. Given the challenge, in 2009 PNGFA drafted the National Forest Development Guidelines which give direction to the National Forest Plan, which underpins all forest based activity in PNG. In addition, the PNGFA drafted the Forestry and Climate Change Policy Framework for Action, 2009-2015⁴⁹.

Recognizing its commitment to sustain development, this Framework for Action outlines the broad priorities for the Government by providing strategic platform for policy and decision makers as well as developing and strengthening partnership between national, provincial, and community initiatives for implementation. The Framework is consistent with the timeframes of the Millennium Development Goals (MDGs), Kyoto Protocol, the Johannesburg Plan of Implementation, the UN Commission on Sustainable Development, the United Nations

⁴⁶ =*Forestry Act* Available at www.pngfa.gov.pg

⁴⁷ =Logging Code of Practice. Available at www.pngfa.gov.pg

⁴⁸ =International Tropical Timber Organization (2007). ITTO criteria includes; Enabling Conditions for Sustainable Forest Management; Forest Resource Security; Forest Ecosystem Health and Condition; Flow of Forest Produce; Biological Diversity; Soil and Water; and Economic, Social and Cultural Aspects. Available at www.itto.org

⁴⁹ =Forestry and Climate Change Policy Framework for Action, 2009-2015 is available at www.forestry.gov.pg

Framework for Climate Change Convention (UNFCCC) & Intergovernmental Panel on Climate Change (IPCC) on Afforestation and Reforestation, Clean Development Mechanism (ARCDM) and Reduced Emission from Deforestation & Forest Degradation (REDD). The framework also recognizes important international multilateral agreements such as Convention on Biodiversity (CBD) and the UN Convention to Combat Desertification (UNCCD) to address the issue of deforestation and climate change.

The forestry sector is dominated by large scale logging activities mainly in West New Britain, East New Britain, Western, Gulf and Sandaun Provinces purposely for export⁵⁰. The total volume of log exported in 2009 was approximately 2 million cubic meter generating about K260 million. The export duty and the export levy received from the period is K72 million and K9.6 million respectively. The Government and the landowners have benefited significantly from the tax, levies and royalties collected from the logging industry. A premium levy of K8 per cubic metre is paid to the Government for export of every unprocessed log. The levy is an extra cost to the timber license holders; however, the Government has offset the cost by reducing the log export tax⁵¹.

Prior to 1994, the logging companies often inaccurately reported on log exports, thus resulting in less taxes, levies and royalties to the Government and land owners than would have been the case if reporting had been accurate. In response to this, the Government has funded SGS Company since 1994 to monitor and report logging activities, which has addressed this issue.

There have been shortcomings in market information and reports for forest products. As such, the Government has initiated a more direct market involvement to improve market returns for its forest products by giving direction to the PNGFA to establish a State Marketing Agency (SMA). SMA is responsible to market forest products and to secure independent market intelligence reports for market verifications. The Agency will also act as a vehicle for PNG to move into the significant area of carbon trading of forest produce from plantations and other sources of forest based carbon trading.

4.0 Tourism

PNG has great potential for international tourism with its many attractions including natural beauty, rich cultural experiences, world-class diving, unique bird watching, deep sea fishing, surfing and trekking. The tourism industry has the potential to create important benefits to the country, including increasing employment, boosting spin-off businesses and preserving the environment and culture. Benefits could also include improvement to rural communities who rely on tourism for their participation in the cash economy.

⁵⁰ = See Annex II. Map of PNG for names of provinces

⁵¹ = Ibid

Recognizing the potential for the tourism industry in PNG, the GoPNG is taking proactive approaches to address the issues acting as constraints to the progression of the tourism industry in PNG. The PNG Tourism Promotion Authority (PNGTPA) has developed the Tourism Master Plan (TMP) 2007-2017 with the goal of ‘increasing the overall economic value of tourism to the nation by doubling the number of tourists on holiday in PNG every five years and maximizing sustainable tourism growth for the social and environmental benefits for all PNGans’. To achieve this goal, the TMP identifies five key areas which the Government should focus on: Marketing the Destination; Product Development and Investment; Transport and Infrastructure; Human Resource Development; and Institutions and Industry Partnerships⁵².

Although the tourism industry has been growing relatively rapidly in recent years, it remains small on the international scale and contributes only around 3 per cent to GDP. However, the number of visitor arrivals to PNG has increased in the last six years from 56,185 in 2003 to 120,134 in 2008 with an estimated spending by these visitors of K960 million. This increasing trend in the number of total visitors is expected to continue with 8.5 per cent growth predicted over the next ten years. The inbound market is dominated by business travel (65.2 per cent) with holiday arrivals comprising 28.9 per cent of total visitor arrivals. Holiday arrivals increased from 27,737 in 2007 to 34,719 in 2008⁵³.

Achieving the TMP target and sustainably developing the industry will be a major challenge. The Government will need to assist in creating a conducive environment to enable the industry to flourish. The Government has introduced various initiatives in the tourism sector. Since 2004 taxation incentives have been in place to encourage more marketing and promotional activities overseas by tour operators and hotelier sub-sectors, which is likely to have significantly increased the number of overseas tourists.

5.0 Oil and Gas

The development of oil and gas industry in PNG is relatively new with the first oil production in Kutubu Southern Highlands Province by Oil Search Ltd commencing in the 1990s. Since then revenues from oil have contributed immensely to improving the economy. There are indications that production levels are naturally declining in the current oil fields with gas likely to become PNG’s most important resource. In 2008, oil exports were valued at an estimated K3.6 billion.

The *Oil and Gas Act 1998* is the principal legislation that governs petroleum exploration and development and State Entitlement and Benefits in PNG. It spells out the role and purpose of the legislation in key areas including the exploration, development, processing, transportation and makes provisions for grant of benefits to traditional landowners, local level Governments and Provincial Governments arising from the production, processing and transportation of petroleum

⁵² = PNG Tourism Promotion Authority (2006). Tourism Master Plan 2007-2017 Also available at www.pngtpa.gov.pg

⁵³ = PNG TPA Tourism Report (2009), Also available at www.pngtpa.com.pg

in PNG. The Petroleum Policy 2003 is primarily derived from the *Oil and Gas Act* and any amendments to the Act take precedence. The responsibility of implementation rests with the Department of Petroleum and Energy (DPE), focusing on specific issues to ensure better management and development of oil and natural gas resources and to improve the progress of socio-economic development in areas of resource extraction.

With the high growth in global demand for natural gas, the Liquefied Natural Gas (LNG) option was examined in late 2006 and presented itself as the most viable opportunity for PNG to develop its gas resources. To take advantage of this opportunity, the Government focused on facilitating and participating in the development of the country's first LNG project⁵⁴. The LNG Project is financed by several co-ventures with ExxonMobil being the major partner. With an expected project life of 30 years and production commencing around 2014, it is anticipated that the Government will experience large revenues both directly and indirectly and that there will be significant job opportunities created as a result of the project.

The LNG Gas Agreement was signed between the Government of PNG and ExxonMobil on 22 May 2008 and paved way for the Front End Engineering Design (FEED) entry decision by the co-ventures. The final decision to go ahead with the project was declared in December 2009 by the Prime Minister at the Parliament house⁵⁵.

The Government also endorsed a second LNG project, a US\$6 billion venture, proposed Liquid Niugini Gas Ltd, with shareholdings from InterOil Corporation, Merrill Lynch Commodities and Pacific LNG Operations. Liquid Niugini Gas Ltd has licenses in the Gulf Province (InterOil Elk and Antelope fields)⁵⁶. The components of the proposed project include an underground gas pipeline from the two fields down to the coast between Kerema and Ihu, entering the sea along the coastline towards Port Moresby and reaching land at the proposed processing plant near the Napa Napa InterOil refinery⁵⁷. The engineering design, including cost estimates, was completed in 2009 together with the environmental and social impact assessments. The construction phase could commence in 2011 for 3 to 4 years and production would be for at least 25 years⁵⁸.

It is anticipated that the Government's focus on on-shore down-stream processing will benefit the sector. In addition, recent agreements for the sale of gas with China and Japan, and the potentially high demand in the Asian markets and the Pacific west coast markets of the Americas indicate the demand for LNG and the potential for PNG to benefit from in the gas sector⁵⁹.

6.0 Mining

⁵⁴ = See Annex V. Map of LNG Project

⁵⁵ = Project Inauguration Speech by Prime Minister Sir Michael Somare at Parliament House in December 2009

⁵⁶ = Annex VI. Second LNG Project

⁵⁷ = InterOil Development Plan Available at <http://www.interoil.com>

⁵⁸ = Business Advantage (2009). LNG in PNG, Also available at www.businessinternational.com

⁵⁹ = Ibid

PNG's mining sector has been a major export earner for the country since the early 1970s with the first gold and copper mine in Bougainville. Between 2006 and 2008 high prices of minerals, namely gold, and copper, have boosted revenue earnings from the mining sector, leading to large Supplementary Budgets. Over the medium term, mining activities will continue to be the major revenue earner for PNG⁶⁰.

There have been high levels of mineral explorations over the last couple of years, but plans for new mines to enter their production phase from 2009 have mostly been reduced or stalled. Drilling still continues at advanced exploration sites such as Yandera, Frieda, Wafi-Golpi, Woodlark, Kainantu and Tabar, but at reduced levels. Generally, there are still more potential mining lease areas indicating a favourable outlook for the industry's contribution to export earnings and GDP over the next ten to twenty years when economic conditions become more favorable⁶¹.

The mining industry in PNG has matured over the years with the evolution of an enabling policy and regulatory environment that provides incentives for developers to invest in the mining industry. The fiscal incentives and less rigid policy stance by Government, and potential increases in mineral prices and high demand for industrial metals will continue to be a catalyst for future increases in exploration activities and further growth in the industry. As the implementation agency of Government for the mining industry, the Mineral Resources Authority (MRA)⁶² has cleared a large backlog of applications for Exploration Licenses (EL) with a growing number of outstanding EL applications for new tenements.

As of June 2009, the Chamber of Mines records indicate 279 current ELs, and 22 license renewals and 104 applications for 2009. There are 13 advanced exploration projects nearing pre-feasibility or feasibility stages with significant drilling programs currently underway⁶³.

The sector has been further developed with the inclusion of Simberi Gold Company Ltd and Mt Sinivit Ltd to current operating mines namely Lihir Gold Ltd, Ok Tedi Mining Ltd, Porgera Joint Venture Ltd, Kainantu Gold, Hidden Valley Ltd and Tolukuma Gold Mine Ltd.

In addition, PNG will host a project that will pioneer the mining of sea floor massive sulphides (SMS) with the company lodging a Mining Lease application for the Solwara 1 located in the Bismarck Sea. An Environment Impact Statement (EIS) and the mining feasibility study were completed in 2008 and approval granted in 2009, with production expected to begin in 2011. The use of innovative engineering and remotely operated robotics will feature in the mining operations that will lead to a production rate of 1.8 million tonnes annually⁶⁴.

⁶⁰ = Ibid

⁶¹ = Annex VII. Map of Existing and Potential Mines in PNG

⁶² = More information on MRA, available at www.mra.gov.pg

⁶³ =PNG Chamber of Mines and Petroleum, available at www.pngchamberofminpet.pg

⁶⁴ =Nautilus Minerals (2008). Environment Impact Statement Volume A: Solwara 1 Project. Available at:

PNG is also diversifying its mining industry with the granting of a mining licence to the Metallurgical Chinese Corporation in 2007 to mine nickel and cobalt in the Ramu District, Madang Province, in 2007. The commissioning of the Basamuk Refinery and commencement of production in 2010 was stalled by legal issues with affected landowners. The production rate from the Ramu project is expected to be 33,000 tonnes of nickel and 3,300 tonnes of cobalt per annum for a 20 year period starting in 2010⁶⁵.

While there is large potential for the industry to expand at a fast rate, there is also a growing concern on the environmental impacts of these mines. The riverine disposal of mine waste has been an issue for PNG, exemplified by the Ok Tedi Mining Ltd court case, and the recent legal claim made against Hidden Valley Gold Mine Ltd for disposing mine waste into the Watut River⁶⁶. The DEC, the agency responsible for conducting Environmental Impact Assessments (EIA) of development projects such as mining, requires the necessary resources to perform its mandated responsibility effectively. As such DEC has an annual allocation of K1 million for mine monitoring under the Mining and Petroleum Projects Assessment and Regulation Project.

7.0 Manufacturing

The manufacturing sector in PNG is relatively small. In 2007 and 2008, it is estimated to have contributed 0.5 percentage points to growth in real GDP with projections for 2009 and 2010 showing a decline to 0.3 and 0.5 percentage points respectively⁶⁷. The manufacturing sector relies on agricultural and resource based industries, particularly in the export of manufactured commodities such as palm oil, processed timber, and recently the export of refined petroleum. Processed tuna is another export industry in PNG with much potential.

The challenge for the manufacturing sector is to identify opportunities which can move the economy from comprising predominantly primary industries into realizing the potential of higher value added processing industries. It is the GoPNG's vision to gradually advance into downstream processing of major primary commodities through the development of higher value production chains and appropriate technologies. In realizing this vision the Government aims to create a conducive environment for the manufacturing sector, which would have the potential to increase formal employment growth and broaden the tax base. However, despite the potential investment opportunities in downstream activities, at present PNG imports almost all processed food, clothing, footwear and inputs for industry and commerce. The challenge for the manufacturing sector is to identify opportunities which can move the economy from comprising

<http://www.cares.nautilusminerals.com>

⁶⁵=RamuNico Management Company Available at <http://www.ramunico.com/plus/list.php?tid=159>

⁶⁶=The Member of Parliament for Bulolo, Mr. Sam Basil served legal proceedings on the owners of the Hidden Valley gold mine, seeking damages on behalf of over 100 indigenous families for environmental damage to the river system. Available at <http://bulololive.blogspot.com/2011/01/legal-claim-for-environmental-damage.html>

⁶⁷=Ibid

predominantly primary industries into realizing the potential of higher value added processing industries.

The current policies by the Government will lead to the development of a strong domestic production base to replace reliance on the non-renewable resource industries such as mining and petroleum⁶⁸. The Government seeks to encourage value adding of the country's natural resources by manufacturing them into finished products such as petrochemical, canned tuna, furniture, biofuel - both for domestic consumption and exports. Also planning for long-term vocational and technical training program to meet the skilled labour needs of the manufacturing sector as well as other economic sectors is important.

The challenge remains for the Government to play a proactive role to create an enabling environment in other sectors, such as law and order and land reform, which act as constraints to reducing the cost of business in PNG. Security costs for businesses are extremely high. In addition, there are many regulatory constraints and other impediments to doing business in PNG.

The role of the Government in taking bold policy decisions to decrease the cost of doing business in PNG is critical. In addition, the Government can assist directly in facilitating the development of Small Medium Enterprises (SMEs). Production cost continues to be the major impediment to the manufacturing industry. Infrastructure improvements and lowering of input tariff would greatly reduce the cost. It is also vital for the sector to improve the quality of its products in order to increase its export opportunities⁶⁹.

8.0 Environment Sustainability

PNG is one of the most bio-diverse countries in the world with a large percentage of its population living in rural areas, depending heavily on the natural environment⁷⁰. These people's livelihoods are dependent on resources such as those in the agricultural, fisheries and forestry sectors, which can be adversely affected by environmental impacts. Also, with increasing population pressures, the country faces the growing challenge of balancing economic development with environmental sustainability. In particular, PNG's pursuit for sustainable development has in many ways been compromised with unsustainable development practices that have affected the country's ecosystem.

The Government must express protection of biodiversity and ecological processes as priority goals across all its policy sectors as well as consider the implications of policy decisions for biodiversity and ecological processes, through effective mechanisms.

⁶⁸ =Ibid

⁶⁹ =PNG Investment Promotion Authority at www.pngipa.com.

⁷⁰ =Nicholls, S. 2002. The Priority Environmental Concerns of Papua New Guinea. Draft Report. Strategic Action Programme for the International Waters of the Pacific Small Island Developing States. Port Moresby: Global Environment Facility, United Nations Development Programme and South Pacific Regional Environment Programme.

The PNG National Biodiversity Strategy and Action Plan (NBSAP)⁷¹ provides a roadmap to the sustainable use and management of the country's biological resources by mainstreaming and integrating nature conservation and protected areas into our respective national policies and strategies which will contribute to the health of the country and the Pacific Region⁷².

The DEC is the mandated Government agency to coordinate the Government's efforts to deal with environmental issues, including monitoring and evaluation of pollution, compliance monitoring of mines and oil and gas fields and the country's fisheries and forestry resources, water resource management, and conservation of biodiversity⁷³. However, there remain serious coordination issues between the relevant agencies in Government with consolidated data being hard to obtain. A coordinated approach in the collection, analysis, storage and dissemination of environmental data to monitor progress and inform policy making is urgently required.

The need to balance environmental sustainability with development and economic progress implies that the environment should be a consideration in all development plans and policies. This will make the increased involvement and coordination of relevant stakeholders in achieving sustainable development goals even more important. The Government is a signatory of the UN MDGs, of which Goal 7 aims to ensure environmental sustainability by integrating the principles of sustainable development into country policies and programs and to reverse the loss of environmental resources by 2015. To address such issues in 2010, DEC has formulated an Environmentally Sustainable Economic Growth (ESEG) strategy to ensure that environmental issues are considered when designing national sectoral policies, strategies or plans⁷⁴.

The Office of Climate Change and Environmental Sustainability (OCCES) was established in 2008 to manage climate change and carbon trade issues for the country. The OCCES aims to coordinate between the agencies and stakeholders on issues relating to climate change and carbon trading. This reflects the Government's commitment towards the effort to tackle climate change and benefit from the opportunities presented by carbon trading. The OCCES is working towards managing the effect of climate change to the country through four main work programmes (adaptation, mitigation, technology, and financing).

D. OVERVIEW OF IMPLEMENTATION PROGRAMS UNDER THE EXPENDITURE PRIORITY AREAS (EPA)

As highlighted earlier in Section B (3.0), the Medium Term Development Strategy (MTDS) consists of seven Expenditure Priority Areas (EPAs), which are: (i) Primary and Preventative Health Care, (ii) HIV/AIDS Prevention, (iii) Basic Education, (iv) Development Oriented Adult Education, (v) Transport Rehabilitation and Maintenance, (vi) Promotion of Income Earning Opportunities, and (vii) Law and Justice.

⁷¹ =Department of Environment and Conservation (2007), National Biodiversity Strategy and Action Plan, Waigani

⁷² =Government of Papua New Guinea (2010), PNG 4th CBD Country Report 2010, DEC, Waigani

⁷³ =Department of Environment and Conservation (2008), DEC Corporate Plan 2009-2012, Waigani

⁷⁴ =Department of Environment and Conservation (2010). Environmentally Sustainable Economic Growth Strategy

A brief review is undertaken below for each of the seven EPAs, covering relevant policies and plans, major programs, and challenges. The aim of this Section is to provide a background on the socio-economic situation and infrastructure developments taking place in the country which would have a greater influence on any integrated marine policy.

1.0 Primary and Preventative Health Care

The overall policy and planning directives for the health sector is provided by the National Health Plan 2001-2010⁷⁵. Its goal is to improve the health of all PNGans through an effective and affordable health system that is easily accessible to the country's citizens. Key strategic priorities of the National Health Plan include: immunization of every child under one year old; reduction of malaria and TB; prevalence in high endemic malaria/TB areas; reduction of maternal mortality in high risk areas; and reduction of HIV and STI cases. The health sector Medium Term Expenditure Framework guides this approach by indicating the overall resource envelope available to the sector to assist the allocation of resources to these priorities⁷⁶.

It is also the Government's intention to establish four specialized regional hospitals in the country to provide specialist health services. This should see further strengthening of the public health system in the country through increased medical training and outreach programs aimed at supporting the provincial and rural hospitals and health centers.

Despite all the efforts and strategies in place to combat primary and preventative health care problems, key health indicators reported in the Annual Health Sector Review show little or no improvement in the country's health status over the past decade. In 2008 only 37 per cent of all deliveries were supervised (including by Village Birth Attendants) - a major contributor to PNG's high maternal and infant mortality rate. The 2006 Demographic Health Survey indicates that maternal mortality is still worryingly high (estimated at 733 per 100,000 live births in 1994) and infant mortality and under-five mortality were estimated to be 77 and 100 per 1,000 live births respectively - a long way short of the localized 2015 MDG targets of 44 and 72 per 1,000 live births respectively⁷⁷.

Although immunization has improved dramatically in recent years, immunization rates still remain relatively low with only 53 per cent of children under one year old immunized against measles per year and only 68 per cent with triple antigen (third dose) per year. Combating malaria, tuberculosis (TB) and HIV/AIDS remain key areas that the health sector is targeting. In 2008, the malaria prevalence rate was 236 (per 100,000) in high malaria endemic districts and in 2007 the TB prevalence rate was 430 (per 100,000) and the HIV prevalence rate 1.61 per cent⁷⁸.

⁷⁵ =Department of Health (2000), National Health Plan (2001-2010), Port Moresby

⁷⁶ =Ibid.

⁷⁷ =Department of Health (2006), Demographic Health Survey, Port Moresby

⁷⁸ =Department of Health (2008), Annual Health Sector Review, Port Moresby

The root causes for the deterioration in health service indicators are complex and systemic. Besides lack of capacity at health facilities, much needed funding does not get to the service delivery frontline. In many provinces vital health infrastructure continues to deteriorate. The challenge remains to ensure that the required recurrent funding is available and that Government funds are adequately prioritized to ensure that the Minimum Priority Activities (operation of rural health facilities, integrated health patrols and district drug distribution) are funded and operational.

In addition, many of the issues which affect service delivery are also the result of lack of progress in other sectors, for example, the poor transport infrastructure, lack of a continuous supply of clean water and electricity, lack of telecommunications infrastructure, poor education, law and order problems and the lack of fully functioning District Treasuries in all provinces.

2.0 HIV/AIDS Prevention

HIV/AIDS epidemic is a development issue that has the potential to significantly undermine the social and economic progress of PNG. It requires coordinated and effective efforts to tackle the issue as a matter of urgency. The most recently published statistics on HIV/AIDS is from the National AIDS Council Secretariat which shows that approximately 0.92% of the adult population in PNG was living with HIV in 2009. This new estimate is lower than the previous estimate of 1.61 per cent⁷⁹.

The downward revision in estimates reflects to a large extent improvements in national disease surveillance systems with a wide coverage of the four regions in the country. The new findings also indicate that the spread of HIV epidemic in PNG may be leveling off or is it?

This latest round of estimates of HIV prevalence was carried out by a panel of national and international experts based on extensive data from antenatal clinics in PNG's Highlands, Southern, Momase, and New Guinea Islands regions.

An estimated 34 100 people in PNG were living with HIV in 2009. HIV prevalence was found to be the highest in the Highlands and Southern regions, at 1.02% and 1.17%, with lower but increasing prevalence in Momase and New Guinea Islands, at 0.63% and 0.61%. Approximately 3200 people in PNG were newly infected with HIV in 2009 and, that same year, some 1300 people died of AIDS⁸⁰.

Policy responses and strategies have been pursued since 1987. These have largely failed to curb the escalation of the HIV prevalence rate. In 2010 the Government conducted a review of the current National Strategic Plan (NSP) on HIV & AIDS (2006-2010) and used past lessons to design an appropriate strategy to stabilize and control this epidemic. In addition the Government

⁷⁹ =National AIDS Council Secretariat (2010). Papua New Guinea – 2010 Country Progress Report to UNGASS March 2010. Also available at: <http://www.nacs.org.pg>

⁸⁰ = Ibid.

finalized the National Prevention and National Leadership Strategies, which were implemented in 2010, and has start drafting the new NSP on HIV & AIDS (2011-2015) in 2010.

The strategic framework under the current NSP on HIV & AIDS focuses on seven main areas for intervention: treatment, counseling, care & support; education and prevention; epidemiology and surveillance; social and behavioral change research, leadership, partnership and coordination; family and community support; and monitoring and evaluation. Other policy responses include the National Gender policy and Plan on HIV and AIDS 2006-2010, which has been developed to guide efforts to integrate gender issues into the response, and integration of HIV/AIDS into sector specific plans. In addition, the support in provision of treatment continued in 2009, with the number of anti-retroviral treatment (ART) sites having increased from 2 in 2004 to 38 in December 2007⁸¹.

Government funding and donor assistance from the UN, ADB, AusAID, NZAID, USAID, Clinton Foundation, and the Global Fund, continues to support the implementation of the national response to HIV/AIDS. In 2010, the Government's National HIV/AIDS program included allocation of grants to Provincial AIDS Committees and grants to stakeholder organizations such as NGOs and faith based organizations to implement activities under the NSP.

3.0 Basic Education

To substantially improve access to basic education in the country the Department of Education, has formulated the National Education Plan 2005–2014, with the overall objectives of achieving Universal Basic Education (UBE), which is Goal 2 of the MDGs⁸². UBE remains the central pillar which guides education reforms in PNG. Under this objective, the Government aims to provide the opportunity for all children to complete eight years of basic education.

The national MDG targets for PNG, as stated in the MTDS, is to achieve a gross enrollment rate of 85 per cent and a cohort retention rate of 70 per cent at primary level by 2015 and to achieve an (indirectly measured) youth literacy rate of 70 per cent by 2015. If current trends continue, the enrollment and retention targets are unlikely to be met. In addition, while progress has been made in improving gross enrollment rates, the completion rate still remains under 50 per cent. Low retention rates are often due to affordability, lack of infrastructure, and absence of teachers and curriculum materials. Furthermore, the lower enrollment rates of girls relative to boys, remains an issue to be addressed by the Government. These indicators, however, do not show the large disparities in enrollment and educational standards between the provinces⁸³.

⁸¹ = Ibid

⁸² = Department of Education (2004), National Education Plan 2005-2014, Port Moresby

⁸³ =Ibid

Furthermore, the gross enrollment rate is a basic measure of access to education as it includes those enrolled irrespective of age, which can be problematic in a country such as PNG where many students enrolled are outside the school age range. The National Net Enrollment rate (NER) is a more precise indicator for assessing the level of participation in basic education. The NER from grade one to grade eight is estimated to be only 53 per cent. The Government is committed to increasing the NER to 70 per cent by 2015 and is working in partnership with the Australian Government to achieve this target⁸⁴.

In addition, to ensuring that enrollment and completion rates increase, a further challenge is to ensure that the quality of education also improves significantly. Class sizes have been increasing since 2001 in both Grade 1 and Grade 8 and the number of visits of school inspectors have been decreasing. Performance monitoring plays a vital role in improving the quality of schooling and measures need to be taken to improve this and other factors relating to the quality of education.

There are considerable challenges associated with the expansion of the education system. Furthermore, high population growth rates put additional pressure on the limited resources in the education sector. Both the capital cost of additional school facilities and the recurrent costs of additional teachers and school materials will be significant. Secondly, the management of an expanded education system, in particular at lower levels of Government, requires an increase in the capacity of the relevant authorities. In addition, insufficient teachers in the rural districts and communities remain an important unresolved issue. In particular, making progress towards higher enrollment rates, ensuring that children in very remote areas of the country are able to have access to a quality education system remains a critical challenge.

In response to these challenges, the Government must recognize the need for large increases in both recurrent and development expenditure, because to improve access to basic education, high subsidies for school fees are required. In addition, the Department of Education must address the issues of the need to improve teacher training, distribution of curriculum and education materials, monitoring of curriculum standards and the production and delivery of reform examination and assessment materials.

4.0 Development Oriented Adult Education

A literate and numerate population plays a fundamental role in addressing poverty levels and social development. According to the Department of Education statistics, PNG's (indirectly measured) youth literacy rate is 61.7 per cent and adult literacy is 49.2 per cent⁸⁵. The MTDS recognizes the importance of the Government intervention to address this and as such has included development oriented adult education as one of the seven expenditure priority areas

⁸⁴ =National Education Board (2008). Annual Report-2008, Policy, Planning & Research Division, Dept. of Education, Waigani. Also available at: <http://www.education.gov.pg/>

⁸⁵ =Department of Education (2008). State of Education Report, May 2008, Port Moresby. Also available at: <http://www.education.gov.pg/>

(EPAs). Despite its status as an EPA, the absence of a clearly defined policy on adult education and the clear delineation of responsibility for which agency of Government should coordinate the sector's response remains unresolved.

Furthermore, there is no clear way that assesses in which areas (economic or geographical) adult education should be focused.

The Government is attempting to address the shortage of skills in the adult population through a number of initiatives. These include interventions in the formal education sector targeting access, completion rates and quality of education, but also by creating informal learning opportunities. Improving vocational training increases the level of skills required by the workforce, which are currently lacking in a number of key sectors. The Department of Education is targeting technical and vocational education through the National Education Plan 2005 – 2014 as a means of absorbing school drop-outs, who often become unemployed or underemployed.

Recognizing the capacity problems within the public service, the Government is now seeking to build partnerships with civil society organizations like churches, NGOs and the private sector to deliver services in this sector⁸⁶. This policy shift is consistent with one of the underlying principles of the MTDS, which is to forge strategic alliances with relevant stakeholders. The Church-State Partnership, signed in October 2008, addresses these issues and the Government is currently working towards a more formal partnership with NGOs too, which may improve assistance in this area.

5.0 Transport Rehabilitation and Maintenance

Transport infrastructure remains a very critical component to the economic and social development of PNG. Improved transport infrastructure will improve access to markets and improve the flow of essential goods and services (including basic services such as health, education and law and order) to both rural and urban communities. However, the state of transport infrastructure in the country is poor and is deteriorating rapidly. Inadequate maintenance of infrastructure has led to cycles in which the major infrastructure is built, deteriorates and subsequently requires large amounts of funding to be rehabilitated, only to fall into a state of deterioration again. This is the case for all three forms of transport (land, air and water).

Transport maintenance and rehabilitation remains the highest funded MTDS expenditure priority area (EPA), being the EPA with the highest grant funding and receiving the majority of concessional loans. This relative funding allocation is justified through the Development Budget Strategy in which investment in transport maintenance and rehabilitation has the largest spillover effects on to other EPAs⁸⁷.

⁸⁶ =Ibid

⁸⁷ =Ibid

However, even with higher funding allocation under the Development Budget, funding falls short of the major capital investments required in all three sub-sectors – land, air and water. Exacerbating the situation is the poor prioritization of funding within the transport sector, leading to lower funding for priorities in the National Transport Development Plan (2006-2010)⁸⁸.

The National Transport Development Plan (2006-2010) continues to guide the prioritization of resources in the transport sector. It identifies 16 priority national roads, which are of the greatest economic and social importance to the country. However, not only have funds been spread too thinly within the priority areas, but they have also been spent across non-priority areas. The Department of Transport has formulated a new National Transport Strategy (2010-2030), which will be implemented through five year Medium Term Transport Plans (MTTPs). These plans will target maintenance and rehabilitation of priority transport infrastructure, assess future transport sector needs and build the capacity to implement Government's policies in the sector⁸⁹.

Aside from the level and allocation of funding, other constraints exist in the sector. The capacity of the private sector remains an important issue. Delays in procurement and approval process of Government, lack of qualified engineers and technical staff, and security issues continue to plague the sector. In addition, landowner issues, including compensation claims, are major obstacles to improving the country's road infrastructure.

Improvements of the capacity in the public sector are also critical. The Government's Transport Sector Coordination Monitoring and Implementation Committee (TSCMIC) continue to coordinate the agencies and donors in the sector to address these issues.

One method of procurement that can address some of the above constraints is the use of Public Private Partnerships (PPPs) in the transport sector. As stated in the National PPP Policy, using PPPs for major infrastructure can raise the capital for large investment projects; improve commitment towards funding the maintenance requirements of infrastructure, and benefit from private sector expertise.

Under the Road Asset Management System (RAMS), annual data is recorded on the national road network with each 10 kilometers stretch of road classified as either; good, fair or poor. The proportion of national roads in good condition has been improving each year from 2003 to 2008. The condition of the 16 priority roads nominated in the National Transport Development Plan (NTDP) 2006 – 2010 has been improving in recent years with 29 per cent in good condition in 2008. Under the PNG-Australia Partnership for Development, the Government is committed to obtaining targets of 45 per cent (1,857 km) of the 16 National Priority roads in good condition in 2010⁹⁰.

⁸⁸ =Department of Transport (2005), National Transport Development Plan (2006-2010), Port Moresby

⁸⁹ =Department of Transport (2010), National Transport Strategy 2010-2030, Port Moresby

⁹⁰ =Transport Sector News February 2008, Issue 1 Also available at: <http://www.pgtssp.com/>

The Civil Aviation Authority (CAA) has succeeded in having 7 of the 22 regional airports fully certified by October 2009. The Government has set itself a target of ensuring 17 airports are compliant with airport certification standards by the end of 2010 and 22 by 2011. PNG Ports Corporation has increased its maintenance activities on the existing Lae wharf.

The PNG-Australia Partnership for Development recognizes the need to improve transport infrastructure. The Partnership Schedule for Transport Infrastructure focuses primarily on maintaining and rehabilitating the road infrastructure with a more limited support to the aviation and maritime sectors. In 2010, AusAID will continue its Transport Sector Support Programme (TSSP), which targets road maintenance and rehabilitation as well as some funds towards airport certification and maintenance⁹¹. In addition, other donors, including World Bank and JICA continue their loan and grant financing, respectively, in the road sub-sector.

Concessional loan funding is being sourced from the ADB to fund Lae Port Development and negotiations are under way to seek funding for the Civil Aviation Development and Improvement Program (CADIP) under an ADB multi tranche financing facility. As in the road transport sub-sector, airport infrastructure has lacked adequate preventative maintenance and the sector has suffered from a lack of funding. Ensuring that all airports provide a safe and secure operating environment is a legal requirement under the *Civil Aviation Act 2000* and a top priority of the Government and the new CADIP will need to address this concern⁹².

6.0 Promotion of Income Earning Opportunities

Despite high economic growth indicators in recent years, many PNGs have not had the opportunity to earn sufficient income to alleviate them from poverty. Indications of this can be seen by comparing the low education and health indicators to those in other Small Island Developing States (SIDS) in the Pacific. The challenge for the Government is to take effective policy measures to ensure that the majority of the rural population who have limited means of participating in the cash economy, can benefit through improved Government services and also through creating their own wealth and becoming a productive member of the workforce.

The Promotion of Income Earning Opportunities is one of the seven expenditure priority areas (EPAs) under the MTDS and the Government is committed to making deliberate policy interventions to provide opportunities in both the formal and the informal sector. Impediments to the existence of income earning opportunities include; low levels of literacy, lack of skills, poor transport infrastructure, lack of banking and postal services and poor telecommunications. Poor health and law and justice services also exacerbate the obstacles. Thus addressing many of the other EPAs will improve the opportunities for the majority of PNGans to earn an income.

⁹¹ = Ibid

⁹² =Asian Development Bank (2009). Proposed Multitranchise Financing Facility Papua New Guinea: Civil Aviation Development Investment Programme, Project Number: 43141, October 2009.

Deliberate interventions to promote income earning opportunities amongst disadvantaged groups are likely to decrease inequality and poverty levels.

These include not only building up vocational and technical skills and providing training in basic business skills, encouraging the expansion of formal sector employment, but also promoting informal activities by improving access to markets and access to credit facilities.

The Government has recognized that the private sector is a key driver of economic growth and employment. The promotion of private sector growth is currently being addressed by the Government through development of the Private Sector Growth Strategy. Obstacles to private sector growth include cumbersome regulations and procedures, security issues and enforcing contracts. Poor public infrastructure also contributes to the high cost of doing business in PNG. Continued legislative reforms and policy initiatives to address these obstacles are essential⁹³.

While encouraging Small Medium Enterprises (SMEs) and improving employment opportunities in the formal sector is necessary, many PNGans depend on income from the informal rather than from the formal sector. With the formulation of the Informal Sector Policy in 2009, there will be an improved coordination and strategic direction to address the issues in the informal sector and improve opportunities for income creation in the informal sector⁹⁴.

7.0 Law and Justice

An effective and fair law and justice system is a critical prerequisite for social and economic development in PNG. The poor access to justice services, corruption, violence, lack of security and inefficient legal systems not only undermine basic human rights, but also pose a major impediment to economic development. The current high levels of crime and violence reduce the quality of life of people in both rural and urban areas.

The law and order situation is costly to both individual communities and the nation as a whole, because it undermines access to basic goods and services and impedes economic growth. The poor law and order situation often results in local disputes leading to the destruction of assets within a community, such as aid posts and schools, and prevent children from attending school. Criminal activities also discourage business enterprises and investment, thus hindering economic growth. For these reasons, the MTDS identifies law and justice as being an expenditure priority area of Government.

The law and justice sector requires effective coordination to address these challenges. The sector is responsible for a range of functions, including land dispute resolution, investigation of corruption, policing, judiciary and the courts, training lawyers, providing legal advice and correctional services. All these responsibilities must be functional for the system to operate effectively as a whole. In response, the Government has adopted a sector wide approach for the

⁹³ = Ibid

⁹⁴ = Department of Community Development (2009). Informal Sector Policy, NEC Decision, Waigani

law and justice sector, which aims to increase the coordination of procedures, activities and funding of all the relevant agencies. In addition, this approach has increased Government ownership of policies and provided a clear direction and sense of unity for the sector. For the above reasons, a sector wide approach is also appropriate to ensure efficient resource distribution in the sector

Through the sector wide approach, the law and justice sector has developed a National Law and Justice Policy and Plan of Action (2000), which together with the White Paper on Law and Justice in PNG, sets the strategic direction for the sector⁹⁵. The policy has three pillars: (i) improved functioning of the formal law and justice system; (ii) improved sectoral coordination and resource use; and (iii) increased focus on crime prevention and restorative justice. For the latter pillar, the policy recognizes the importance of approaches based upon culture and traditions of PNG communities, such as mediation, alternative dispute resolution and village courts.

The implementation of this policy is through the Sector Strategy Framework (SSF), which has the overall goal of ensuring ‘a just, safe and secure society for all’. The SSF focuses on five key areas: (i) improved policing, safety and crime prevention; (ii) improved access to justice and results; (iii) improved reconciliation, reintegration and deterrence; (iv) improved accountability and reduced corruption; and Improved ability to provide law and justice services⁹⁶.

To implement the SSF, the formal principal law and justice agencies work with civil society through the Community Justice Liaison Unit (CJLU)⁹⁷. The CJLU aims to improve the capacity of Government agencies to work with civil society at both the national and the provincial level. The sector targets people in the community to strengthen local level systems of restorative justice and crime prevention. The National Coordinating Mechanism leads the promotion of the Law and Justice Policy and the SSF, including in policy and budget matters and provides oversight and direction.

E. CONCLUSIONS

The need for economic prosperity is eminent in PNG as seen from the Governments development agendas; however the Government as the custodian of the natural resources also recognizes the importance of maintaining a balance with environmental and livelihood needs. The marine environment is an important ecosystem that is greatly influenced by both land and sea based activities of economic importance discussed in previous sections. Therefore, the integrated marine policy approach is a refinement to the government’s commitment to environmental sustainability and ecosystem-based management approach.

The country also face challenges like low educational and health indicators, escalating law and order problems, high poverty, limited access to clean water, and poor housing conditions are still

⁹⁵ =PNG Law and Justice Sector. Also available at www.lawandjustice.gov.pg

⁹⁶ =Ibid

⁹⁷ =Ibid

important livelihood issues in PNG despite high economic growth indicators. Thus, the integrated marine policy must take into consideration livelihood issues from the onset of any implementation strategies to address some of these issues where possible in all sectors. Two important areas where an integrated management approach can play an important role in are providing and sustaining income earning opportunities and food security issues.

PART TWO

STATUS OF THE MARINE ENVIRONMENT IN PAPUA NEW GUINEA

In PNG a country with extensive and highly productive marine ecosystems, very few nationwide assessments of the marine habitats, flora and fauna have been documented. Much of our current understanding of the marine environment is a result of research contributions by the UPNG, DEC, NGOs and individual researchers.

However, there is no comprehensively collated documentation published for the entire country covering; habitat types and species status and their distribution. This information is not only very important to different areas in PNG for the continued productivity of near shore waters, or to the maintenance of their important biological diversity, but also the basis of regional marine planning process.

A broad overview of the marine habitats and species important to conservation, fisheries and livelihood in PNG is presented here to highlight the significance of an integrated management approach. Towards the end of this section I will identify marine priority areas in PNG within large marine ecosystem that merit the regional planning and management approach.

1.0 OVERVIEW OF COASTAL MARINE ENVIRONMENT

The island of New Guinea was formed at the collision point between the Pacific and Australian plates⁹⁸. The mainland land forms three distinct geological provinces:

- (i) southern plains and lowlands represents essentially Australian shelf areas, variously uplifted and covered by deposition of erosional products;
- (ii) the central ranges which reach over 4000m and have a mixed geology including volcanic, metamorphic, and sedimentary facies;
- (iii) the intermontane trough which is a young, structural depression of extensive plains and swamps (Sepik Plains) that separates the central cordillera from the northern coastal mountains such as the Saruwaged and Finisterre ranges in the Huon Peninsula, Morobe Province.

PNG is engulfed by 3 major water bodies – the Bismarck Sea, the Solomon Sea, and the Coral Sea covering a total area of 3,120,000 km² and a coastline of 17, 000 km (Figure 3).

Surrounding the Bismarck Sea are seven large islands and numerous smaller ones that can be structurally divided into island arcs: the southern arc includes New Britain (36, 520 km²) and the chain of volcanic islands off the north coast of the mainland; the northern arc consists of New Ireland (8650 km²), Lavongai (New Hanover, 1190 km²), the St. Mathias Group (of which Mussau is the largest, 400 km²), and the Admiralty Group which includes

⁹⁸ =Loffler, E. (1977). Geomorphology of Papua New Guinea. CSIRO & The Australian National University Press, Canberra, Australia.

Manus (1640 km²). Along the northern side of the islands in the southern arc lie active or potentially active volcanoes, including, Manam, Bam, Karkar, Bagabag, Long Island, Pago, Langila, Ulawun, and Bamus. To the southeast of New Britain, in the northern section of the Solomon Sea, lies the New Britain trench which reaches a depth of 6400m. Geologically, the northern arc represents an extension of the Solomon Islands chain, and included within the political boundaries of PNG are the large island of Bougainville (10,619 km²) and its smaller, northern outlier, Buka (829 km²)⁹⁹.

The Solomon and Coral seas are isolated somewhat from the main Pacific Basin, lying to the southwest of the major island arc of the Solomons. The Bismarck Sea is less isolated from the influence of the Pacific Basin, lying in the path of the equatorial current.

Off the southern tip of New Guinea in the Solomon Sea lie the island archipelagos of the Louisiades (approximately 1200 km²), D'Entrecasteaux (approximately 3000 km²), and Trobriand Islands (440 km²). The Trobriands consist of raised limestone (reef platforms) with flat or undulating surfaces and karstic features, while the other two groups include volcanic and land bridge islands separated from the mainland during the Pleistocene transgression. Among the 600 or so smaller islands within the country are representatives of virtually all oceanic island types found in the Pacific¹⁰⁰.

To the south, around 142° west, lies the Torres Strait, with coral reef and seagrass communities that form a northern extension of the Australian Great Barrier Reef System. Separating this from the Papuan Barrier Reef system to the east is the mangrove fringed Gulf of Papua, an area of extensive mangrove swamps and wetlands. The large Papuan Barrier system parallels the southern coastline two to twelve kilometers offshore beginning west of Port Moresby and continuing eastwards, where it becomes sunken, eventually forming discontinuous patch reefs in the southern Milne Bay Province¹⁰¹.

⁹⁹ = Dahl, A.L. (1986). Review of the protected areas system in Oceania (including Oceania island list). International Union for Conservation of Nature and Natural Resources, Gland and Cambridge. 239pp.

¹⁰⁰ = Ibid

¹⁰¹ = Ibid

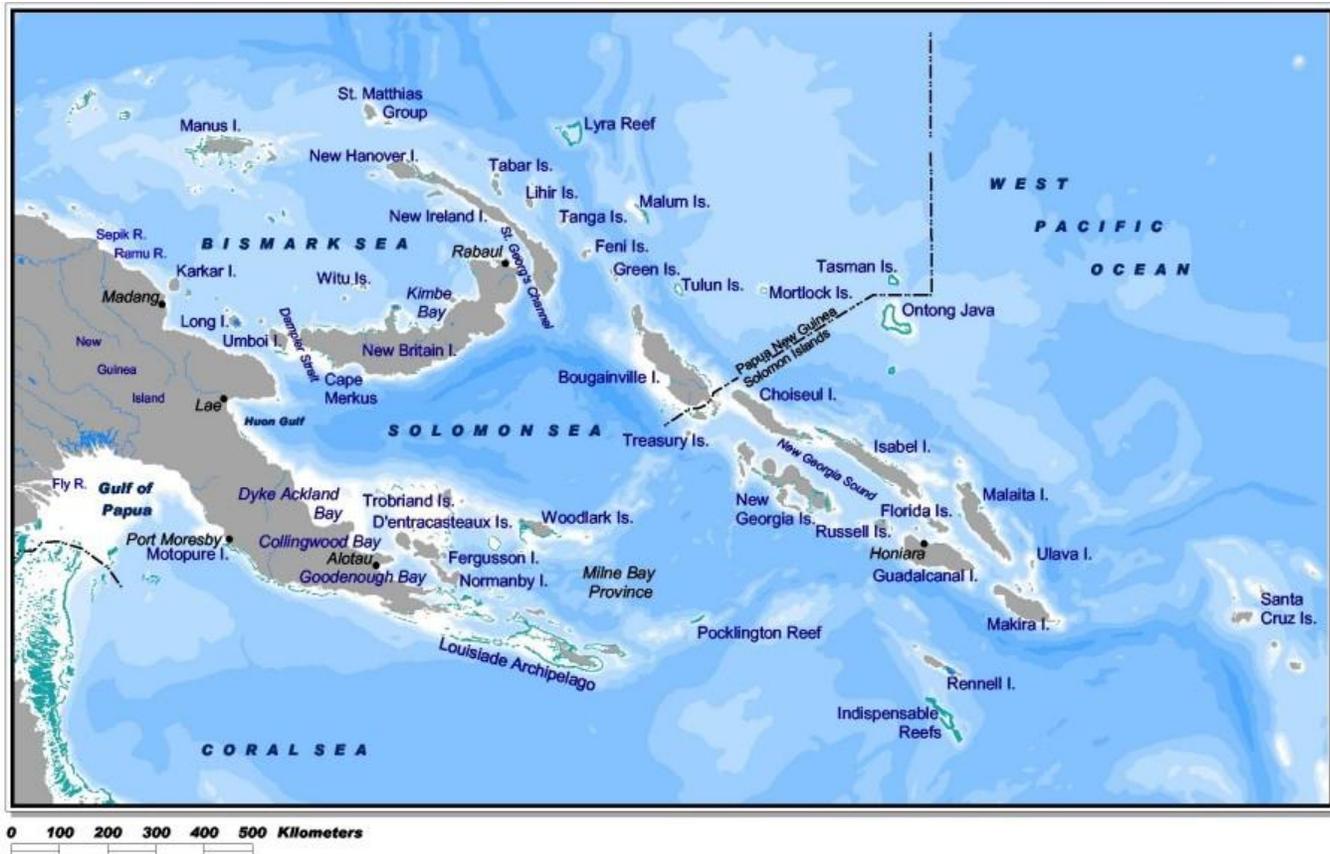


Figure 3. Location of islands, coasts lines and seas in PNG (Source: Green and Mous 2008).

The southern coastline is sinking while; in contrast the northern mainland coast is subjected to active uplift. Hence, cliffed areas and large areas of raised coral reef terraces are a common feature of the northern coastline, particularly in the area of the Huon Peninsula. Along the northern coast, isolated mangrove swamps occur in the vicinity of the Sepik, Ramu and Markham river mouths, and on sheltered shores in the East and West Sepik, Morobe, Madang and Oro provinces. Patch reefs, shoals, lagoon reefs, platform reefs, atolls, and fringing reefs occur in discontinuous patterns along the north coast and around islands. Physically, the south coast of the mainland, with its relatively shallow waters and extensive reef systems, is considered by some a physically protected marine environment¹⁰². The north mainland and offshore island coasts are closer to deep waters offshore and, lacking the protection of barrier reef systems, are subject to strong effects from east coast swells.

2.0 DISTRIBUTION OF MAJOR COASTAL AND MARINE HABITATS TYPES

Major habitat types in PNG coastal areas include fringing, barrier, and patch reefs; mangrove forests; seagrass meadows; sand and mud-accreting shorelines and intertidal flats; barrier dunes

¹⁰² = Sullivan, M.E (1991). The Changing Climate in Paradise: Feasibility Study on Climate Monitoring and Impacts in the South West Pacific, Bureau of Meteorology, 145pg

and associated lagoons; deltaic floodplains and major estuarine areas; sea mounts; hydrothermal vents; rocky shorelines; and reef walls or drop off areas of the continental slope.

Summaries of the biology of the some important coastal and shallow water habitats and their general locations are provided below.

2.1 Coral Reefs

PNG has a total reef area of approximately 40,000 sq. km¹⁰³. In the Torres Strait region immediately to the south of PNG, the southern reefs extend up to the south edge of the Orman platform reef¹⁰⁴. The extensive Warrior reefs lie to the east of the Torres Strait axis, running north-south. Farther to the east, the great combination of freshwater and sediment influxes from the Fly, Purari, and other rivers precludes reef development. Two hundred kilometers from land in the Gulf of Papua, however, the Porklock and Boot reefs, and farther offshore, Osprey Reef atoll, mark an area outside the sediment shadow of the greater Fly deltaic system. Farther eastwards, the Eastern Fields patch reefs lie between the Gulf of Papua proper and the Coral Sea¹⁰⁵.

Coral reefs begin again off the southern coast to the west of Port Moresby at Yule Island, some 200 km southeast of the Purari delta. This extensive southern Papuan Barrier Reef runs eastwards until it forms a series of discontinuous, easterly trending reefs. The barrier system extends for approximately 400 km to the eastern tip of the mainland near Samarai and beyond to the Louisiade Archipelago¹⁰⁶.

Small regions of fringing reefs occur on the coast behind the main barrier reef and around the offshore islands, while discrete patch reefs and shoals are scattered in the barrier lagoon areas. At the edge of the continental shelf in the vicinity of the Louisiade Islands, the reef system weaves its way around many of the islands, forming two substantial lagoon areas at Long Reef and Bramble Haven¹⁰⁷. Separated from this Louisiade system by deep water to the north, a barrier reef surrounds Woodlark Island and an atoll occurs at Egum. Abyssal depth of some 10,000 m separates these reef areas from the Bismarck Archipelago to the north.

The profuse development of coral on the southeast coast of New Guinea stops at the narrow peninsula leading to the East Cape; thereafter, around the mainland, the reefs occur only as small fringing or patch reefs¹⁰⁸. The shoal ground around Hall Point and Dyke Acland Bay extends out for 100 km. Another area of shoal grounds extends beyond Goodenough Bay and the D'Entrecasteaux Islands to the Trobriands. Thus the coral reefs to the south of the Huon Gulf are limited to the areas far enough offshore to escape the nutrient loading delivered from the extensive river systems draining north. Diverse and abundant reefs occur in patches farther

¹⁰³ =Frielink, A.B.J (1983). Coastal Fisheries in Papua New Guinea, the current situation. Research Report 83-10. Department of Primary Industry, Papua New Guinea, Port Moresby.

¹⁰⁴ =Whitehouse, F.W (1973). Coral Reefs of the New Guinea region. In Biology and Geology of Coral Reefs, Vol.1: Geology1 (O.A. Jones&R.Endean.eds).pp. 169-186. Academic Press, New York.

¹⁰⁵ =Ibid

¹⁰⁶ =Ibid

¹⁰⁷ =Ibid

¹⁰⁸ =Ibid

along the north coast, near Madang and elsewhere outside the area influenced by sediment from the Sepik and Ramu rivers.

Reefs exist around the islands of the Bismarck Archipelago, including New Britain, and appear to be more abundant and diverse on the north side of this archipelago than on the south. Around the islands of New Ireland and Bougainville, fringing and incipient barrier reefs are found¹⁰⁹.

2.2 Mangroves

Some of the most extensive pristine mangroves areas in the world are found along the south coast of New Guinea (Figure 3). Early work by Percival and Womersley (1975) record some 37 species, while Johnstone and Frodin (1982) later recorded 32 commonly occurring species from PNG mangrove communities. The official known number of mangrove species is 33 with 2 hybrids¹¹⁰.

Distinct zonation characterizes this habitat, with zones tending to be wider in areas of accretion such as the Purari delta. In coastal areas with low sediment inputs or areas exposed to high wave action, zonation tends to be narrower and the mangrove forest itself is reduced to a thin coastal fringe. Small stands of mangroves, one or two trees thick, maybe found on coral coastlines and rocky exposed offshore islands. The best studied mangrove systems are those of the Purari delta. The south coast mangrove system is distinctive, containing nine species not found on the north coast where the mangrove flora resembles a more generalized Indo-Pacific community¹¹¹.

Zonation is controlled by salinity, tidal range, sediment inputs, and degree of exposure. *Avicennia* forms a narrow seaward fringe in stable locations, being replaced by *Rhizophora* in more exposed sites. At above one meter above mean sea level *Rhizophora* gives way to *Bruguiera*, and on the landward side maybe found a *Ceriops* thicket. In protected areas a seaward zone of *Sonneratia alba* maybe found on deep, young, unconsolidated substrates, while along river courses in brackish areas this species is replaced by *Sonneratia caseolaris*. The *Rhizophora* zone is characterized by *R. mucronata* in some saline areas, being gradually replaced by *R. apiculata* as salinity drops. The *Bruguiera* forest often includes *Heritiera litoralis* and *Xylocarpus spp.* Monospecific stands of *Nipa fruticans* occur along tidal streams flooded by high spring tides, thriving in brackish water environments.

2.3 Seagrass Beds

The seagrass communities occur in soft-bottom areas outside the extremely muddy delta regions of the great rivers. In areas of significant turbidity, seagrasses are restricted to shallow waters¹¹². The sea grass beds provide feeding and nursery grounds for many marine species, including the dugongs and turtles.

¹⁰⁹ =Ibid

¹¹⁰ =SPREP (1999). Regional Wetlands Action Plan for the Pacific Islands, Quality Print Ltd, Suva, Fiji

¹¹¹ =Johnstone, I.M and Frodin, DG (1982). Mangroves of the Papuan Subregion. In: J.L Gressitt; (editor), Biogeography and Ecology of New Guinea, Dr. W Junk, The Hague. Pp.513-528

¹¹² =Poiner, I. R., Staples, D. J., and Kenyon, R. (1987). Seagrass communities of the Gulf of Carpentaria, Australia. *Australian Journal of Marine and Freshwater Research* 38, 121-31.

The Torres Strait region has at least 12 species of seagrasses, representing 22% of the taxonomically described seagrass species¹¹³. Twelve species are also recorded from the Papuan Lagoon with ten species occurring in seagrass meadows in Bootless Inlet¹¹⁴. Heijs and Brouns (1987) surveyed seagrass communities in four locations around the Bismarck Sea, identifying ten species of seagrass from Wewak, Manus and Kavieng, and eight from Rabaul (11 species total). No significant differences were found in the distribution and relative abundance of the seven most common seagrass species around the Bismarck Sea and in the Papuan Lagoon. The four species that were observed only occasionally apparently have more restricted distributions or specific habitat requirements than the common species. *Halophila spinulosa*, recorded from the Papuan Lagoon¹¹⁵, was not recorded from the Bismarck Sea. Although systematic surveys have not been published for all areas of PNG's waters, it is likely that seagrass diversity around the mainland is similar to that of the areas studied to date. Data for species diversity in the Indo-West Pacific are as follows:

Site	Number of Species	Reference
Torres Strait & Gulf of Carpentaria	12	Poiner et al. 1987
Papua New Guinea	10-14	Johnstone 1979, 1982
Papuan Lagoon	12	Brouns&Heijs 1985
Bootless Inlet	10	Brouns&Heijs 1985
Wewak	10	Heijs&Brouns 1986
Manus	10	Heijs&Brouns 1986
Kavieng	10	Heijs&Brouns 1986
Rabaul	8	Heijs&Brouns 1986

(Source: Compiled by author)

With the exception of the pantropical *Halophila decipiens*, all the species are restricted to the Indo-Pacific region.

In the Gulf of Carpentaria, three quarters of the 906 km² of seagrass habitat occur along open coastlines¹¹⁶. Elsewhere throughout the region, seagrass meadows are frequently associated with lagoon areas in the vicinity of reefs. Individual species distributions are influenced by water depth and tidal range¹¹⁷.

2.4 Barrier Beaches/Lagoons

¹¹³ = Bridges, K. W., Phillips, R. C., and Young, P. C. (1982). Patterns of some seagrass distributions in the Torres Strait, Queensland. *Australian Journal of Marine and Freshwater Research* 33, 273-83

¹¹⁴ = Brouns, J.W.M. &Heijs, F.M.L (1985). Tropical seagrass systems in Papua New Guinea. A general account of the environment, marine flora and fauna. In Proceedings of the KoninklijkeNederlandseAkademie van Wetenschappen C88, 145-182

¹¹⁵ = Johnstone, I.M (1982). Ecology and Distribution of seagrasses.,Gressit (ed.) Biogeography and Ecology of Papua New Guinea. Dr. W. Junk, The Hague. Pp. 513-528

¹¹⁶ = Ibid

¹¹⁷ = Ibid

These habitats occur in association with deltaic floodplains or as smaller and more restricted landforms in areas of alluvial deposition. In PNG, beach ridges are generally of Holocene age¹¹⁸. Extensive areas of coastal dunes are rare in PNG, primarily because of low wind conditions, high soil moisture content, and dense vegetation¹¹⁹. However, at Hood Lagoon coastal dunes cover more than ten square kilometers, and extensive dunes may be found on the Aroma Coast¹²⁰. An extensive freshwater lagoon, or swamp, formed by the impoundment of river water through closure of an extensive barrier beach ridge, occurs in the Murik Lakes area of the East Sepik Province and in Pomio, East New Britain.

2.5 Deltaic Floodplains

Floodplains and subaqueous mud flat systems occur at the mouths of the major river systems around the Gulf of Papua, and at the mouths of the Sepik and Ramu rivers on the north coast¹²¹. Of the two largest southern rivers, the Fly is tidal some 240 km inland while the Purari has a river dominated estuary which contributes significant volumes of sediment through offshore drift to the tidally dominated estuaries of the Kikori and neighboring small rivers.

On the Southern mainland, coastal swamp forest and deltaic floodplains occupy over 50% of the coastline, much of it colonized by mangrove. On the north coast and around major offshore islands, floodplains occupy only 5%-10% of the coast line¹²². The Sepik floodplain is up to 80 km wide, while the final 250 km of the Ramu have an imperceptible decline.

2.6 Rocky Shorelines

Rocky shorelines exist in areas far from alluvial deposits on mainland and offshore island areas. Such habitats are comprised of coral limestone, and intrusive, volcanic, and metasediment rock types¹²³. Fringing reefs are found in association with rocky shorelines, primarily because these areas are distant from sediment-laden deltas. Approximately 40% of the mainland shoreline has rocky features¹²⁴.

2.7 Sea Mounts

Little documentation on the existence of sea mounts in PNG waters is available. Sea mounts are volcanic underwater “mountains,” thought to play an important role in pelagic fish predation and breeding, and also considered to be an overlooked, highly diverse feature of marine systems.

2.8 Sea Walls

¹¹⁸=Ibid

¹¹⁹=Ibid.

¹²⁰=Ibid

¹²¹=Percival, M and Womersley, J.S (1975). Floristics and Ecology of the mangrove vegetation of Papua New Guinea, Botany Bulletin No.8, Papua New Guinea National Herbarium, Dept. of Forest

¹²²=Ibid

¹²³=Ibid

¹²⁴=Ibid

Sea mounts, sea wall and continental steep slope areas are often highly diverse, reflecting strong vertical zonation. Also thought to be important is the role such that physically steep slopes play in prey concentration for pelagic fish species. The steep slope of the continental shelf drops of PNG can be mapped using bathymetry data. However, their ecological communities and role in biodiversity cannot be elucidated.

2.9 Hydrothermal vents

The Manus Basin located in the Bismarck Sea is the famous area known to have active hydrothermal vents from research conducted¹²⁵. A variety of organisms are known to inhabit these vent sites. Some of these include the dominant snails of *Alviniconcha spp* and *Ifremaria nautilei* and barnacles of *Eochionelasmus spp* which form a distinct zonation pattern due to certain environmental gradients around a host vent¹²⁶.

Organisms such as crabs, shrimps, squat lobsters, and polychaete worms utilize the zonation on these vents as habitat¹²⁷. A species of the tubeworm *Alaysia* and two species of *Alviniconcha* are new-to-science¹²⁸ while a mussel *Bathymodiolus manusensis* is known only from the Manus Basin¹²⁹.

Fish species reported around the vent sites include cartilaginous *Chimaera spp* and the blobfish *Psychrolutes marcidus*¹³⁰. Stalked barnacles *Vulcanole pasparensis*, carnivorous sponges of *Abyssocladia spp*, and corals of *Keratoisis spp* are among the characteristic organisms of inactive hard surfaces away from vent sites¹³¹. Overall, Manus Basin organism densities are reported to be lower in comparison to other vent sites worldwide¹³², however they offer the opportunity for further bio-geographical studies on faunal exchange among western Pacific hydrothermal vents¹³³.

2.10 Low and Raised Coral Islands

¹²⁵ =Galkin, S.V. (1997). Megafauna associated with Hydrothermal Vents in the Manus Back-arc Basin (Bismarck Sea). *Marine Geology* 142 (1997): 197-206; Van Dover, C.L (2000) *The Ecology of Deep- Sea Hydrothermal Vents*. Princeton UP, 2000; Collins, P., Carol Logan, Martha Mungkaje, Rebecca Jones, Katie Yang, and Cindy Lee Van Dover (2007). *Characterization and Comparison of Macrofauna at Inactive and Active Sulphide Mounds at Solwara I and South Su (Manus Basin)*. Duke University Marine Laboratory, Beaufort, NC, USA.

¹²⁶ =Nautilus Minerals (2008). *Environment Impact Statement Volume A: Solwara 1 Project*. Available at: <http://www.cares.nautilusminerals.com>

¹²⁷ =Ibid

¹²⁸ =Johns, S.M., C.J.Yeats, R.M.Hough, R.A.Binns and G.W.Rouse (2007). *Baseline Environmental Study, Eastern Manus Basin, Papua New Guinea: Module 3*. Ms. Submitted to Nautilus Minerals Niugini, Ltd, Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) Exploration and Mining, North Ryde, New South Wales.

¹²⁹ =Ibid

¹³⁰ =Ibid

¹³¹ =Ibid

¹³² =Ibid

¹³³ =Ibid

Several hundred low islands exist in PNG waters, more than 200 of which exceed two square kilometers in area. Most of the latter groups are permanently or seasonally inhabited. Motus are formed from accumulations of sand- and gravel-sized coral rubble built up on reef platforms¹³⁴. In general, the vegetation consists of a typical Pacific strand line association of salt tolerant plants.

Raised coral islands and high islands are formed on sedimentary, volcanic, and metamorphic rock, and are one order of magnitude less abundant than are the low islands. Limestone islands have a more diverse flora than motus, but forest formations are normally more diverse and well developed on high islands of more diverse geology.

3.0 DISTRIBUTION AND STATUS OF SPECIES IMPORTANT TO CONSERVATION

Due to the extensive subsistence use in PNG of many marine resources, and in particular a number of the species listed below; their present population status may be linked more closely with the size of neighboring human populations and, hence, exploitation rates, rather than with broader environmental quality.

3.1 Sea Turtles

Sea turtles are useful indicators of some types of marine environmental change, particularly since they require a string of different intact habitats for survival. Although most marine species require such a network of habitats, sea turtles belong to a limited group of marine organisms with a life history linking them to land. The compounding impacts of overharvesting of nesting females, and eggs with the loss, alteration, and degradation of critical habitats, including nesting beaches, foraging grounds, and pelagic nursery grounds, all species of marine turtles are threatened with extinction to varying degrees.

Six species of marine turtles occur in PNG waters, including the green turtle (*Chelonia mydas*) flatback turtle (*Natator depressa*), loggerhead sea turtle (*Carreta carreta*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), and the leatherback turtle (*Dermochelys coriacea*).

Green turtle are the most abundant species in the region. This high fishing mortality, combined with significant egg harvests at virtually all nesting beaches close to population centers, slow natural growth and late maturity, and habitat destruction threaten the populations of even the relatively common species¹³⁵. Green turtle are herbivorous, grazing primarily on seagrass beds.

¹³⁴ =Ibid

¹³⁵ =Limpus, C and C.J.Paramenter (1991), The Sea Turtle Resources of the Torres Strait Region, Available at http://www.gbrmpa.gov.au/_data/assets/pdf_file/0012/4008/ws008_the_sea_turtle_resources.pdf

For the migratory green turtles in southern PNG waters, the Torres Strait acts as an important corridor through which turtle may move from feeding grounds in southeastern Indonesia, the Arafura sea, and Gulf of Carpentaria, to rookeries on mainland and offshore island beaches¹³⁶.

Loggerhead turtles are relatively common in the southern region of PNG, including the Torres Strait, though the region is more important as a foraging ground than as a breeding area¹³⁷. Loggerheads that migrate from the Gulf of Carpentaria to the southern Great Barrier Reef rookeries may pass through PNG waters. Loggerheads are more opportunistic feeders than green turtles, having an omnivorous diet composed primarily of shrimps, crabs, and other crustaceans.

Hawksbill turtles typically forage and breed in coral reef areas. For this reason, hawksbill distributions in PNG are concentrated in the Torres Strait, southern barrier reef of PNG, and in the reef areas around the western and northwestern islands. The Torres Strait and the adjacent nesting population of the Australian Great Barrier Reef is thought to be one of the largest demes of *Eretmochelys imbricate* remaining in the world¹³⁸. Hawksbill turtles are, like loggerheads, omnivorous, but occupy a peculiar niche in coral reef systems by being one of the only animals to regularly consume sponges.

Leatherback turtles, *Dermochelys coriacea*, are the largest species of marine turtles, commonly exceeding 800 kg as adults. The seemingly shell-less condition of the animal, and its distinct grey-black coloration and prominent white-speckled longitudinal ridges render these turtles markedly different in appearance from all other sea turtles in the region. This species is also the most migratory, commonly moving between tropical breeding areas and temperate, and in some cases even subarctic, feeding grounds. The movements of the Leatherback turtles of PNG are shared by the Solomon and Indonesia. Leatherbacks are pelagic animals, feeding primarily on coelenterates¹³⁹.

Major nesting populations of Leatherback turtles occur along the north coast of the mainland (especially Boiken to Turubu in East Sepik Province; Aitape in West Sepik Province, Morobe Coast), on Manus (near Tulu and Timonai villages), New Ireland (southeast coast), New Britain (Garu and Ganoi villages), Long Islands, Normanby Island in the Milne Bay Province, and Bougainville islands¹⁴⁰. A significant rookery has been studied by Quinn and Kojis (1985) on the coast of Morobe Province at Maus Bunag, where an estimated 300-500 adult female nests. This rookery is protected through a small-scale ecotourism operation. Relative to *Chelonia* abundances in PNG territory, Leatherbacks are not common.

¹³⁶ =Ibid

¹³⁷ =Miller, J.D and Limpus, C.J. (1991). Torres Strait Marine Turtle Resources, Queensland National Parks and Wildlife Service. In: Torres Strait Baseline Study Conference. pp. 213-226

¹³⁸ =Ibid

¹³⁹ =Benson, S. R., K. M. Kisokau, L. Ambio, V. Rei, P. H. Dutton, and D. Parker. 2007. Beach use, interesting movement, and migration of leatherback turtles, *Dermochelys coriacea*, nesting on the north coast of Papua New Guinea. *Chelonian Conservation and Biology* 6:17-14

¹⁴⁰ =Spring, C.S (1982). Status of Marine Turtle Population in Papua New Guinea. In: Bjorndal, K.A, editor. *Biology and conservation of sea turtles*, Washington, D.C. Smithsonian Institution Press.pp.281-289;

The sandy beaches found in the western Torres Strait support the largest documented nesting population of the endemic flatback turtle¹⁴¹. The size of this population has not been estimated. The extent to which these flatback turtles venture into PNG waters is also unknown. *Natator* has ecological requirements similar to that of *Chelonia*, though major behavioral differences exist.

Olive Ridley turtles are rare in PNG; nesting of this species in PNG has not been documented. Most olive ridley sightings are reported from the Torres Strait¹⁴², and it is likely that olive ridley found in PNG are transients rather than resident. Ridelies have a highly omnivorous and varied diet.

3.2 Estuarine and Coastal Swamp Turtles

A number of fresh and brackish turtle species occur in coastal areas of the country, particularly along the south coast. One endemic species is found in the mangrove and swamp forest habitats of the Fly River flood plain and estuary.

The large pig-nosed or pitted shelled turtle, *Carettocheilus insculpta*, the sole extant member of its family, is relatively abundant in the coastal and semi-saline reaches of the Fly, Kikori, and Purari deltas, being found some distance inland along freshwater riverine reaches. Nesting occurs on the delta sand banks, and the annual harvest of eggs and adults is substantial. Around 20,000 eggs of this species were sold annually in the mid-eighties in Kikori market¹⁴³. The ecology, distribution, and abundance of these animals are not well known, and some evidence for population differentiation exist between demes in the Fly and Kikori areas¹⁴⁴.

3.3 Dugongs

Dugongs (*Dugong dugon*) are unusual marine mammals belonging to the order Sirenia. This species is closely linked with the distribution of seagrass, and is found to be common in the Torres Strait region, with estimates of abundance greater than 12,000 individuals¹⁴⁵. For some societies, such as the Kiwai of the northern Torres Strait area, the dugong is an important cultural symbol, playing a vital role not only in the subsistence economy but also in the social values of the people concerned¹⁴⁶. It is regarded as a protected species under the PNG *Fauna Act*

3.4 Cetaceans (Whales and Dolphins)

¹⁴¹ =Ibid

¹⁴² =Ibid

¹⁴³ =Georges et.al 2008 Georges, A., Alacs, E.A. and Kinginapi, F. (2007). Freshwater turtles of the Kikori (with special reference to the pig-nosed turtle). Report to Oilsearch Pty Ltd, Sydney and World Wide Fund for Nature (WWF), Institute for Applied Ecology, University of Canberra. January 2007

¹⁴⁴ =Ibid.

¹⁴⁵ =Marsh, H. and W. K. Saalfeld. 1989. The distribution and abundance of dugongs in the northern Great Barrier Reef Marine Park. Australian Wildlife Research 16:429–440

¹⁴⁶ =Hudson, B (1980). Dugong myth and Management in Papua New Guinea. In: Morauta et.al.(eds) (1980). "Monograph 16. Traditional Conservation: Implications for Today" IASER, Port Moresby, PNG

The order Cetacean includes whales, dolphins and porpoises. They are the mammals most fully adapted to aquatic life with a spindle-shaped nearly hairless body, protected by a thick layer of blubber, and forelimbs and tail modified to provide propulsion underwater.

Table 2: List of common Cetaceans in PNG		
Common Name	Scientific Name	IUCN Status
Pygmy Sperm Whale	<i>Kogia breviceps</i>	Lower Risk/least concern
Dwarf Sperm Whale	<i>Kogia sima</i>	Lower Risk/least concern
Blainville's Beaked Whale	<i>Mesoplodon densirostris</i>	Data Deficient
Ginkgo-toothed Beaked Whale	<i>Mesoplodon ginkgodens</i>	Data Deficient
Rough-toothed Dolphin	<i>Steno bredanensis</i>	Data Deficient
Indo-Pacific Humpback Dolphin	<i>Sousa chinensis</i>	Data Deficient
Pantropical Spotted Dolphin	<i>Stenella attenuate</i>	Lower Risk/conservation dependent
Spinner Dolphin	<i>Stenella longirostris</i>	Lower Risk/conservation dependent
Fraser's Dolphin	<i>Lageno delphishosei</i>	Data Deficient
Risso's Dolphin	<i>Grampus griseus</i>	Data Deficient
Melon-headed Whale	<i>Pepono cephalaelectra</i>	Lower Risk/least concern
Pygmy Killer Whale	<i>Feresa attenuata</i>	Data Deficient
Orca	<i>Orcinus orca</i>	Lower Risk/conservation dependent
Irrawaddy Dolphin	<i>Orcaella brevirostris</i>	Data Deficient

(Source: Compiled by author)

No systematic surveys of whales and dolphin have been undertaken in PNG waters, although these animals were traditionally taken in small numbers by many coastal people, only a few cultures on the north coast of New Guinea and the Solomon Islands undertook a more systematic exploitation of these resources, especially dolphins. In 2003, the EEZ of PNG was declared a Whale Sanctuary. A list of common cetaceans found in the PNG waters is shown in Table 2 with their IUCN status.

3.5 Coral Reef Fishes

According to IUCN 2008 the total number of marine fish species described for PNG is 2719. Of this figure some may share freshwater habitats, while some even breed inland. The highest diversity of species is associated with reefs that are subjected to heavy traditional subsistence based fisheries. In the Madang Lagoon 652 species of fish were recorded¹⁴⁷, while Kimbe bay

¹⁴⁷ = Jenkins, A.P, 2002 (a). Sinub Island Marine Wildlife Management Area Plan of Management. Wetlands International – Oceania. John Gorton Building, Canberra, ACT 2601. 49 pgs.

recorded 860 species (TNC). However, Milne Bay recorded the highest fish fauna diversity with 1109 species¹⁴⁸.

3.6 Hard Corals

Milne Bay has the highest diversity of hard coral species with over 429 species including 10 new species which were recorded during the Rapid Assessment Survey by Conservation International in 1998¹⁴⁹. In Kimbe Bay 400 hard coral species were recorded. Overall, the total number of coral species described for PNG is 560¹⁵⁰.

3.7 Giant Clams

Giant clams (Tridacnidae) have a truncated distribution representing a restriction of their original range to the Indo-West Pacific.

Six of the eight species known to science are found in PNG: *Tridacna gigas*, *T.derassa*, *T.squamosa*, *T.crocea*, *T.maxima*, and *Hippopus hippous*. These species are susceptible to overharvesting and the local extinction. The range and abundance of giant clams have been dramatically reduced in areas of high human population density, and small scale commercial exploitation for adductor muscle export threatens populations in areas such as the Trobriand Islands.

4.0 DISTRIBUTION AND ABUNDANCE OF COMMERCIALY IMPORTANT STOCKS

4.1 Tuna Fishery

This is the biggest commercial export fisheries in the country and represents a balance of both domestic industry development and Foreign (DWFN) Access arrangements. The fishery is primarily based on the skipjack and yellowfin fish species with smaller quantities of bigeye and albacore.

The fishery is guided by a National Tuna fishery Management Plan, which establishes an overall management structure and an application framework for the longline, purse seine and pole and line fisheries, including license limits and total allowable catches. PNG has embarked on onshore investments in the tuna fishery and as a result foreign and domestic access by purse seine vessels

¹⁴⁸ = Gerald R.Allen, J.P Kinch, S.A Mckenna (2000). A Rapid Marine Biodiversity Assessment of Milne Bay Province, Papua New Guinea-Survey II (2000). RAP Bulletin of Biological Assessment 29. Conservation International, Washington, DC. USA.

¹⁴⁹ = Ibid

¹⁵⁰ = IUCN Red List 2008 IUCN (World Conservation Union).2008. Species Survival Commission. Red List Database 2008 (Available at: <http://www.iucnredlist.org/>)

is increasingly linked to commitment to onshore investment, preferably in the form of tuna processing.

Tuna is found throughout the PNG fisheries zone but especially to the north and east. Tunas are a migratory species moving from area to area depending on climatic conditions, the quantity found in the PNG zone may vary significantly from year to year. A regional approach to managing tuna is therefore important and PNG is a party to a number of bilateral and multilateral arrangements for this purposes.

Catch is usually about 150,000mt to 200,000mt per year but it is estimated that the resource can sustain much higher annual catches of 250,000mt to 300, 000mt. The potential market value is about K1 billion depending on the commodity price. Catch from PNG waters accounts for 20-30% of the regional catch and is about 10% of the global catch. There is concern that yellowfin and big eye tuna may be nearing an overfished state¹⁵¹.

4.2 Prawns and Lobster Fishery

A total of 23 fishing licenses are available to trawl in PNG's Prawn fisheries; 15 in the Gulf of Papua Prawn fishery, one in Orangerie Bay and seven to Torres Strait. Currently, a total of 19 prawn vessels are operating in PNG, 15 operating in the Gulf of Papua Prawn Fishery, while one is operating in the Orangerie Bay fishery and only three in the Torres Strait Fishery¹⁵².

The fishery is based on the spiny lobster, (*Panulirus ornatus*) and a variety of penaeid prawns of which the banana prawn, *Penaeus merguensi*, forms about 50% of the annual catch. Other species in the fishery include the tiger prawns, *Penaeus monodon* and *P. semisulcatus* and endeavor prawns *Metapenaeus spp.*

4.3 Live Reef Food Fish Trade (LRFFT)

Live Reef Food Fish Trade (LRFFT) is the catching and selling of live reef food fish to overseas markets. This activity can provide significant income to the fishing community, but can also bring negative environmental impacts.

Of particular concern in PNG is the targeting of grouper spawning aggregation sites by live reef food fish operators. Also, of concern is the possible use of cyanide (and other chemicals) to stun and capture the fish. The live reef food fish trade is operating in Central, Milne Bay, Manus, East New Britain, Bougainville and New Ireland provinces¹⁵³.

¹⁵¹ = National Fisheries Authority (2004), Corporate Plan 2005-2007, Port Moresby

¹⁵² =Ibid

¹⁵³ =Ibid

Common Name	Species	Size limits	IUCN/CITES Status
Humphead Maori Wrasse*	<i>Cheilinus undulates</i>	65cm	Endangered/II
Mangrove Jack	<i>Lutjanus argentimaculatus</i>	40 cm	Not listed
Maori Perch	<i>Lutjanus rivulatus</i>	55 cm	Not listed
Moses Perch	<i>Lutjanus russellii</i>	24 cm	Not listed
Red Emperor	<i>Lutjanus sebae</i>	55 cm	Not listed
Barramundi Cod	<i>Cromilepes altivelis</i>	40 cm	Vulnerable
Brown Marbled Grouper	<i>Epinephelus fuscoguttatus</i>	55cm	Near Threatened
Camouflage Grouper	<i>Epinephelus polyphemadion</i>	37cm	Near Threatened
Squaretail Coral Trout	<i>Plectropomus areolatus</i>	36 cm	Vulnerable
Chinese Footballer Trout	<i>Plectropomus laevis</i>	60 cm	Vulnerable
Leopard coral Trout	<i>Plectropomus leopardus</i>	36 cm	Near Threatened
Highfin Coral Trout	<i>Plectropomus oligacanthus</i>	36cm	Near Threatened

(Source: PNG Fisheries Regulations 2005)

The fishery is operating under a strict management plan being gazetted in April 2003. Over a 6 months period of operation in 2001, over 6 tonnes of live fish was exported out of New Ireland to Hong Kong, valued at about PGK 0.13 million. In 2003 the company made another export of 6.76 tonnes of live reef fish valued about the same amount as in 2001 export. Currently only one company has license to operate LRFFT in PNG and two more licenses are yet to be issued¹⁵⁴. Table 3 shows common target fish species and their size limits.

4.4 Subsistence and Small Scale Commercial Fisheries

Subsistence and small scale commercial fisheries continue to exploit the wide range of species used traditionally. In general, reef fisheries are dominated by members of the families Scaridae, Holocentridae, Apogonidae, Epinephelidae, Lutjanidae, Lethrinidae, Labridae, Coridae, Siganidae, Carangidae, and Balistidae; In the mangrove areas members of the families Mugilidae, Atherinidae, and Hemirhamphidae make up a larger proportion of the catch. In contrast, estuaries and swamps tend to support fisheries dominated by catfishes, tilapia, and carp.

Seasonally, pelagic species, including trevally, tuna, and barracuda, form important component of local fisheries being exploited when they visit spawning grounds inshore.

¹⁵⁴ =Ibid

Obviously, the abundance and diversity of fish available at one location is correlated to the nature of substratum and the proximity of habitats such as reefs, mangroves, and seagrass meadows, of which the latter two form important spawning grounds and nursery areas for many species.

Small scale commercial exploitation of species such as giant clams, green snails (*Turbo marmoratus*), Trochus (*Trochus niloticus*), and pearl oyster (*Pinctada spp*) and beche-de-mer has occurred in various areas with varying degree of impact.

In general, small scale commercial fisheries provide products for consumption in PNG, and rely on enhanced transport system and improved methods of preservation including freezing, smoking, and drying. As systems are improved, catch rates increase, resulting in increased pressure on resource base. The pressure for providing opportunities for rural income generation must therefore be taken into consideration in any marine management and conservation plan.

4.5 Crocodiles Skin

Two species of crocodiles are found in PNG, *Crocodylus porosus*, the saltwater crocodile and *Crocodylus novaeguineae*, the New Guinea freshwater species. Population distribution shows that *C.porosus* is widely distributed on both mainland and outer islands while *C.novaeguineae* is only found on the mainland. Aerial surveys conducted annually in the middle-upper Sepik Region shows viable populations of both species¹⁵⁵. Current management regime has proven effective in protecting breeding and under size members of the population. The trade of the species are managed and regulated under the *Crocodile Trade (Protection and Control) Act*.

4.6 Shark Fishery

A shark fishery was established in 2003 and is presently operating under a National Shark Longline Management Plan that was approved and gazetted in June 2003. Nine vessels were licensed to fish for sharks since 2003 and this number was to be reviewed after two years when a review is done for the fishery¹⁵⁶.

Shark exports ranged from 1897 tonnes valued at about 6.7 million kina in 2000; 1769 tonnes valued at about 8.5 million kina in 2001; 1442 tonnes valued at 6.6 million kina in 2002; 1360 tonnes valued at about 4.9 million kina in 2004; 824 tonnes at 2.1 million kina in 2004¹⁵⁷.

4.7 Barramundi

The barramundi or giant perch, *Lates calcarifer*, is a large catadromous fish species that spends the bulk of its life history in inland freshwater, but migrates to coastal areas to spawn. Because of

¹⁵⁵ = Sine, R and Nundima J (2009). Update on Saltwater Crocodile Aerial Survey Results March 2009, Department of Environment & Conservation, Waigani, Unpublished Report

¹⁵⁶ =Ibid

¹⁵⁷ =Ibid

this biotic linkage with interior freshwater systems and coastal ecosystems, the barramundi may be an important bio-indicator species, signaling the onset of impact on freshwater systems inland before impact in coastal habitat can be observed.

4.8 Beche-de-mer (Sea cucumbers)

The growth in the beche-de-mer industry has gradually increased in the last few years, and with it an increase number of participants, as well as the hype of trade activities and multiple financing arrangements between locals and non-citizens. Subsequently this has constraint the allocated resources for monitoring for this fishery by both the NFA and the provincial administration.

There is significant improvement on the quality of the export product, as a result of improving processing method by many operators. It is also attributed to dissemination of information to fishermen on handling of different species and processing techniques.

Table 4: List of Commercial Sea Cucumber Species and Size limits

Common Name	Species	Size Limits (live / dried)
Black teatfish	<i>Holothuria nobilis</i>	22 cm / 10 cm
Blackfish	<i>Actinopyga miliaris</i>	15 cm / 10 cm
Curryfish	<i>Stichopus hermanni</i>	25 cm / 10 cm
Greenfish	<i>Stichopus chloronotus</i>	20 cm / 10 cm
Prickly redfish	<i>Thelenota ananas</i>	25 cm / 15 cm
Sandfish	<i>Holothuria scabra</i>	22 cm / 10 cm
Stonefish	<i>Actinopyga lecanora</i>	15 cm / 10 cm
Surf redfish	<i>Actinopyga mauritiana</i>	20 cm / 8 cm
White teatfish	<i>Holothuria fuscogilva</i>	35 cm / 15 cm
Amberfish	<i>Thelenota anax</i>	20 cm / 10 cm
Brown sandfish	<i>Bohadschia vitiensis</i>	20 cm / 10 cm
Chalkfish	<i>Bohadschia similis</i>	25 cm / 7 cm
Deep-water redfish	<i>Actinopyga echinites</i>	25 cm / 15 cm
Elephant trunkfish	<i>Holothuria fuscopunctata</i>	45 cm / 15 cm
Lollyfish	<i>Holothuria atra</i>	30 cm / 15 cm
Pinkfish	<i>Holothuria edulis</i>	25 cm / 10 cm
Tigerfish	<i>Bohadschia argus</i>	20 cm / 10 cm

(Source: PNG Fisheries Regulations 2005)

The overall export has level off to more than 400mt (dried) annually, values as a result of weaker PNG kina against US dollars at more than PGK21 million¹⁵⁸. While the establishment of the national management plan has had a positive impact on the sustainability of the fishery at some

¹⁵⁸ =Ibid

provinces, there is further need to involve the community in the overall management of the resources under their respective jurisdiction.

Due to the overharvesting of this resource, the stock levels have gone down to extremely low levels for the entire country, that prompt the NFA to ban the harvest and export of beche-de-mer for three years (2009-2011).

Table 4 provides a list of commercially exploited sea cucumber species with the high value species highlighted.

4.9 Trochus

Production for the trochus (*Trochus niloticus*) shell in the country increased for each passing year since 1998, though the lowest production was observed in the year 1999. The highest production was in the year 2003 at about 353mt. The fluctuation of production was affected by export price couple with weaker PNG kina against US dollar. In most cases, fisheries or licensed exporters would hold trochus for a year or two till the export price improves. The establishment of the trochus shell processing plant in Rabaul (MSB Ltd). And its competitive price (K12/kg) would certainly have a direct impact on the production from hereon¹⁵⁹.

4.10 Crab Fishery

Crab fishery is a small but increasing fishery in PNG. At present, crab is an important subsistence fishery to the coastal communities along the estuarine mangrove habitats. The most common species often exported or sold at the local markets and restaurants is the mud crab (*Scylla serrata*). According to NFA records about 29.3mt of crabs were exported between 1994 and 2001 with a cumulative value of PGK 0.353 million. Most crabs were exported out of East New Britain, Milne Bay, NCD, New Ireland, and Western Provinces. They are either exported live, frozen or cooked¹⁶⁰.

4.11 Other Fisheries

Other fisheries resources of significant national or community interest include aquarium trade, pearl oyster and greenshell snail (*Turbo marmoratus*). These are generally coastal resources and it is the intention of NFA to work with communities to establish effective management regimes to realize the potential of these fisheries¹⁶¹.

4.12 Aquaculture Species

Since 2003 the propagation of banana prawns in PNG has been a success story with a tonne of prawns being harvested from a trial run by a local company Bismarck Barramundi. This

¹⁵⁹ =Ibid

¹⁶⁰ =Ibid

¹⁶¹ =Ibid

achievement encouraged the establishments of the prawn culture industry in PNG. Another local company is the Coral Sea Mariculture which established the first pearl hatchery in PNG on Samarai Island in 2002 and has so far conducted on-going spawning of Gold lip and Silver lip pearl oysters. The availability of juvenile pearl oysters is a bonus for potential farmers and the PNG pearl industry¹⁶². Bismarck Barramundi also pioneered the propagation and farming of barramundi in 2000 in Madang. The Company is now producing around 200,000 table size fish annually. Spin off benefits of this achievement has been the involvement of villagers along north coast of Madang through the ‘Family Farm’ concept, where the Company provides fingerlings, feed, technical assistance, etc and buys back the fish for processing and marketing.

Currently there is high interest in aquaculture both at the subsistence and commercial level. A new area trialed out in the some areas in PNG is sea weed farming. There is growing potential for aquaculture both to complement capture fisheries and export earnings.

5.0 MARINE PRIORITY AREAS AND CRITICAL WATERSHEDS IN PNG

PNG published its Conservation Needs Assessment (CNA) report in 1993 where teams of international and national experts compiled and analyzed the existing base of scientific information on the country’s terrestrial and marine ecosystems and the biodiversity that they support. The reports and maps detailing areas of known biodiversity concentration, unusual ecosystems, and habitats and environmental threats were identified. Data poor areas were also identified. The process identified: 42 terrestrial high biodiversity areas and 13 important wetland habitats, 30 marine and coastal high biodiversity areas and 5 watersheds critical to the health of these and 16 biologically unknown areas that merit immediate survey and study¹⁶³. For regional marine planning purpose I am further classifying the 30 priority marine areas into four (4) broad geographical regions or large marine ecosystem:

5.1 Bismarck Sea

The Bismarck Sea includes the island of Manus, New Britain, New Ireland and north coast of the Momase region. This region encompasses a larger area compare to the others and has 17 priority areas (Figure 4 and Table 5). The sites range from coral reefs to mangrove estuaries and sea bed volcanic formations.

Table 5. Marine Priority Areas in the Bismarck Sea

#	Site	Features
21	Hermit Islands	Extensive, discrete patch reefs with sea turtles and a highly productive area of rich fisheries. Reef areas are far from population centres, but threats exist from poaching and overfishing. Uncontrolled tourism in the western islands may represent a potential

¹⁶² =Ibid

¹⁶³ =Beehler, B. M. (ed), 1993. Papua New Guinea Conservation Needs Assessment Vol. 2. Biodiversity Support Program, Government of Papua New Guinea, Department of Environment and Conservation. Corporate Press Inc., Landover, Maryland.

		threat as well.
22	Manus Complex	Reefs and lagoon complexes, seagrass beds, and seabird rookery islands, with green tree snails, reef fishes, pelagics, and sea turtles. This is an area of high beta diversity with highly diverse reefs that are seriously threatened from dynamite fishing and by phosphateminig on seabird islands
11	Fullerborne	Raised limestone islands, mangrove and associated nursery areas, and sea grass beds, with high habitat and structural
12	Talasea	Reef and soft bottom marine habitats, nesting beaches for leatherback turtles.
13	Rabaul/Duke of York	Mangrove, sea grass, reef, and offshore deepwater areas with thermal vents. Threats arise from proximity to Rabaul town and from timber operations in watersheds above the coast.
14	Tigak Islands	Mangroves, sea grasses, reef, and deepwater mangrove lagoon, which are highly productive fishery areas. Beta diversity is very high, and threats arise from dynamite fishing.
15	Mussau Island	This marine system includes reef systems and seagrasses, some parts of which are relatively pristine due to traditional practices of islanders, but now threatened by dynamite fishing.
16	Tanga/Tabar/Feni Islands	Subsea volcanic formations, mineral-rich areas, and isolated island systems that may be very important for endangered vertebrates such as sea turtles. This is an area of diverse habitats and unusual geomorphology, possibly threatened by nearshore and offshore overfishing
17	Southern New Ireland	An area of fringing reefs.
23	Cape Cretin	An area of ancient reef faces
24	Vitiaz Straits	Reefs, with steep land in proximity, threatened by land-use practices.
25	Volcanic Chain: Manam to Long	Volcanic islands, reef walls, and sea mounts, sea turtle nesting beaches, and upwelling areas. Pelagic fishes congregate at the sea walls and sea mounts. Threats arise from overfishing and overharvesting of sea turtle eggs.
26	Madang Lagoon	Coral reefs, lagoon islands, and mangrove patches, with coral and fish species. This is a well-studied area, species-rich, with high habitat diversity, which faces threats from commercial development in Madang town, as well as logging and dynamiting.
27	Laing Island	This is a reef system and marine research station, threatened by dynamiting and by copra plantation wastes
28	Sepik Delta	Mangrove, brackish lake systems. This is a highly productive area with a unique hydrology and habitat for crocodiles. Threats arise from watershed mismanagement and introduction of exotic fishes.
29	Vokeo and Islands	Small island systems in association with deep water.
30	Northwest Coast	Sandy beaches with largely unsurveyed fauna. This area contains interesting current regimes and bottom topography and productive waters, and is threatened by overfishing and coastal

(Source: Department of Environment & Conservation 1993, Conservation Needs Assessment Report)

5.2 Solomon Sea

Includes the areas between Lae and Milne Bay Province excluding the south east of the province, and borders with Solomon Islands and also covers the Bougainville region (North Solomons). The Solomon Sea comprises of 8 priority areas (Figure 4 and Table 6).

#	Site	Features
6	Rossel Island	Reef systems, lagoons, isolated island areas, and an upwelling area, are largely unknown biologically and face possible threats from foreign poaching.
7	Pocklington Reef	An extensive reef system, thought to be relatively pristine, and isolated by deep water from all other reef systems in Milne Bay. This reef may show affinities to the New Georgia reef system.
8	Morobe Coast	An area of mangroves, sea walls, leatherback turtle nesting beaches, and fringing reefs, with the potential for community-initiated conservation action. An area of high beta diversity facing threats from nearby Lae town, especially logging of coastal hill forests.
9	Tufi Coastal Fjords	Coral fjords, fringing reefs, mangrove, sea walls, thermal vents in an environment unique in Papua New Guinea, with high potential for nature tourism.
10	Trobriand Reef and Drop	Extensive coral reefs, habitat for hawksbill. turtle, beche-demer, giant clams, dugongs, green sea turtles, coral reef fishes, and invertebrates. Largely unsurveyed, but thought to be highly productive reef systems.
18	Buka	A reef and lagoon complex with soft bottom communities and coral reef fishes, but otherwise largely unknown. Buka Channel comprises a unique habitat in Papua New Guinea but is threatened by overfishing and poor land-use practices.
19	South Coast Bougainville	An area of reefs and associated habitats, with swamp forest, which differs from that on the mainland. Fauna are largely unknown, and this area contains reef systems in proximity to deep open ocean waters.
20	Borone Bay	A largely unknown area with unusual hydrology coupled with steeply sloped shore fall-off, facing threats from logging and mining in upland areas

(Source: DEC 1993, Conservation Needs Assessment Report)

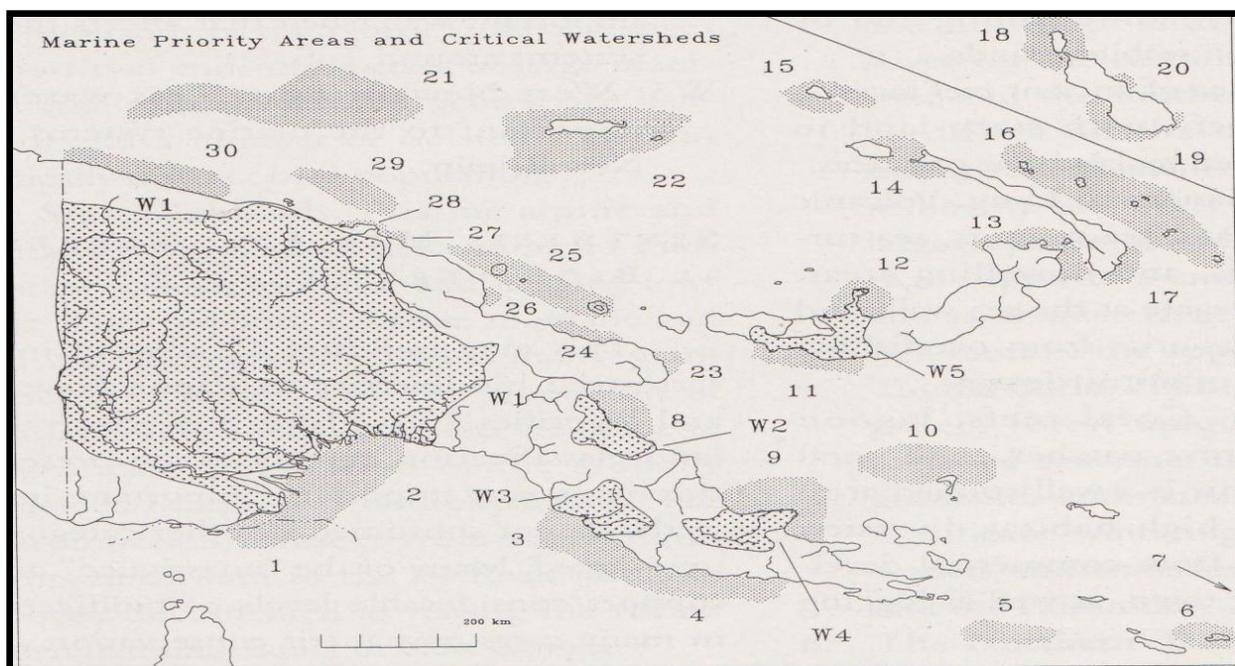


Figure. 4 Marine Priority Areas and Critical Watersheds (Source: DEC 1993, Conservation Needs Assessment Report)

5.3 Coral Sea

The Coral Sea includes Sudest Island in the Milne Bay Province to Central Province and south west to the Torres Strait Region and the Gulf of Papua. Five sites have been identified as priority areas (Figure 4 and Table 7) within this region.

Table 7. Marine Priority Areas in the Coral Sea

#	Site	Feature
4	Papuan Barrier and Lagoon	Barrier reef, coastal lagoon, and mangrove habitat for hawksbill turtles, reef fishes, corals, and marine invertebrates. This area of high diversity faces threats from dynamiting, overfishing, and eutrophication from sewage effluent emanating from development near Port Moresby.
5	Dumoulin	A reef in proximity to the southern drop-off (potential upwelling), which is largely unknown; habitat for giant clams.
1	Maza/Fly Delta	Mangrove and associated nursery habitats with seagrass beds, green sea turtle foraging habitats, and dugong habitat. Possibly threatened by overfishing and river-borne pollutants
2	Gulf	Shallow intertidal and soft bottom habitats, with mangrove communities that comprise important nursery areas for prawns, barramundi, and other commercially important species. Possible threats from overfishing, oil exploration, and pipeline.
3	Galley Reach	A highly productive area of mangrove forests, wetlands, and reef, threatened by development and exploitation based in nearby Port Moresby.

(Source: DEC 1993, Conservation Needs Assessment Report)

5.4 Critical Watersheds

Watersheds or catchments play an important role in marine biodiversity as natural drainage exit points into the sea. With activities like logging, agriculture, and mining in the headwaters can have an adverse effect on the coastal marine ecosystem. As such it is important to identify critical watershed and its receiving marine ecosystems. 5 critical watersheds were identified as important to the marine environment (Figure 4 and Table 8).

#	Site	Feature
W1	Sepik/Fly Drainages	These comprise the two largest drainages in PNG. The Fly is of critical importance to the health of the Gulf of Papua.
W2	Morobe/Waria Watershed	Important upland drainages that affect coastal islands and reef of Morobe coast
W3	Vanapa/Brown	A river system that drains into an important mangrove system
W4	Musa/Topographers	Another small but important watershed that affects the marine systems around Tufi
W5	West New Britain	This watershed is important to the marine systems of West New Britain

(Source: DEC 1993, Conservation Needs Assessment Report)

The identified priority areas provides the DEC an overview of the general status of critical marine areas in PNG that needs special attention and warrants certain level of protection.

6.0 GLOBALLY AND REGIONALLY IMPORTANT MARINE ECOSYSTEMS IN PAPUA NEW GUINEA

6.1 Bismarck Solomon Sea Ecoregion

The Bismarck Solomon Sea Ecoregion (BSSE) also known as the Western Indo Pacific Cradle of Marine Biodiversity is one of the last tropical marine ecoregions that remain relatively unaffected by human activity¹⁶⁴. Its rich natural wealth is demonstrated by;

- (i) extraordinary diversity of reefs, seagrasses, deep sea and pelagic habitats;
- (ii) globally diverse centers of reef-building corals and reef fish;
- (iii) largest and most critical remaining pacific leatherback turtle nesting sites;

¹⁶⁴ =WWF 2003. Bismarck Solomon Sea Ecoregions – Fact Sheet, Available at http://assets.panda.org/downloads/bsse_flyer_0204.pdf

- (iv) center of sperm whale abundance in the tropics; and
- (v) major biogeographic transition zone between the Indonesian, Philippine, Micronesian, Coral Sea and central Pacific region.

The expansive boundaries of the BSSE is defined by clear biogeographic, oceanographic, geophysical, and climatic boundaries stretching from Birdshhead Peninsula of the Province of Papua in Indonesia, across the Admiralty and Bismarck archipelagos of PNG, to Makira Island of the Solomon Islands¹⁶⁵.

Over 60 scientific experts (academics, Government officials, researchers, and NGOs) were assembled by WWF from three countries (Indonesia, PNG and Solomon Islands) to profile to the best of their knowledge and experience the biodiversity of the BSSE¹⁶⁶.

The experts identified a total of 48 priority areas within the BSSE. Six (6) of these were considered as globally important with rare examples found in few other places or nowhere else on the planet. Another 24 sites were identified as outstanding on a ecoregional level and 18 were considered sub-regionally important sites.

Individually some of these sites are more diverse or unique than others but together they represent the overall importance of the marine ecosystems of the BSSE.

Of these 48 areas, 30 sites occur in PNG which is about 63% of the total BSSE priority areas. The Bismarck Sea Region accounts for 19 sites: 2 globally significant, 11 eco-regionally outstanding, 5 sub-regionally outstanding and 1 unknown (Figure 6).

The Solomon sea has 9 areas: 2 globally significant, 3 Eco regionally outstanding, 3 sub-regionally outstanding and 1 unknown (Figure 6). Solomon Archipelago has two areas in the northern region within PNG waters. 1 is regionally outstanding while the other is sub-regionally outstanding (Figure 6).

¹⁶⁵ =Ibid

¹⁶⁶ =Ibid

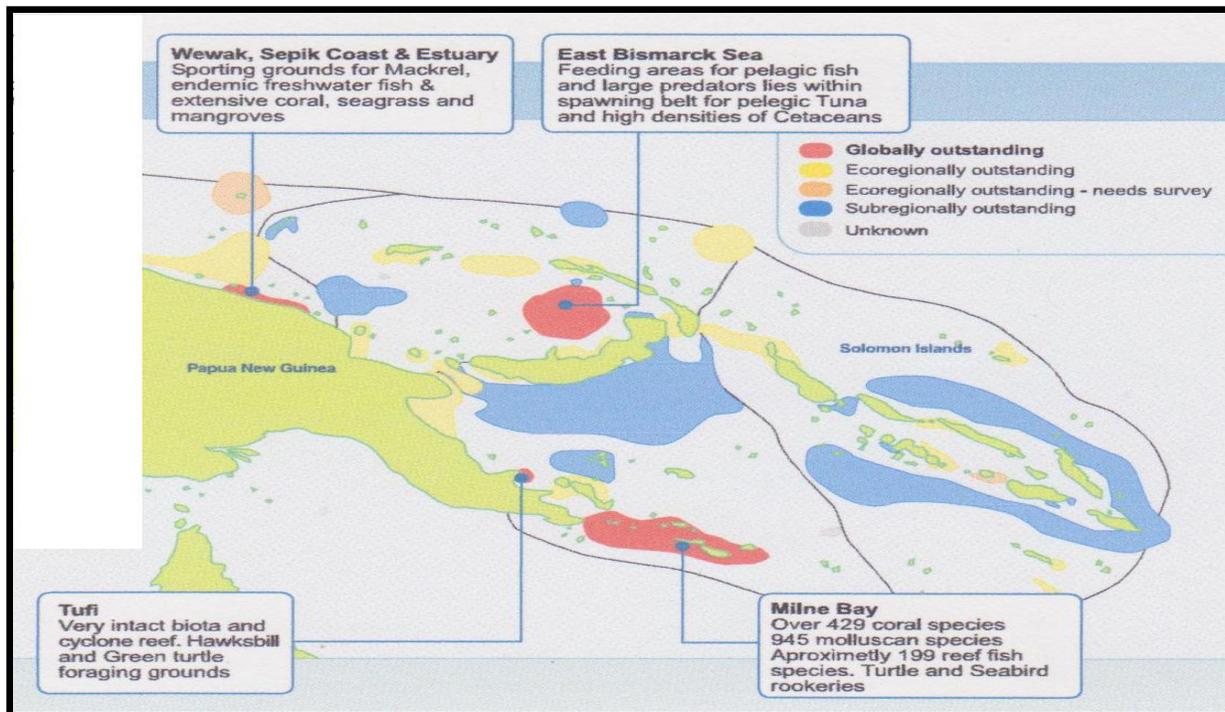


Figure 5. BSSE Priority Areas in PNG (Source:WWF 2003)

This identification and prioritization of eco-regions is further emphasized by the Coral Triangle Functional Seascape approach which is briefly outlined below.

6.2 Identification of Coral Triangle Functional Seascapes

The Coral Triangle region is located along the equator at the confluence of the Western Pacific and Indian Oceans. Using coral and reef fish diversity as the two major criteria, the boundaries of this region are defined by scientists as covering all or part of the exclusive economic zones of six countries: Indonesia, Malaysia, PNG, the Philippines, the Solomon Islands and Timor-Leste¹⁶⁷.

The Ecoregion covers only 1.6% of the planet's oceanic area, and represents the global epicenter of marine life abundance and diversity -- with 76% of all known coral species, 37% of all known coral reef fish species, 53% of the world's coral reefs, the greatest extent of mangrove forests in the world, and spawning and juvenile growth areas for the world's largest tuna fishery.

A scientific expert workshop convened in Bali, Indonesia in 2003 delineated the Coral Triangle ecoregion¹⁶⁸ into 32 functional seascapes. The primary criteria used to identify ecoregions were:

¹⁶⁷ = Annex IX. Coral Triangle Initiative Region

¹⁶⁸ = Ecoregions are defined as large areas containing geographically distinct assemblages of species, natural communities, and environmental conditions. Within these ecoregions are Functional seascapes which are defined as areas within a wider ecoregion within which there is some geographic or ecological distinctiveness, but over a smaller area that may be more suitable for the application of management measures.

- (i) High species biodiversity (where in excess of 500 coral species, a high biodiversity of reef fishes, forams, fungid corals, and stomatopods are likely to occur in each ecoregion) and habitat diversity; and
- (ii) Oceanography (currents).

Where insufficient data was available on the primary criteria, the following criteria were also used:

- (i) Geomorphology (type of coastal structure);
- (ii) Bathymetry (shallow continental shelf, ocean trenches);
- (iii) Sea level fluctuations (on a geological time scale);
- (iv) Habitat type (coral reef, exposed coast etc); and
- (v) River discharge.

In PNG 14 functional seascapes were identified within the Coral Triangle Region as outlined below¹⁶⁹(Figure 6 and Table 9).

Table 9. Functional Seascapes in PNG’s Coral Triangle Region

Functional Seascape	Feature
17. Western Islands	Oceanic coral atolls on the northwest side of the Bismarck Sea.
18. Sepik River Area	North coast of PNG influenced by outflows from large river systems (Sepik & Ramu Rivers).
19. Manus Island Group	Large island and associated volcanic and coral atolls. Strong oceanic influences from the Bismarck Sea, with some influence of the Western Pacific Ocean.
20. New Hanover- Mussau	Group Large islands and associated volcanic and coral atolls that experience oceanic influences from both the Bismarck Sea and Western Pacific Ocean.
21. West New Ireland	Narrow fringing reefs in calm protected waters of the Bismarck Sea, which experience little oceanic influence and no major currents.
22. St George’s Channel	Strongly influenced by currents in major strait between Bismarck and Solomon Seas. Also experience volcanic influences in some locations, particularly around Rabaul.
23. Kimbe-Witu Islands	Coastal and offshore reefs that experience oceanic influences from the Bismarck Sea, but are not influenced by currents from the major straits either side of New Britain (Dampier Strait and St. George’s Channel).
24. Madang- Dampier Strait	North coast of PNG that experiences oceanic influences from the Bismarck Sea, and major currents from the Dampier Strait (exchanging water with the Solomon Sea).
25. South New Britain	Coastal fringing reefs in very deep water close to shore, along the southern side of the island of New Britain and the

¹⁶⁹ =Ibid

	northern side of the Solomon Sea and Solomon Trench. Influenced by coastal rivers and streams.
26. Trobriand & Woodlark	Offshore reefs with strong oceanic influences from the Solomon Sea
27. Huon Gulf & Milne Bay	Coastal reefs of the northeastern side of the southeast peninsula of the main island of New Guinea, extending from Lae to Alotau, and including the Huon Gulf; Dyke Ackland, Collingwood and Goodenough Bays; Fergusson and Normanby Islands, the D'entrecasteaux Islands, and the inshore islands off the eastern point of the peninsula (Basilaki, Sideia etc).
28. Louisiade Archipelago	Offshore reefs off the eastern tip of the southeast peninsula of the main island of New Guinea, which experience strong oceanic influences from both the Solomon and Coral Seas.
29. East New Ireland	Offshore reefs and atolls in the Western Pacific, east of New Ireland.
30. Ontong Java-Tasman Island	Oceanic atolls with high disturbance regimes.
31 & 32 are located in Solomon Islands Maritime waters	

(Source: Green and Mous 2008)

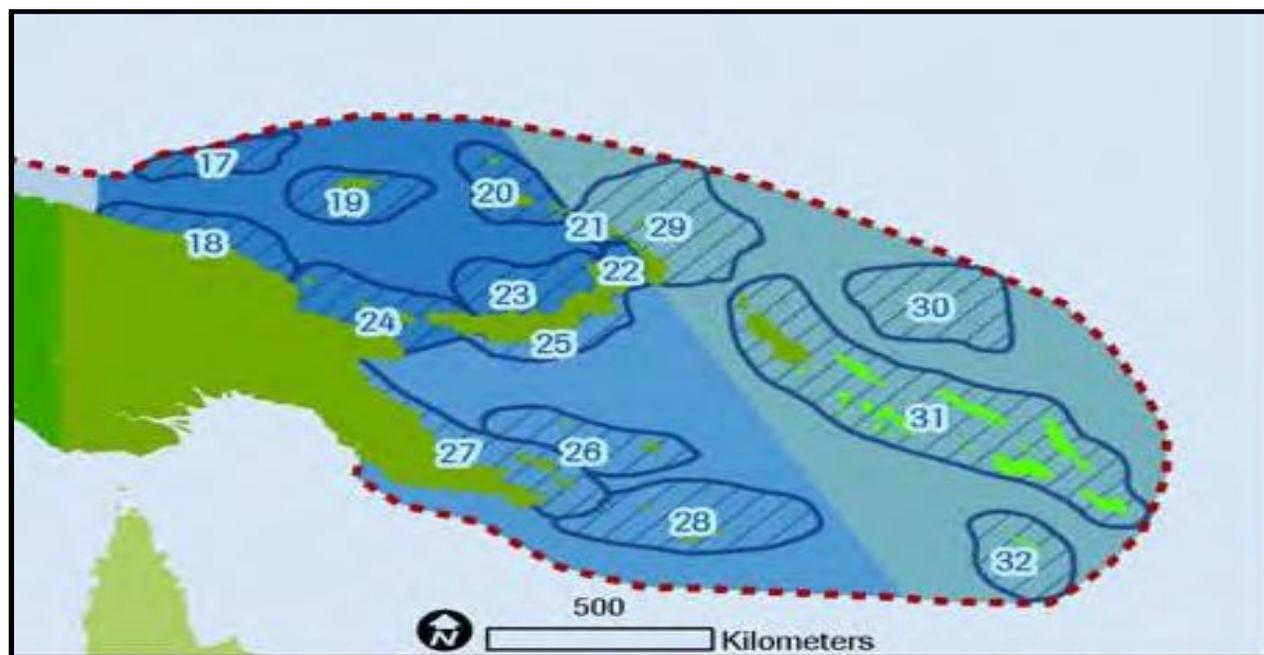


Figure 6. Functional Seascapes in PNG (Source: Modified from Green and Mous 2008)

By comparison to the BSSE and CNA priority areas discussed earlier, they are basically the same sites. If all three maps were overlaid on top of each other they would approximately cover the same areas. These identified ecoregions and seascapes sets the basis for the ecosystem based approach to regional marine planning for PNG.

7.0 OVERVIEW OF MARINE PROTECTED AREAS

7.1 Types of Protected Areas in PNG

There are 6 types of nature conservation or protected areas in PNG. These are:

National Parks: National parks can only be designated over Government land that is owned, leased or given as a gift. The declaration of National Parks is covered by the *National Parks Act (1982)*. National Parks are managed by the Government and landowners are excluded from use, management and establishing rules for the area. This concept has certain value in the protection of areas of particular scenic, historical or scientific interest which are of national significance but is difficult to apply in PNG because of complex land tenure and resource use issues.

Fauna Sanctuaries: Within this type of area it is prohibited to kill any animal. There is no mechanism for landowner input into the management of fauna sanctuaries even though it may be declared over land that is under customary ownership. Rules for management are provided by the Minister of Environment and Conservation. This type of area is covered by the *Fauna (Protection and Control) Act (1966)*.

Protected Areas: This type of area allows for hunting of wildlife except for species that are specially named by the Minister of Environment and Conservation. The rules for management are made by Government. This type of area is covered by the *Fauna (Protection and Control) Act (1966)* and allows for little management input from the customary landowners.

Natural Reserves: This type of area is established to protect a representative sample of ecosystem or habitat. Scientific research is permitted but access by the public is restricted.

Wildlife Management Areas (WMAs): these are established on customarily owned land on the request of the land owners for the conservation and controlled utilization of the wildlife and its habitat. Landowners are entirely responsible for establishing the rules for the area. Landowners designate a WMA Committee and they are responsible for making and enforcing the rules. These rules may be made for the protection, exploitation or management of wildlife. This is currently the best option available to landowners in PNG.

The major weaknesses are that rules can be changed by landowners or they can be de-gazetted at landowner request. Other problems are lack of local resource management expertise and delays in responding to requests for WMA establishment which leads to apathy and weak enforcement of regulations.

Conservation Areas: This is a form of protected area that has enormous potential. It can be applied to any form of land tenure and can be declared to protect an area having particular biological, topographical, historical, scientific, and social or any other special value for the present community or future generations. This contrasts with WMAs which are specifically designated to manage wildlife. Conservation Areas also provide for stronger protection and penalty clauses (up to K40, 000) than a WMA. For each Conservation Area the Minister appoints a Conservation Management Committee for each Conservation Area which reflects the

interest of the landowners, provincial and local Governments. This committee is responsible for preparing a management plan for the area, coordinating development and directing the work of rangers. No development can occur within the area that is contrary to the plan of management. Only one Conservation Areas established in PNG is the YUS Conservation Area in Morobe Province.

7.2 Existing MPAs in PNG

PNG has 14 designated protected areas that contain coastal ecosystems within their legal boundaries (Table 11)¹⁷⁰ administered by DEC. Three of these are National or Provincial Parks under Government management, and eleven are community run WMAs gazetted by the Government. In addition, there are also three Integrated Conservation and Development (ICAD) projects under NGO direction that have Locally Managed Marine Areas (LMMA)¹⁷¹ are; Kimbe Bay, Milne Bay, and New Ireland.

Name	Province	Size (Ha)	Declaration Date	Gazette No.	Gazettal Date
Bagiai Wildlife Management Area	Madang	13,760	13-Jan-77	G07	27-Jan-77
Crown Island Wildlife Sanctuary	Madang	58,969	21-Jul-77	G61	4-Aug-77
Horse Shoe Reef Marine Park	Central	395.90	12-Jun-81	G53	9-Jul-81
Kamiali Wildlife Management Area	Morobe	47,413	6-Aug-96	G77	19-Sep-81
Laugum Wildlife Management Area	Madang	72.95	1-Sep-03	G17	26-Jan-06
Maza Wildlife Management Area	Western	184, 230	7-Dec-78	G99	21-Dec-78
Ndrolowa Wildlife Management Area	Manus	5,850	28-Mar-85	G16	28-Mar-85
Pirung (Eight Islands) Wildlife Management Area	North Solomons	43,200	9-May-89	G33	25-May-89
Ranba Wildlife Management Area	Madang	41,922	16-Jun-77	G54	30-Jun-77
Sinub Island Wildlife Management Area	Madang	11.80	1-Sep-03	G17	26-Jan-06
Tab Wildlife Management Area	Madang	984.30	1-Sep-03	G17	26-Jan-06
Tabad Wildlife Management Area	Madang	16.20	1-Sep-03	G17	26-Jan-06
Talele Island Natural Reserve	East New Britain	12.00	26-Nov-73	G111	6-Dec-73
Tavalo Wildlife Management Area	West New Britain	20,000	13-Jul-77	G100	13-Nov-77

(Source: Compiled by author)

¹⁷⁰ = Annex IX. Map of Existing Marine Protected Areas in PNG

¹⁷¹ = More on Locally Managed Marine Areas Network available at <http://www.lmmanetwork.org/>

WMAs form the bulk of the existing MPAs in PNG and in these areas the management responsibility lies almost entirely with the local landowning community.

These legally designated MPAs encompass a very small portion of the marine ecosystem in PNG and due to lack of capacity for management and enforcement they rarely provide the level of protection anticipated when they were established. There is a severe lack of in-country capacity to implement a working national system of MPAs from Government to community levels. However, the LMMAs provide some examples of small community-run MPAs that are currently functioning effectively and may provide widely replicable models.

8.0 PREVAILING THREATS TO MARINE ECOSYSTEMS

There are four major threats prevalent and having direct adverse impact on the marine ecosystem. Marine habitats and species biodiversity face various threats and there are number of important issues relating to their effective conservation, management and sustainable use.

8.1 Over Harvest

Direct harvesting of marine resources includes over harvesting and destructive fishing methods. These pose a serious threat to the marine resources. By-catch is also a serious issue from a number of different fisheries. A classic example of over harvesting is the 3 year ban on bechedemer (2009-2011).

8.2 Climate Change

Climate change is potentially a high threat to the marine species and their habitats in PNG through the potential disruption of ocean circulations, changes in the amount and distribution of fish populations, changes in salinity, temperature and acidity, and other parameters. Current climate change models include a wide range of potential scenarios.

8.3 Habitat Destruction

Habitat destruction includes coastal development, sedimentation of coastal waters, nutrients and other habitat impacts. The most significant habitat destruction are localized point source activities especially in urban areas, coastal roads and infrastructure development for logging ponds, mining activities and large scale agriculture developments.

8.4 Pollution

Anthropogenic debris, toxic chemicals, land-based sources of pollution such as sewage, sedimentation, nutrient loads etc. that are being dumped into the sea are major causes of pollution in PNG. These pose a series threat to marine habitats and species.

9.0 CONCLUSION

PNG is blessed with rich marine biodiversity, but the failure to document the status of the marine environment for the country remains as a gap that needs to be filled immediately. With the emerging threats and challenges to the marine environment from development activities, PNG needs to urgently consider a comprehensive assessment of its marine environment which would greatly enhance decision making and the overall planning process.

In terms of the regional planning approach, the three large marine ecosystem identified are the national seas; Bismarck, Solomon, and Coral seas. They provide ideal basis for planning and development of regional management plans. The priority marine areas identified within these large sea areas can serve as demonstration sites or planning units at the local level where integrated management options can be trialed. However, further work using GIS technology and site visits is necessary to the overall planning process.

PART THREE

INTERNATIONAL OBLIGATIONS ON SUSTAINABLE MARINE ENVIRONMENT

PNG has signed up to over 40 Multilateral Environment Agreements (MEAs); in this part the major global, regional and bilateral agreements of relevance to the marine environment and maritime resources will be outlined to demonstrate the relevance for PNG to align its policy and implementation programs to fulfill these international obligations as well as abide by its guiding principles.

A. GLOBAL OBLIGATIONS AND GUIDANCE

In the global arena, five major treaties have binding influence on PNG's ocean use policy initiatives and provide guidance for implementation of appropriate actions. The first is the UN Millennium Development Goals (MDGs), which has a broad overarching influence on all national and sectoral policies formulated by the national Government as discussed in Part One of this paper. The second treaty is the United Nations Convention on the Law of the Sea (UNCLOS) which provides the legal basis for states to mark out their respective maritime boundaries, protect their resources, navigation access, etc. The implementation responsibilities under this convention cuts across many national sectors involved with the marine environment. The third is the three outcome Conventions of the United Nations Conference on Environment and Development (UNCED) Earth Summit in 1992.

1.0 United Nations Millennium Development Goals (UN MDGs)

In 2000, all member states of the United Nations, including PNG, adopted the Millennium Declaration¹⁷² which focuses on the core challenges facing humanity at the start of the 3rd millennium and formulates the required responses through appropriate benchmarks. These benchmarks are reflected in the eight MDG's and associated indicators. The MDG's relate to: poverty, primary education, gender equity, child mortality, maternal health, HIV/AIDs, malaria and other diseases, environmental sustainability and global partnerships for development.

MDG7 is particularly concerned with finding effective solutions to the negative impacts of climate change, the unsustainable use of the natural resource base, and declining condition of air, water, soils and biodiversity in many countries. This goal has a major influence on all economic sector policies covering development projects in both marine and terrestrial environment in PNG. In response the PNG Department of Environment and Conservation (DEC), on behalf of the national Government formulated the Environmentally Sustainable Economic Growth (ESEG) Policy for economic sectors to apply principles of precautionary approach when dealing with resource extractive development projects. An integrated marine policy will provide further refinement to the principles of sustainable economic growth.

¹⁷² =Ibid

2.0 United Nations Convention on the Law of the Sea (UNCLOS)

The UNCLOS¹⁷³, also called the Law of the Sea Convention or the Law of the Sea Treaty is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place from 1973 through 1982. The Law of the Sea Convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention, concluded in 1982, replaced four 1958 treaties and came into force in 1994. To date, 160 countries and the European Community have joined in the Convention.

While the Secretary General of the United Nations receives instruments of ratification and accession and the UN provides support for meetings of states party to the Convention, the UN has no direct operational role in the implementation of the Convention. There is, however, a role played by organizations such as the International Maritime Organization (IMO), the International Whaling Commission (IWC), and the International Seabed Authority (the latter being established by the UN Convention).

The convention introduced a number of provisions. The most significant issues covered were setting limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, protection of the marine environment, scientific research, and settlement of disputes¹⁷⁴.

3.0 UNCLOS and IMO (Part XII)

UNCLOS provides a comprehensive legal framework for the conduct and regulation of all marine sector activities. This includes a framework for settlement of disputes from conflicting ocean activities and state interests at sea.

Part XII consists of 46 articles which attempt to provide a framework to protect the marine environment. It covers all forms of marine pollution and creates special enforcement provisions for flag, port, and coastal states. This gives effect to pollution conventions administered by the International Maritime Organization (IMO).

UNCLOS is acknowledged to be an “umbrella convention” to all maritime conventions because most of its provisions can be implemented only through clearly defined operational regulations in other international agreements¹⁷⁵. These provisions clearly establish an obligation on UNCLOS States Parties to apply IMO rules and standards. Some of the maritime conventions signed by PNG include; London Convention, 96 Protocol and MARPOL¹⁷⁶.

¹⁷³ = Ibid

¹⁷⁴ = United Nations (1983). The Law of the Sea: The United Nations Convention on the Law of the Sea with Index and Final Act of the Third United Nations Conference on the Law of the Sea. New York: United Nations

¹⁷⁵ = <http://www.imo.org/>

¹⁷⁶ = Annex X. List of IMO Conventions signed by PNG

4.0 United Nations Conference on Environment and Development (UNCED) - Rio Summit

The United Nations Conference on Environment and Development (UNCED), met in Rio de Janeiro from 3 to 14 June 1992, twenty years after the first global environment conference, in Stockholm to reaffirm the Declaration of the United Nations Conference on the Human Environment. The Rio Summit was held to build upon the declaration, with the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people, working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system.

In Rio, Governments (108 represented by heads of State or Government) adopted three major agreements aimed at changing the traditional approach to development:

- (i) **Agenda 21:** a comprehensive programme of action for global action in all areas of sustainable development.
- (ii) **The Rio Declaration on Environment and Development:** a series of principles defining the rights and responsibilities of States; and
- (iii) **The Statement of Forest Principles:** a set of principles to underlie the sustainable management of forests worldwide.

In addition, two legally binding Conventions aimed at preventing global climate change and the eradication of the diversity of biological species were opened for signature at the Summit, giving high profile to these efforts: (1) The United Nations Framework Convention on Climate Change (UNFCCC) and (2) the Convention on Biological Diversity (CBD).

4.1 Agenda 21

This is the major action plan coming out of the deliberations of the four UNCED preparatory meetings and the Rio meeting itself. It spells out a course of action in forty (40) areas that, if followed, will lead to a more sustainable world in the twenty-first century. It includes not only the full range of environment and resources issues—from oceans and coasts (Chapter 17, longest chapter) to freshwater resources, radioactive waste, forests, agriculture practices and the like—but also chapters on such crosscutting issues as poverty, pollution, financing, and the role of major groups (women, indigenous people), business, labor, and local communities.

4.2 Chapter 17-The Oceans and Coasts

Chapter 17 of Agenda 21 clearly emphasizes that new approaches to marine and coastal areas management will be needed, approaches that are “integrated in content and precautionary and anticipatory in ambit”. The introduction to Chapter 17 highlights that the LOS Convention provides “the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources.”

Seven major program areas are included in Chapter 17:

- i. Integrated Management and Sustainable development of coastal areas, including EEZ;
- ii. Marine Environmental Protection;
- iii. Sustainable Use and Conservation of Living Marine Resources of the high seas;
- iv. Sustainable Use and Conservation of Living Marine Resources in areas under national jurisdiction;
- v. Addressing critical uncertainties for the management of the marine environment and climate change;
- vi. Strengthening international and regional cooperation and coordination; and
- vii. Sustainable development of small islands.

The first section, on integrated management and sustainable development of coastal and marine areas, underlies all other sections of the Chapter¹⁷⁷. Coastal nations commit themselves to ‘integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction’. The text stresses the need to reach integration (e.g., identifying existing and projected uses and their interactions); promote compatibility and balance of uses; apply preventative and precautionary approaches, including prior assessment and impact studies; and ensure full public participation. Furthermore, the Chapter calls for integrated policy and decision-making processes and institutions.

4.2 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) was inspired by the global community's growing commitment to sustainable development. It represents a huge step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources¹⁷⁸.

From the coastal perspective, an important dimension of the biodiversity regime was formulated during the second Conference of Parties (CoP) in Jakarta, Indonesia, in November 1995. The Jakarta mandate is a program of action for implementing the Convention with respect to coastal and marine biodiversity. It identifies five areas of importance, and requires action by nations having coastal and marine areas. These are; (1) Institute integrated coastal area management; (2) establish and maintain marine protected areas; (3) ensure sustainable use of fisheries and other marine living resources; (4) ensure that mariculture is sustainable; and (5) prevent introduction of, and control or eradicate, harmful alien species¹⁷⁹.

4.3 United Nations Framework Convention on Climate Change (UNFCCC)

¹⁷⁷ = Cicin-Sain, B., and Knecht, RW., (1998). *Integrated Coastal and Ocean Management: Concepts and Practices*, Island Press, Washington D.C, USA

¹⁷⁸ = Ibid

¹⁷⁹ = Ibid

The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself¹⁸⁰.

4.4 Reduced Emissions from Deforestation and Degradation (REDD)

PNG is a founding member of the Coalition for Rainforests global initiative which is a grouping of mainly developing countries that are committed to improving forest protection and reducing deforestation and degradation through the development of global financing mechanisms based on carbon. The REDD initiative seeks to use the development of carbon as a tradable commodity to obtain funds to transform the utilization of forests to allow emissions reduction strategies to increasingly influence forest use decisions.

If effective this initiative could assist developing countries to attract significant foreign investment for carbon offset purposes and to finance other environmental needs (e.g. establishment and maintenance of protected areas). It could also provide major incentives for countries to reform industry development strategies to focus on reforestation and plantation development, and reduce carbon emissions from the extractive use of intact forest. Potential benefit to the marine environment will arise from the reduced levels of land based pollution from major logging activities in the major catchment areas.

5.0 Implementation of UNCED

5.1 Global Environment Facility (GEF)

The GEF is a fund established by the global community to assist developing countries to implement their obligations under the three Rio Conventions, and provides funding to support activities which will lead to the global environment being better protected¹⁸¹. The GEF has recently adopted a new funding model called the Resource Allocation Framework (RAF) for the CBD and the UNFCCC which aims to improve governance arrangements for GEF funds, to target capacity building efforts within developing countries focused on developing sustainable Government led initiatives, and to improve the outcomes being achieved through GEF investments¹⁸².

A key component of the new funding model is the targeting of specific funding allocations to developing countries based on an estimation of a country's potential to support delivery of global environment outcomes. For example, countries which have a high level of CO₂ emissions will have a substantial country specific funding allocation to assist in developing strategies to reduce

¹⁸⁰ =Ibid

¹⁸¹ =<http://www.gef.org/>

¹⁸² =Ibid

emissions. The GEF expects recipient countries to develop long term strategic and sustainable investment strategies for the funds being provided through the RAF¹⁸³.

The new GEF-RAF framework has resulted in PNG being allocated US\$12.5 m for biodiversity conservation and approximately US\$1 m for climate change mitigation activities over the four year period from 2006-2010. The GEF-RAF investment into PNG presents it with a vehicle for advancing global environment objectives within the context of national development policies and programs, including supporting the achievement of the MDG Goals¹⁸⁴.

5.2 UN Agreement on Straddling and Highly Migratory Fish Stocks

To resolve the issue of straddling and highly migratory fish stocks in the northwest Atlantic between fishing countries from Europe with Canada and United States, a post UNCED (Rio Summit) conference on the matter was held under the auspices of the United Nations between April 1993 and August 1995¹⁸⁵.

The result was the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10th December 1982, Related to the Convention and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Agreement).

In one of the most important provisions, it holds that conservation and management measures established for the high seas (beyond EEZ or national fishing zone boundaries), and those adopted for areas under national jurisdiction should be compatible, and that coastal states and states fishing in the high seas shall have a duty to cooperate in the management of straddling stocks and highly migratory species¹⁸⁶. The Agreement calls for the creation and/or strengthening of regional and sub-regional fishery management bodies to be governed in a transparent manner and with appropriate involvement of NGOs¹⁸⁷. Based on this outcome the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was adopted by leaders from the Pacific during the Multilateral High-Level Conference in Honolulu on 5 September 2000 (See regional agreements).

5.3 The UN Commission on Sustainable Development

To regularly monitor progress being made in accomplishing the goals of the Agenda 21, a new institution, the Commission on Sustainable Development was established by the United Nations General Assembly in December 1992, and came into operation in February 1993 under the UN

¹⁸³ = Ibid

¹⁸⁴ = Department of Environment and Conservation, (2007), New Strategic Directions , Papua New Guinea Government

¹⁸⁵ = Ibid

¹⁸⁶ = Cicin-Sain, B (1996) Earth Summit Implementation: Progress since Rio. Marine Policy 20(2):123-143

¹⁸⁷ = Ibid

Economic and Social Council (ECOSOC). The CSD is tasked to ensure the effective follow-up of the decisions of the UNCED conference, including Agenda 21¹⁸⁸.

Annual meetings of the CSD have been held at the UN in New York since 1993 to follow up on progress in specific issue areas. The oceans and coasts issue was reviewed in the 1996 meeting where progress was noted with respect to the Straddling Stocks Agreement, land-based activities affecting the marine environment, and issues of concern to Small Island developing states, and was reviewed again at the 1999 CSD session¹⁸⁹.

A major meeting to assess the progress in implementing Rio decisions after five years (the Earth Summit +5) was held by the UN General Assembly in 1997. At this meeting it was decided to convene a two-day special session in September 1999 to review progress in implementing the Barbados Plan and discuss how the international community can boost action in support of small island nations.

5.4 Barbados Program of Action (BPoA) for the Sustainable Development of Small Island States (SIDS)

The United Nations Conference on the Sustainable Development of Small Islands States, held in Barbados from 25 April to 6 May 1994 adopted the Barbados Programme of Action (BPoA) for the Sustainable Development of Small Islands Developing States (SIDS). The BPoA constitutes specific actions and measures to be taken at the national, regional, and international levels to support the sustainable development of SIDS. The adoption of the BPoA was a concrete step forward for SIDS to implement the sustainable development agenda, adopted at the Rio summit.

The BPoA¹⁹⁰ constitutes 14 priorities areas of critical importance to SIDS, including climate change and sea level rise; natural and environmental disasters; management of wastes; coastal and marine resources; freshwater resources; land resources; energy resources; tourism resources; and biodiversity resources.

The United Nations General Assembly, at its 22nd Special Session in September 1999, devoted two days to review the implementation of the BPoA in SIDS. This Special Session revealed that despite the efforts of SIDS, the international community, especially the developed countries and the donor community have not yet fulfilled their commitments in supporting the SIDS with financial, technical and other resources to implement the BPoA. In light of this, the General Assembly called for the international community to support the SIDS in their efforts to implement BPoA commitments¹⁹¹.

¹⁸⁸ =Ibid

¹⁸⁹ =Ibid

¹⁹⁰ = United Nations General Assembly A/Conf.167/9 Available at <http://www.sidsnet.org/docshare/other/BPOA.pdf>.

¹⁹¹ = Ibid

The review of the BPoA at the international meeting in Mauritius was based on the National Assessment Reports (NARs) of SIDS' implementation of the BPoA, since its adoption 10 years ago. Hence, PNG submitted its NAR as part of this important international review process to further enhance the implementation of the BPoA in SIDS¹⁹².

5.5 World Summit on Sustainable Development (WSSD)

The World Summit on Sustainable Development (WSSD), held in Johannesburg, South Africa from 26 August to 4 September, 2002, drew the world's attention and direct action on meeting difficult challenges, including improving people's lives and conserving our natural resources in a world that is growing in population, with ever-increasing demands for food, water, shelter, sanitation, energy, health services and economic security.

The important outcomes of the summit include two negotiated texts-the Johannesburg Declaration on Sustainable Development and the Plan of Implementation of the WSSD (Johannesburg Plan of Implementation – JPoI) and a number of voluntary partnerships.

The special case of SIDS was reaffirmed and highlighted a series of SIDS-specific issues and concerns in the JPoI. In follow-up to the WSSD, the General Assembly adopted Resolution A/57/262, which called for, *inter alia*, a comprehensive review of the BPoA at an international meeting to be held in Mauritius in 2004. The objective of the International Meeting is to secure renewed political commitment by all countries, by focusing on practical and pragmatic actions for the further implementation of the BPoA through, among other measures, the mobilization of resources and assistance for SIDS.

5.6 Mauritius Strategy (2005-2015)

The Mauritius Strategy for the further development of the Programme of Action for the sustainable development of Small Island Developing States (SIDS) was adopted by 129 countries and territories in the global conference held in Port Louis January 2005¹⁹³.

The strategy covering a decade is the only global development strategy that addresses the unique development problems of Small Island Developing States and sets out the basic principles and specific actions required at the national, regional, and international levels to support sustainable development. The interdependent and mutually reinforcing pillars of sustainable development are economic development, social development, and environment protection¹⁹⁴.

¹⁹² = Government of Papua New Guinea (2004), National Assessment Report, Port Moresby

¹⁹³ = A/CONF.207/CRP.7 Available at http://www.un.org/smallislands2005/pdf/sids_strategy.pdf

¹⁹⁴ = http://www.unescap.org/epoc/L3_inter_reg_n_frameworks.asp#mauritius

The Mauritius Strategy (2005-2015) covers; climate change and sea level rise; natural and environmental disasters; waste management; marine and coastal resources; freshwater resources; land; energy; tourism; biodiversity; transport and communication; science and technology; trade; education; sustainable production and consumption; health; knowledge management; culture; and the need for building capacity to implement sustainable development policies.

5.7 Global Programme of Action on the Protection of the Marine Environment from Land-Based Activities

Land-based activities account for up to 80% of the pollution of the marine environment, but similar to the case of straddling stocks, the controversy surrounding the issue of land-based sources of marine pollution were too large and diverse to be dealt with at UNCED¹⁹⁵. Again UNCED called for a post-UNCED meeting to be arranged by the United Nations Environment Programme (UNEP). The conference was convened by UNEP and hosted by the United States in Washington, D.C from 23 October to 3 November 1995. A Global Programme of Action (GPA) aimed at preventing the degradation of the marine environment from land-based activities was adopted by the meeting, with UNEP designated as the secretariat¹⁹⁶.

The GPA is designed to assist national Governments in taking actions that will lead to the prevention, reduction, and control and /or elimination of the degradation of the marine environment from land-based activities. It identifies nine marine source categories that have the potential for degrading the marine environment: sewage, persistent organic pollutants, radioactivity, heavy metals, oils, nutrients, sediment mobilization, litter/plastics, and physical alterations and destruction of habitats. The GPA specifies national, regional, and international actions that can be taken to control these sources¹⁹⁷.

UNEP prepared a GPA Implementation Plan in 1997 that resulted in a GPA Coordination office being setup in the Netherlands (as host country) and a GPA clearing house to be organized by UNEP. As a first step, UNEP is strengthening its Regional Seas Program as the principle regional element of the GPA. Efforts at the regional level in the Pacific have been spearheaded by SPREP while international NGOs have played significant roles in promoting marine eco-regions within the Pacific.

5.8 International Coral Reef Initiative (ICRI)

The International Coral Reef Initiative (ICRI)¹⁹⁸ is a partnership among Governments, international organizations, and non-Government organizations. It strives to preserve coral reefs

¹⁹⁵ =Ibid

¹⁹⁶ =Document UNEP (OCA)/LBA/IG.2/7 Global Programme of Action for the Protection of the Marine Environment from Land Based Activities. Also at http://www.gpa.unep.org/documents/full_text_of_the_english.pdf

¹⁹⁷ =Ibid

¹⁹⁸ =<http://www.icriforum.org/>

and related ecosystems by implementing Chapter 17 of Agenda 21, and other relevant international conventions and agreements

ICRI directly addresses one of the important issues identified in Chapter 17, Section 17. 86 that calls on states to:

"identify marine ecosystems exhibiting high levels of biodiversity and productivity and other critical habitat areas and should provide necessary limitations on use of these areas, through inter alia, designation of protected areas. Priority should be accorded, as appropriate, to: 1. Coral reef ecosystems; 2. Estuaries; 3 Temperate and tropical wetlands, including mangroves; 4. Seagrass beds; 5. Other spawning and nursery areas."

The International Coral Reef Initiative emerged out of the recognition that the coral reefs and related ecosystems found in tropical and sub-tropical regions are facing serious degradation, primarily due to anthropogenic stresses. Global estimations point that 10 percent of the Earth's coral reefs have already been seriously degraded and a that much greater percentage of coral reefs is under serious threat. Damaged or destroyed reefs can be found in more than 93 countries, with the coral reefs in South and Southeast Asia, East Africa and the Caribbean facing the greatest risk. It has been recognized that, if allowed to continue, this decline is likely to lead to the loss of most of the world's reef resources during the next century.

The international scientific community has been focusing the public attention on the serious decline of reefs for some years. Eventually, the concept of a Coral Reef Initiative to provide a focus on the plight of reefs and on the actions necessary to reverse the trend of degradation emerged at various international fora in 1994. It was founded on the clear recognition that many nations face similar threats to coral reefs and related ecosystems as well as similar management problems.

A Pacific Regional Workshop was coordinated by the South Pacific Regional Environment program (SPREP) in December 1995, in which Pacific Island countries, as a team, developed an ICRI Pacific Regional Action Strategy as well as a Pacific Framework of Action.

Due to funding limitations, only three major activities were implemented under the umbrella of the ICRI Pacific Regional Strategy: (1) Implementation of the 1997 Pacific Year of the Coral Reef; (2) 'Train-the-Trainers' Coral Reef Monitoring and Survey Workshops in support of the Global Coral Reef Monitoring Network (GCRMN); and (3) Development of a Regional Wetland Action Plan.

6.0 Other Biodiversity Conventions governing Marine Species and Ecosystems

6.1 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora)¹⁹⁹ is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival in the wild.

Widespread information nowadays about the endangered status of many prominent marine species, such as sharks, corals, and aquarium fish species, make the need for such a convention obvious. Annually, international wildlife trade is estimated to be worth billions of dollars and to include hundreds of millions of plant and animal specimens. The trade is diverse with the levels of exploitation of some animal and plant species are high. Together with other factors, such as habitat loss, heavily depleted populations can come close to extinction. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future.

Since the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation. PNG signed up to the Convention on 12 December 1975, to regulate the exploitation of its diverse wild flora and fauna. A national implementation law was enacted shortly afterwards, called the *International Trade (Protection) Act*, to enforce the convention.

6.2 Convention on Wetlands of International Importance (Ramsar Convention)

The Convention on Wetlands of International Importance (Ramsar, Iran, 1971) also called the "Ramsar Convention" is an inter-Governmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories²⁰⁰.

Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements, but it works very closely with the other MEAs and is a full partner among the "biodiversity-related cluster" of treaties and agreements. Given the vast wetlands found in PNG and its significant ecological role as staging sites for migratory birds, PNG signed on 16 March 1993.

¹⁹⁹ =Text of the Convention. <http://www.cites.org/eng/disc/text.shtml>.

²⁰⁰ =http://www.ramsar.org/cda/en/ramsar-home/main/ramsar/1_4000_0_

Wetlands by definition include marshes, lakes, lagoons, and intertidal zones most of these habitats are within the close proximity of the coastal marine zones.

The Ramsar Contracting Parties, or 160 Member States, have committed themselves to implementing the “three pillars” of the Convention: (1) to designate suitable wetlands for the List of Wetlands of International Importance (“Ramsar List”) and ensure their effective management; (2) to work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education; (3) and to cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands²⁰¹.

PNG currently has two designated Ramsar sites on the Ramsar list. The Lake Kutubu, which has been known for its high endemic species of fish and pristine lake limnology, while the Tonda Wildlife Management Area, accommodates a diverse array of migratory birds from Australasia and European regions. The Kamiali WMA is the other marine protected area proposed for listing.

6.3 Convention on Migratory Species (CMS)

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention)²⁰² aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an inter-Governmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include over 100 Parties from Africa, Central and South America, Asia, Europe and Oceania. The Convention was signed in 1979 in Bonn (hence the name) and entered into force in 1983.

Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.

Migratory species that need or would significantly benefit from international co-operation are listed in Appendix II of the Convention. For this reason, the Convention encourages the Range States to conclude global or regional Agreements.

In this respect, CMS acts as a framework Convention. The Agreements may range from legally binding treaties (called Agreements) to less formal instruments, such as Memoranda of Understanding, and can be adapted to the requirements of particular regions. The development of

²⁰¹ =Ibid

²⁰² =<http://www.cms.int/>

models tailored according to the conservation needs throughout the migratory range is a unique capacity to CMS.

Several Memoranda of Understanding (MoU) have been concluded to date under the auspices of CMS to which has relevance to PNG as a range state:

- (i) CMS Memoranda of Understanding (MoU) for the conservation of marine turtles, cetaceans, dugongs and sharks²⁰³; and
- (ii) Dugong²⁰⁴

A Secretariat under the auspices of the United Nations Environment Programme (UNEP) provides administrative support to the Convention. It is based in the UN Campus in Bonn, Germany. The decision-making organ of the Convention is the Conference of the Parties (COP). A Standing Committee provides policy and administrative guidance between the regular meetings of the COP. A Scientific Council consisting of experts appointed by individual member States and by the COP gives advice on technical and scientific matters.

6.4 UNESCO World Heritage Convention

The most significant feature of the 1972 World Heritage Convention²⁰⁵ is that it links together the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The Convention is of relevance to PNG because the majority of the people still maintain cultural linkages to nature and the struggle to preserve such culture in the face of a changing society of western influence.

As a party to this Convention, PNG has designated a prehistoric agricultural site currently on the world heritage list. For the marine environment there have been discussions to look into the possibility of a world heritage listing to give more prominence to the protection of some of the unique features of the coral atolls and associated cultural linkages in these places. For example; the Milne Bay Seascape has been submitted to the UNESCO for possible listing as World Heritage Site²⁰⁶. Currently, the responsibility of PNG World Heritage Secretariat is located within the DEC.

B. REGIONAL COMMITMENTS TO OCEAN PLANNING AND MANAGEMENT

1.0 Regional Situation

²⁰³ =http://www.cms.int/news/PRESS/nwPR2010/09_sep/dugong_press_notice.pdf

²⁰⁴ =http://www.cms.int/news/PRESS/nwPR2010/pressrelease/UNEP_CMS_Press_Release_dugongs.pdf

²⁰⁵ =<http://whc.unesco.org/en/about/>

²⁰⁶ =Tentative Lists @ <http://whc.unesco.org/en/tentativelists/state=pg>

For the people from the 22 island States and Territories of South Pacific Region (Figure 8), the sea has always been an integral part of life. The Pacific Ocean provides food, raw materials, transportation, and a source of pride and identity for Pacific Islanders.

Traditional cultures evolved around the uses of the sea and its resources have emphasized wise use and environmental stewardship. However, industrialization, urban drift and rapid population growth threaten the ecosystems that were once largely pristine in nature.

Habitats are rapidly being destroyed by unsustainable logging practices and large scale agriculture, the marine environment is polluted from both sea and land based sources, fish and other marine resources are being over harvested, exotic species are pushing out native biota, and climate change induced sea level rise is threatening to drown low-lying island and coast.

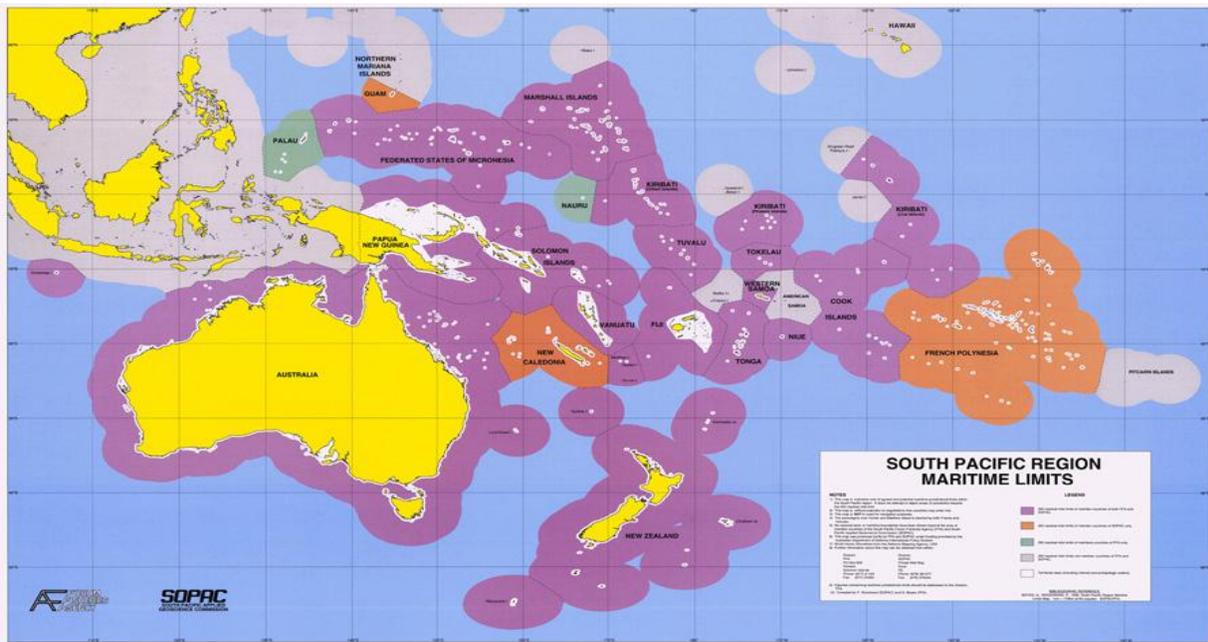


Figure 7.South Pacific Regional Maritime Areas (Source: SOPAC <http://www.sopac.org.fj>)

The Pacific Ocean occupies half of the earth’s sea surface and more than a third of the earth’s surface around 180 million square kilometers. Over 200 high islands and 2500 low islands make up the 22 PICTs²⁰⁷. Though small in terms of land mass with the exception of PNG these PICTs have exclusive rights to the exploitation of nearly 30 million square kilometers of sea area delimited by their EEZ. Pacific Island states have recognized that ocean issues are too overwhelming for states to resolve alone. As such the move to regionalization began in the 1970’s with the establishment of regional bodies to deal with matters of regional interest, of which some are discussed below.

²⁰⁷ = Govan, Hugh (2009; Status and Potential of Locally-managed marine areas in the Pacific Islands Region: Meeting Nature Conservation and Sustainable Livelihood targets through wide-spread implementation of LMMAs. Unpublished

2.0 Key Regional Organizations

2.1 Pacific Islands Forum Secretariat (PIFS)

First established in 1972 as South Pacific Bureau for Economic Cooperation (SPEC), over the years it has grown and changed its focus as well as its name in 2000 to what is now called Pacific Islands Forum Secretariat (PIFS)²⁰⁸.

In the last 38 years the Forum has been serving the political needs of the Pacific Island countries and has been successful in seeing many countries gaining political independence as well as preventing nuclear testing by France in the 1970s, negotiating the Lome Convention with EU, the South Pacific Regional Trade and Cooperation Agreement (SPARTECA) with Australia and New Zealand and supported all Island countries in the deliberations of the UNCLOS.

The Forum was active in promoting the views of the Pacific coastal states in the UNCLOS deliberations in the 1970s which proved extremely vital in the successful negotiations of UNCLOS treaty in 1982. Later on, the Forum was also instrumental in prohibiting the use of Long drift net fishing in the South Pacific.

2.2 South Pacific Regional Environment Program (SPREP)

The formation of the South Pacific Regional Environmental Program (SPREP)²⁰⁹ in 1982 was a direct result of a collective desire emanating from a workshop held earlier in 1969. The 1979 regional workshop emphasized the need to establish a Pacific regional environmental program that will raise awareness among the Pacific SIDS on the importance of responsible management of the environment and the natural resources to the future livelihood and prosperity of the people. In response to that, a regional conservation programme was formed within SPC in 1973, and in 1982 changed into SPREP and was fully independent as a regional organization in 1993.

Following its establishment, SPREP expanded into five (5) main programs of responsibilities which includes the following activities; (1) Terrestrial Ecosystems and Coastal and Marine Ecosystems, (2) Species of Special Interest, (3) People and Institutions (Pacific Futures) which includes the following: (a) Managing Multilateral Environmental Agreements and Regional Coordination Mechanisms, (b) Environment Monitoring and Reporting, (c) Climate Change, Climate Variability, Sea Level Rise and Stratosphere Ozone Depletion, (4) Waste Management and Pollution Control, (5) Environmental Policy and Planning which includes, (a) Integrated Policy, Planning and Partnerships, (b) Human Resources Development and Training, (c) Public Awareness and Education, (d) Knowledge Management.

2.3 South Pacific Geoscience Commission (SOPAC) – (A Division of SPC)

As of January 2011, SOPAC has become a division of the SPC, but still maintains most of its functions.

²⁰⁸ = <http://www.pifsec.org.fj/>

²⁰⁹ = <http://www.sprep.org/>

SOPAC was formed initially as a United Nations Development Programme (UNDP)²¹⁰ aimed specifically at promoting research on offshore mineral and petroleum. Over the years SOPAC has expanded its areas of coverage to include water and sanitation and disaster reduction. A notable component of SOPAC is its offshore research capacity, which has assisted Pacific SIDS who qualifies to a possible claim to the extended continental shelf.

In addition, SOPAC also support the investigation of natural systems and management of vulnerability through applied geosciences. In that capacity, SOPAC has developed a specific arm called ‘Disaster Reduction’ which focuses on strengthening resilience, and mitigating the effects of tropical cyclones, Tsunamis, floods and earthquakes. The ‘ocean and islands’ component tries to find ways in resources use solutions, monitoring physical and chemical changes of the oceans and ocean governance in general.

PNG has benefited from the assistance provided by SOPAC in developing sea bed mining guidelines, deep sea tailings placement guidelines, archipelagic baseline survey and disaster risk assessments.

2.4 South Pacific Forum Fisheries Agency (FFA).

The South Pacific Forum Fisheries Agency was formed in 1979, in response to the Pacific SIDS’s desire to effectively enforce their rights over the tuna fisheries within their EEZ accorded by the Law of the Sea Convention. Having realized the need to effectively enforce their jurisdictional rights over the EEZ, they also realized that equally, they also need to enforce their responsibilities to manage those trans-boundary resources. With that realization, the FFA member countries²¹¹ desired to promote regional cooperation and coordination in respect of fisheries development, management and conservation. As stated explicitly in the FFA Strategic Plan 2005-2020 that the FFA’s Corporate Mission²¹² is:

“To enable Member Countries to manage, conserve and use the tuna resources in their EEZ and beyond, through enhancing national capacity and strengthening regional solidarity”.

The FFA strengthens national capacity and regional solidarity so its 17 members can manage, control and develop their tuna fisheries now and in the future by providing expertise, technical assistance and other support to its members who make sovereign decisions about their tuna resources and participate in regional decision making on tuna management through agencies such as the Western and Central Pacific Fisheries Commission (WCPFC).

2.5 Secretariat of the Pacific Community (SPC)

²¹⁰ = <http://www.sopac.org/index.php/sopac-programmes>

²¹¹ = 17 Pacific Island members are; Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, PNG, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu.

²¹² = FFA Strategic Plan 2005-2020. Available at http://www.ffa.int/system/files/%252Fhome/ffa/FFA_Strategic%20Plan.pdf

The Secretariat of the Pacific Community (SPC) was the first regional organization formed in the Pacific by the colonial powers in 1947. SPC's origin during the colonial era of many Pacific island countries has attracted the largest membership of all regional organizations in the region, and now has a total of twenty six members²¹³.

An important characteristic of SPC is its non-political orientation, which shifted the attention of the organization since formation to socio-economic development of the Pacific SIDS. Its focus is on land and forestry resources development, marine and ocean resources development and human demography, and culture. As mentioned before, SOPAC is now a division of SPC.

Apart from its involvement in land and forestry development, SPC has developed a strong marine arm which currently supports coastal fisheries, oceanic fisheries and a regional maritime program. The scientific fisheries focus of SPC has been very useful indeed for the Pacific SIDS Island in terms of stock assessments of the highly migratory tuna and tuna related species both within the EEZ and beyond, and in that capacity has been able to provide scientific advice to the Pacific SIDS for regional tuna management and development purposes. At present, SPC, among other things, is the chief fisheries scientific body, providing timely scientific advice on the status of all fisheries stocks in the western central Pacific region.

2.6 Western and Central Pacific Fisheries Commission (WCPFC)

The WCPF Convention draws on many of the provisions of the UN Fish Stocks Agreement (UNFSA) while, at the same time, reflecting the special political, socio-economic, geographical and environmental characteristics of the Western and Central Pacific Ocean (WCPO) region. The WCPFC²¹⁴ aims to address problems in the management of high seas fisheries resulting from unregulated fishing, over-capitalization, excessive fleet capacity, vessel re-flagging to escape controls, insufficiently selective gear, unreliable databases and insufficient multilateral cooperation in respect to conservation and management of highly migratory fish stocks. A framework for the participation of fishing entities in the Commission which legally binds fishing entities to the provisions of the Convention, participation by territories and possessions in the work of the Commission, recognition of special requirements of developing States, and cooperation with other Regional Fisheries Management Organizations (RFMO) whose respective areas of competence overlap with the WCPFC reflect the unique geo-political environment in which the Commission operates.

The Commission supports three subsidiary bodies; the Scientific Committee, Technical and Compliance Committee, and the Northern Committee, that each meet once during each year. The meetings of the subsidiary bodies are followed by a full session of the Commission. The work of the Commission is assisted by a Finance and Administration Committee.

²¹³ = 22 Pacific SIDS, Australia, France, USA, and New Zealand. Available at <http://www.spc.int/>

²¹⁴ = <http://www.wcpfc.int/>

3.0. Overarching Regional Development Plans and Strategies

3.1 The Pacific Plan

Through the Pacific Plan the Pacific Island Forum Leaders have proposed a new and innovative response to many of the unique challenges that Pacific Island Countries face through a framework of greater regional cooperation and integration²¹⁵.

To progress development across the region a number of core initiatives have been identified in the Pacific Plan. These initiatives have been developed around four ‘pillars.’ Each pillar: economic growth; sustainable development; good governance; and security, represents in many respects the key challenges that the Pacific as a region must work to address should it be able to raise living standards, increase access to opportunity and stimulate economic growth for the peoples of the Pacific.

The Pacific Plan is based on the concept of regionalism: that is, countries working together for their joint and individual benefit. Regionalism under the Pacific Plan does not imply any limitation on national sovereignty. It is not intended to replace any national programs, only to support and complement them. A regional approach should be taken only if it enhances national efforts.

On a global perspective the Pacific Plan reflects the region’s priorities which are in line with and support the implementation of international frameworks such as the BPoA and The Mauritius Strategy of Implementation. As such, the Pacific Plan provides a solid platform for regional cooperation guiding collective positions through the Commission on Sustainable Development and other international forums that advocate the ‘special case’ of Small Island Developing States (SIDS). The collective position of Pacific Islands Forum members in the international arena is a significant tool in garnering support for Pacific Island Countries individually and as a group and is recognized and valued by other United Nation members.

3.2 Pacific Islands Regional Ocean Policy (PIROP)

The CROP Marine Sector Working Group at the direction of the Pacific Islands Forum, worked for over two years to develop a Pacific Islands Regional Ocean Policy. The Thirty-Third Pacific Islands Forum (held in Suva, Fiji, August 2002), adopted the Policy. A Pacific Islands Regional Ocean Forum (PIROF) was held in Suva in February 2004 to develop an implementation framework for the Ocean Policy²¹⁶.

The development process of the Pacific Regional Oceans Policy (PIROF) grew out of a strong desire for improvement in the management of the region’s ocean resources at the regional level. Specifically, the driving objective behind the process was the need for stronger cooperation among regional entities operating in the Pacific region in assisting member countries implements UNCLOS.

²¹⁵ =Auckland Declaration 2004 <http://www.pifsecretariat>

²¹⁶ = www.piocean.org

Between 2001 and 2002 a comprehensive consultation was undertaken by the Marine Sector Working Group (MSWG) of CROP and a regional ocean policy framework was drafted and was endorsed at the 33rd Pacific Forum. The PIROF official document highlighted the main set of principles for governing the Pacific Ocean by the Pacific SIDS, giving top priority to;

- (i) Improving the understanding of the oceans;
- (ii) Sustainably developing and managing the use of ocean resources;
- (iii) Maintaining the health of the oceans;
- (iv) Promoting the peaceful use of the ocean; and
- (v) Creating partnerships and promote cooperation

3.3 Council of Regional Organizations in the Pacific (CROP)

The Forum Leaders established the Council of Regional Organizations of the Pacific, CROP (formerly the South Pacific Organizations Coordinating Committee, SPOCC) in 1988 with the mandate to improve cooperation, coordination, and collaboration among the various inter-Governmental regional organizations to work toward achieving the common goal of sustainable development in the Pacific region. CROP comprises the heads of the inter-Governmental regional organizations in the Pacific.

Secretary General of the Forum Secretariat was mandated during the 1995 Forum to be the permanent chair of CROP, a decision reaffirmed at the Special Leaders' Retreat in April 2004. Leaders also mandated the 'coordination role' of CROP to the Secretary General who then reports to Leaders on CROP matters.

CROP functions as²¹⁷ (i) a coordination mechanism between the heads of the regional organizations in the Pacific, and (ii) a high-level advisory body, to provide policy advice and may assist in facilitating policy formulation at national, regional and international level. CROP provides a forum to enable CROP heads to collectively review progress with their respective organizations' contributions on the Pacific Plan.

CROP takes advantage of opportunities to pool and share expertise and resources to optimize benefits to member countries and territories. Where CROP sees the need, it establishes specific working groups with clear terms of reference to address important emerging or on-going priority issues of a cross-cutting nature

CROP membership which comprises all the major regional organizations in the Pacific has the potential of producing best advices to the Forum leaders should its decisions be kept clear of politics. Its members are highly specialized agencies including; Forum Fisheries Agency (FFA); Pacific Islands Forum Secretariat (PIFS); Secretariat of the Pacific Community (SPC); Secretariat of the Pacific Regional Environment Programme (SPREP); South Pacific Applied Geoscience Commission (SOPAC); South Pacific Tourism Organization (SPTO); and University of the South Pacific (USP).

²¹⁷ =Ibid

4.0 Regional Fisheries Agreements

4.1 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

The objective of the Western Pacific Fisheries Convention, which entered into force in 2004, is to promote the conservation and sustainable use of highly migratory fish stocks in the western and Central Pacific Ocean, in accordance with the 1982 United Nations Convention on the Law of the Sea and the 1995 UN Fish Stocks Agreement²¹⁸.

The Convention was adopted in Honolulu on 5 September 2000. It is one of the first regional fisheries agreements to be adopted since the conclusion in 1995 of “The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982, relating to the Conservation and Management of Straddling Fish Stock and Highly Migratory Fish Stocks” (the Agreement).

One of the most important provisions of the Agreement is that conservation and management measures must be established for high seas; and those adopted for areas under national jurisdiction should be compatible, and that coastal states and states fishing in the high seas shall have a duty to cooperate in the management of straddling stocks and highly migratory species²¹⁹. In accordance with the Agreement and UNCLOS, the Convention’s objective is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean.

For this purpose, this Convention establishes a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The Contracting Parties to the Convention are *ips facto*, members of the Commission.

The convention incorporate ‘principles and measures for responsible and sustainable fisheries management, and addressed the biological unity of the stocks and provides a framework for cooperation between states, and defining and elaborating their legal rights, duties and responsibilities.

4.2 1982 Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest:

A sub-regional agreement among the eight Pacific States whose waters account for the majority of the region’s tuna catch²²⁰. The agreement is on terms and conditions for tuna purse seine fishing licenses in the region. The parties to the Nauru Agreement are; Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, PNG, Solomon Islands, and Tuvalu.

4.3 1989 Wellington Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific:

²¹⁸ = <http://www.wcpfc.org/>

²¹⁹ = Ibid

²²⁰ = www.oceanlaw.net/texts/nauru.htm

This Convention was negotiated as part of the global response to concerns over the rapid expansion of fishing for albacore tuna in the Atlantic, Pacific and Indian Oceans by Japanese, Korean and Taiwanese driftnet fleets in the 1980s.²²¹

4.4 1992 Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery:

The Parties to the Nauru Agreement negotiated the Palau Arrangement in the early 1990s in response to a rapid expansion of purse seine fishing effort in the region and concerns over the impact of purse seine fishing on juvenile yellow fin and bigeye tuna²²².

4.5 1992 Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region:

The Niue Treaty, based on Article 73 of UNCLOS, was negotiated to promote the optimum utilization of limited fisheries surveillance and fisheries law enforcement resources in the Pacific Islands region²²³.

5.0 Regional Conservation Strategies

5.1 1990 Apia Convention on Conservation of Nature in the South Pacific

The Apia Convention was negotiated in the mid-1970s to support national and regional action for the conservation, utilization and development of the natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations. The Convention prescribes the establishment and maintenance of national parks, protected areas and reserves to protect indigenous flora and fauna²²⁴.

5.2 Action Strategy for Nature Conservation and Protected Areas in the Pacific Region 2008-2012

The Strategy charts a course for conservation practice in the Pacific. The purpose of the document is to provide focus and strategy for concerted conservation action. It encourages coordination and cooperation around Pacific priorities that address a spectrum of issues from grassroots through national and to regional levels. It provides context for individual action to be framed in terms of contribution to a holistic Strategy. The document, and the wealth of experience that informed its development, represents knowledge of best Pacific practice in the field of nature conservation.

²²¹ = www.oceanlaw.net/texts/wellington.htm

²²² = www.spc.int/oceanfish/html/sctb/sctb14/FT5_Opnai_Clark.pdf

²²³ = www.oceanlaw.net/texts/niue.htm

²²⁴ = <http://www.spc.org.nc/coastfish/Asides/conventions/apia.htm>

The underlying theme of the Strategy is ‘Empowering people, communities and institutions’ runs extensively throughout the document. It includes specific recommendations on how conservation can best serve communities in the Pacific, drawn from 400+ contributors at the 8th Pacific Island Conference on Nature Conservation and Protected Areas, Alotau, PNG, 22-26 October 2007.

6.0 Regional Marine Pollution Strategies and Plans

6.1 1986 Convention for the Protection of the Natural Resources and Environment of the Pacific Islands Region and Associated Protocols (Nouméa Convention):

At the time of its adoption, the Convention and its two protocols provided a comprehensive umbrella agreement for the protection, management and development of the marine and coastal environment of the Pacific Islands region.

6.2 1986 Action Plan for Managing the Natural Resources and Environment of the South Pacific Region:

SPREP was established in 1982 as a programme of SPC. It was accorded formal legal status as an autonomous regional organization in 1993 under the Agreement Establishing SPREP. The Action Plan entered into force in 1995²²⁵.

6.3 1995 Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and the Control of the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (The Waigani Convention):

The main purpose of the Waigani Convention is to ban the importation of hazardous and radioactive wastes from outside the Pacific Islands region. The Convention also ensures that any transboundary movements of hazardous wastes within the Convention Area are undertaken in a controlled and environmentally sound manner. SPREP is the Secretariat for the Convention.

C. BILATERAL MARITIME BORDER AGREEMENTS

PNG entered into agreement with four sovereign nations regarding its maritime borders. With Australia in December, 1978, Indonesia in December 1980, Solomon Islands in January 1989, and with Federated States of Micronesia in 1991 (Figure 9).

²²⁵ = www.sprep.org.ws

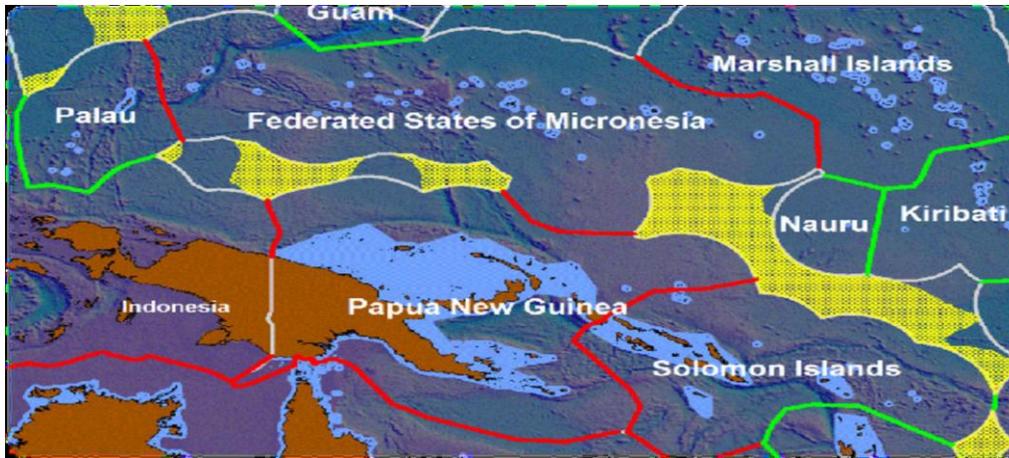


Figure 8. Maritime Boundaries of PNG (Source: Modified from SOPAC)

1.0 Torres Strait Bilateral Treaty (PNG/Australia)

The Treaty between Australia and PNG concerning matters of sovereignty and maritime boundaries in the area known as the Torres Strait, and related matters, is commonly known as the "Torres Strait Treaty"²²⁶. The Treaty was needed to remove all doubts about the boundaries straight after PNG gained independence from Australia in 1975.

There are two main boundaries specified in the treaty are:

i) Seabed Jurisdiction Line (shown by an unbroken line on the map) – (Figure 10)

Australia has rights to all things on or below the seabed south of this line and PNG has the same rights north of the line.

ii) Fisheries Jurisdiction Line (shown by a broken line on the map) – (Figure 10)

Australia has rights over swimming fish south of this line and PNG has the same rights north of the line. The two countries have agreed under the Treaty to share these rights.

²²⁶ = The Treaty was signed in December 1978 and entered into force in February 1985. It defines the border between Australia and PNG and provides a framework for the management of the common border area. The agreement describes the boundaries between the two countries and how the sea area may be used.

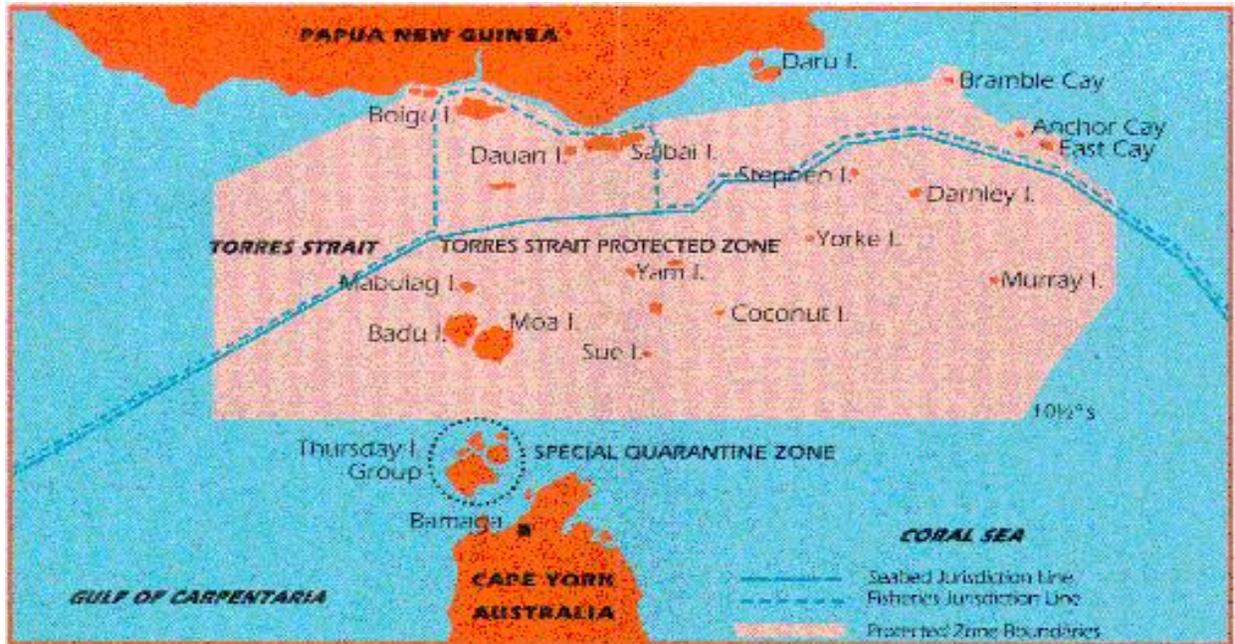


Figure 9: Boundary delimitation of the Torres Strait Protected Zone (Source: http://www.dfat.gov.au/geo/torres_strait/index.html)

The Seabed Jurisdiction line is the main boundary between Australia and PNG as far as islands are concerned. However, the following islands which lie north of that line also belong to Australia: Anchor Cay, Aubusi Island, Black Rocks, Boigu Island, Bramble Cay, Dauan Island, Deliverance Island, East Cay, Kaumag Island, Kerr Islet, Moimi Island, Pearce Cay, Saibai Island, Turnagain Island and Turu Cay.

Australian islands north of the Seabed Jurisdiction line also have their own territorial seas of three nautical miles unless otherwise specified in the Treaty.

The Torres Strait Protected Zone (TSPZ) is an area recognized by both countries as needing special attention. The area is shaded on the map (Figure 10). The main reason for the Protected Zone is so that Torres Strait Islanders and the coastal people of PNG can carry on their traditional way of life. For example, traditional people from both countries may move freely (without passports or visas) for traditional activities in the Protected Zone.

The formation of the Protected Zone has also helped to preserve and protect the land, sea and air of the Torres Strait, including the native plant and animal life. A special provision of the Treaty allows free movement between Australia and PNG for traditional activities in the Protected Zone and nearby areas. This is only for Torres Strait Islanders and for coastal people from PNG who live in and keep the traditions of the region.

Torres Strait Islanders are allowed to travel north into PNG as far as the 9 degrees South latitude line just north of Daru. They are also allowed to visit Parama Island and the villages of Sui and

Sewerimabu. Vice versa traditional inhabitants from the nominated thirteen PNG coastal villages are allowed to travel south into Australia as far as the 10 degrees 30 minutes South latitude line near Number One Reef.

1.1 Consultative Mechanisms

There are a number of consultative mechanisms in place to progress the implementation of the Treaty. These are:

(i) Traditional Inhabitants Meeting (TIM);

As part of the liaison arrangements under the Torres Strait Treaty²²⁷ and the Government's obligation to keep Traditional Inhabitants informed of relevant developments in (and in the vicinity of) the Protected Zone, the Traditional Inhabitants Meeting (TIM) was formed. This is a forum for traditional inhabitants of both countries to discuss issues and activity in the region, and report concerns to Government through their Treaty Liaison Officer.

(ii) Treaty Liaison Meeting (TLM)

Treaty Liaison Meetings, chaired by the Torres Strait Treaty Liaison Officer and PNG Border Liaison Officer, are also conducted and attended by agencies involved in the implementation of the Treaty (Commonwealth, State and Local) represented in the region, together with a PNG delegation. Meetings are held alternately in Australia and PNG and its main purpose is to address issues raised at the TIM and other Treaty related matters such as free movement implementation, illegal activity, customs and police matters, health, environment, quarantine and fisheries.

(iii) Joint Advisory Council (JAC)

The JAC was established under Article 19 of the Treaty as an advisory body of Australian and PNG officials, together with traditional inhabitant representatives. Meetings are held alternately in Australia and PNG. The functions of the JAC are to seek solutions to problems arising at the local level that are not resolved by the Torres Strait Treaty Liaison Officer and the PNG Border Officer located on Thursday Island and Daru respectively consider and make recommendations to the Parties on any developments or proposals which might affect the protection of the traditional way of life and livelihood of the traditional inhabitants, their free movement, performance of traditional activities and exercise of traditional customary rights review from time to time as necessary, and to report and to make recommendations to the Parties on any matters relevant to the effective implementation of this Treaty, including the provisions relating to the protection and preservation of the marine environment, and fauna and flora in and in the vicinity of the Protected Zone.

²²⁷ = Torres Strait Treaty, Article 18: 2(a), 3(a)+(b), Available at http://www.dfat.gov.au/geo/torres_strait/

In the exercise of its functions, the Council is required to ensure that the traditional inhabitants are consulted and given full and timely opportunity to comment on matters of concern to them, and that their views are conveyed in the Council's reports and recommendations. The Council is required to transmit its report and recommendations to the Foreign Ministers of Australia and PNG respectively.

1.2 Shared Management of the Rock Lobster Fishery

Most commercial fishing for tropical rock lobster (*Panulirus ornatus*) occurs on the northern Warrior Reefs (Silver, Wapa & Kokope Reefs) of Torres Strait Protected Zone (TSPZ). The lobster fishery forms part of the same stock shared with Australia. The fishery provides a major source of income for inhabitants of Daru and the surrounding coastal villages.

The lobster fishery²²⁸ in the Torres Strait is one of the six fisheries managed under Article 22 of the Torres Strait Treaty, which was ratified between PNG and Australia in 1985. The Treaty's main objective is to preserve the fishery for traditional inhabitants of Torres Strait. There is limited entry for non-traditional inhabitants and expansion is strictly reserved for traditional inhabitants. A limit of 7 licensed freezer vessels are allowed to operate in the fishery at any one time. A catch sharing agreement with Australia allows PNG divers to catch 25 % share from Australian side of the TSPZ. To conserve the breeding populations, a ban on trawling for lobsters in both Australia and PNG waters was imposed in 1984.

1.3 Management of Dugong and Turtle Fisheries

Hunting for turtle and dugong is important in Torres Strait Islander culture as well as being a major source of protein in Islanders' diet. Dugong and turtle may only be taken in the course of traditional fishing and used for traditional purposes. Turtles are taken in all areas of the Torres Strait while dugongs are caught mainly in the western region.

Management objectives for the Torres Strait Turtle and Dugong Fisheries are to:

- (i) promote the conservation of turtle and dugong stocks; and
- (ii) restrict the taking of dugongs and turtles to Traditional Inhabitants fishing for traditional purposes.

²²⁸ = The Torres Strait and Western Province tropical rock lobster Fishery Management Plan is prepared in accordance with the *Fisheries Management Act 1998* and the *Fisheries (Torres Strait Protected Zone) Act 1984*, Chapter 411. The plan is to be interpreted in accordance with Section 2, *Fisheries Management Act 1998*, Part 1.1, *Fisheries Management Regulations 2000*, the *Fisheries (Torres Strait Protected Zone) Act 1984*, Chapter 411 and Articles 22 and 23 of the Torres Strait Treaty.

Only traditional inhabitants of the Torres Strait and PNG Treaty villages are allowed to take dugongs or turtles. Regulations currently implemented in the Torres Strait Dugong and Turtle Fisheries include:

- (i) Dugongs and turtles may only be taken by traditional inhabitants;
- (ii) Dugongs may only be taken using the traditional gear (spear);
- (iii) Dugong hunting is banned in a large area of western Torres Strait which has been set aside as a dugong sanctuary (Maza WMA); and
- (iv) Dugongs and turtles cannot be taken or carried in a commercially licenced fishing boat greater than 6m in length (boats less than 6m with a Torres Island Boat licence are permitted to take and carry turtle and dugong).

2.0 PNG/Indonesia Boundary

The agreement between the Government of Indonesia and the Government of PNG Concerning the Maritime Boundary between the Republic of Indonesia and PNG and Cooperation on related Matters, was signed by both parties on 13 December 1980.

At the diplomatic level both countries maintain regular Joint Border Committee Meetings on issues concerning both countries. The two countries have set out principles in managing relations along the border under the agreement which include provisions for border crossing privileges for traditional inhabitants.

3.0 PNG/Solomon Islands Boundary

The Treaty between the PNG and Solomon Islands Concerning Sovereignty, Maritime and Seabed Boundaries between the Two Countries, and Cooperation on Related Matters was signed on 25 January 1989.

The text of the treaty sets out a north-south boundary that is approximately 1000 nautical miles long and is composed of two a single straight-line segment defined by two individual coordinate points. The boundary passes through the Bougainville Strait and the Solomon Sea. The boundary represents a modified equidistant line between PNG and the Solomon Islands. The southern coordinate point is the tripoint with Australia (Figure 10).

In 1994, the two countries signed another treaty that set out principles in managing relations along the border, including provisions for border crossing privileges for traditional inhabitants of the islands nearest to the maritime boundary.

The need now is for technical officers and officials of both countries to check the agreement and revisit the agreed coordinates and to establish standard base points and maps to be used for formal maritime boundary negotiations.

At the recent "4th Joint Border Meeting" in Gizo, Western Province 28 October 2010, Senior Officials from both countries discussed a number of bilateral and common border issues between the two countries²²⁹. Treaty and issues of concern that were not signed previously were reviewed including Basic Border Arrangement, Treaties on Sovereignty, Maritime Boundary Arrangement as well as an MOU of Joint Border Meetings. It was resolved that officials are to recommend to their Governments to ratify the Agreements and Treaties for the advancement of the treaties and also management of the SI-PNG Border.

4.0 PNG/ Federated States of Micronesia (FSM)

Maritime border agreement with FSM for areas to the north east of PNG was made in 1991. Since both countries don't have islands close to the border, the agreement was straight forward. In regards to joint fisheries management efforts both countries are parties to the Nauru and FSM Agreements.

In May 2009, the FSM, PNG and the Solomon Islands jointly submitted to the Commission on the Limits of the Continental Shelf, in accordance with UNCLOS, information on the limits of the continental shelf beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured concerning the Ontong Java Plateau²³⁰.

D. CONCLUSIONS

On the global perspective all UNCED agreements provides the overall guidance to integrated management and precautionary approaches, while UNCLOS provides the legal basis for states to apply principles of sustainable development in areas of their national jurisdiction.

At the regional level PNG is part of the Pacific Ocean and therefore must ensure that actions within its jurisdiction do not compromise its neighboring states. Therefore, PNG has signed up to many regional agreements on fisheries, conservation, and pollution which PNG is obligated to at the national level. This further amplifies the need for an integrated management approach to be undertaken by PNG for areas within its national jurisdiction.

Bilateral agreements between PNG and its immediate bordering state is very important to ensure that both countries recognize each other's sovereignty and take diplomatic steps to ease any problems that may arise regarding use of marine resources. A good example is the joint

²²⁹ = Islands Business (Fri, 29 Oct, 2010), Solomon Islands and PNG Border Talks End, Also at http://www.islandsbusiness.com/news/index_dynamic/containerNameToReplace=MiddleMiddle/focusModuleID=130/focusContentID=21275/tableName=mediaRelease/overrideSk

²³⁰ = Joint Taskforce of the Ontong Java Plateau Technical Team (2009), Ontong Java Plateau MOU Signed by Federated States of Micronesia, Papua New Guinea and Solomon Islands, March 11, 2009, Port Moresby (PNG)

submission to the Commission on the Limits of the Continental Shelf with Solomon Islands and FSM on the Ontong Java Plateau. Currently, the Torres Strait Treaty remains an effective management approach undertaken in the region despite enforcement constraints on the PNG side.

PART FOUR

NATIONAL IMPLEMENTATION PROGRAMS ON SUSTAINABLE MARINE ENVIRONMENT

A number of important government agencies responsible for different aspects of the marine environment and maritime resources are discussed here to highlight their role and to link their actions towards global and regional actions. These identified key organizations will eventually play an important role in the overall integrated marine policy.

A. KEY NATIONAL INSTITUTIONS DEALING WITH MARINE ENVIRONMENT AND MARITIME RESOURCES

1.0 Department of Environment and Conservation

PNG's diverse natural environment is managed by the DEC²³¹ whose primary role is to maintain its strategic focus by helping address environmental issues arising from natural resource development, environmental impact assessment, environment protection measures, water resource management, compliance and enforcement of environment regulations, conservation of biodiversity, and now climate change.

In regards to marine environment matters, the DEC's responsibilities cover two clear areas: marine environment protection and conservation and management of marine biodiversity and ecosystems including threaten species (Table 6).

Table 11. Summary of Legislations administered by DEC

Legislation	Area of Governance	Implementation Strategy
<i>Fauna (Protection and Control) Act (1982)</i>	Marine Biodiversity (ecosystem, species, genes)	Establishment of Marine Protected Areas Designation of Protected Species Status
<i>Conservation Areas Act (1978)</i>	Marine Ecosystem Management under Conservation Area system	Establishment and Management of Conservation Areas
<i>National Parks Act (1982)</i>	Marine Biodiversity Protection under Parks system	Establishment of Provincial and National Marine Parks

²³¹ = Department of Environment and Conservation. (2009), Corporate Plan 2009 – 2010, Waigani, Port Moresby

<i>International Trade (Protection and Control) Act (1979)</i>	Protection of Threaten Species	CITES Management Authority <ul style="list-style-type: none"> • Permitting and Licensing system
<i>Environment Act 2000</i>	Marine Environment Protection	<ul style="list-style-type: none"> • Environment Permits • Regulations • Waste Management Plans

(Source: This author)

Through DEC, the Government is pushing not only to protect and preserve the environment, but to apply the techniques of ‘sustainability’ for all its development projects and programs. This is in line with the Millennium Development Goal 7, which aims to ensure environmental sustainability by integrating the principles of sustainable development into country policies and programs.

To effectively address such issues, DEC formulated the Environmentally Sustainable Economic Growth Policy (ESEG), for economic sectors to develop policy initiatives to ensure that environmental issues were considered and appropriate precautionary measures taken.

The DEC administers the following legislations relevant to the protection of marine environment and sustainable use of marine biodiversity:

Environment Act 2000

The Act amalgamates the three former environment protection legislation²³² that deals with protection of the environment into a single Act of Parliament that regulates discharges to the air, land and water including controlling the level of noise emissions. The basic philosophy of the Act is one of preventing pollution and environmental damage by setting appropriate ambient environmental quality objectives and regulating activities in order to achieve them.

The environmental regulatory framework under the *Environment Act 2000*²³³ provides a significant step forward in the way in which the environment in PNG would be managed and protected. Environmental quality within each segment of the environment would be defined by establishing the characteristics of the natural environment and the values that it supports. Where environmental quality has been modified as a result of anthropogenic input, the existing *status quo* would be appraised before deciding, with inputs from relevant stakeholders, the level of protection that can be offered to protect certain environmental values but to forego others due to the level of impact.

²³² = *Environment Act (2000)* amalgamates three former environment acts; *Water Resources Act 1982*, *Environment Planning Act 1978* and the *Environmental Contamination Act 1978*

²³³ = Department of Environment and Conservation. (2004a). *Environment Act 2000 Operational Manual*, Port Moresby:

The Act also provides the legal basis for the establishment of a range of mechanisms for the protection and management of the environment, including –

(a) Regulations.

Five Regulations have been developed under the Act and includes: *Environment (Permits & Transitional) Regulation*, *Environment (Prescribed Activities) Regulation*, *Environment (Fees & Charges) Regulation*, *Environment (Water Quality Criteria) Regulation* and *Environment (Procedures) Regulation*. The requirements in each of the Regulation, apart from *Environment (Procedures) Regulation*, are specific for a variety of pollution control purposes.

(b) Environment Permit.

The permitting process would enable DEC to have direct control of activities that may impact on the environment. The permit is a tool that is employed by the Department to have an early input into the design of a project to ensure that the overall objectives of the *Environment Act* would be complied with. Specific discharge conditions are also incorporated into the permit to ensure that those objectives will be met.

(c) Enforcement.

Enforcement tools available under the Act include issuance of notices in situations where an environmental problem has occurred or is likely to occur. Depending on the nature of the problem, the appropriate notice is served on the person who is effectively in charge of the premises requiring an evasive action or clean up after an incident has occurred. On the whole, the regulatory framework will enable DEC to effectively discharge its statutory responsibilities in ensuring that activities with potential for causing environmental harm are adequately regulated in order to promote sustainable socioeconomic developments while protecting and maintaining environmental quality.

This Act is cross referenced in all resource development acts, like: *Mining Act*, *Oil and Gas Act*, *Forestry Act*, *Fisheries Management Act*, *Lands Act*, and *Agriculture and Livestock Act*.

Fauna (Protection and Control) Act, (1982)

This is the principle species-based Act implemented by DEC which provides for mechanisms to protect and control the commercial exploitation for international trade. The Act provides for fauna protection by listing them as Protected Fauna and can be managed in Protected Areas, Sanctuaries, and Wildlife Management Areas (WMAs) by independent WMA Committees. The Act is cross referenced to the *International Trade (Fauna and Flora) Act*. It is also the principle Act for the *Crocodile Trade (Protection and Control) Act*. Unfortunately this Act is flawed from a biodiversity conservation perspective because it is restricted to fauna.

The *Fauna Act* provides for the protection of fauna in areas under customary tenure, through the establishment of Wildlife Management Areas. These WMAs constitute the overwhelming majority of the protected area network by number and by area. WMAs are generally used by

local communities to assist them in managing their hunting, fishing and subsistence resources.

National Parks Act, (1982)

This Act provides mechanisms for DEC on behalf of the State to manage and control ‘Parks and Reserves’ including scenic areas, cultural sites and historical sites. Provisions of the *Lands Act* (1997) can also be applied to acquire customary lands and resources for the State to manage. This Act has its own weakness in that it applies only to State land.

The *National Parks Act* provides for the protection of areas for various purposes, including recreation, biological conservation and cultural conservation. Protected area established under this act may only be established on land that is owned by the national Government, and their ongoing management is the responsibility of the national Government.

Conservation Areas Act, Chapter No. 362 (1978)

This Act provides the mechanism for the management and control of resources in ‘conservation areas’ through Management Plans submitted by the Conservation Areas Management Committee (CAMC). The Act in principle enables commercial development projects and activities to be included and binds the State, resource owners and communities and developers through the Management Plan. This Act is the appropriate law through which the issue of sustainable use can be effectively piloted.

The *Conservation Areas Act* is intended to provide protection of areas under customary tenure, specifically for the purpose of biodiversity conservation, by the establishment of Conservation Areas.

International Trade (Fauna and Flora) Act (1979)

This is the act that enables the implementation of the Convention on International Trade in Endangered Species (CITES). PNG ratified the convention in 1976, which regulates the trade of wild fauna and flora species, based on the listing of species in the three Appendices. The Wildlife Trade and Enforcement Branch (WTEB) of the DEC undertake this responsibility.

The Act allows for the establishment of the CITES Management Authority which is the Wildlife Trade Enforcement Branch, that makes decisions based on scientific advice from Scientific Authorities. The roles of the Scientific Authorities through NEC decision have been delegated to competent national agencies dealing with each taxon group. The NFA is the Scientific Authority on Marine Fish and other species, PNGFA on forest Resources, National Botanical Gardens on orchids, PNG Insect Farming and Trading Agency on Insects, and DEC on Mammals, Reptiles and Birds²³⁴.

Crocodile Trade (Protection) Act (1974)

²³⁴ = Sine, R (2007). Overview of CITES Management in Papua New Guinea, Department of Environment & Conservation, Waigani, Unpublished Report

This act was enacted in 1974 but did not become operational until 1980 when the regulations were enacted.

The purpose of the act is to regulate trade in crocodiles so as to ensure the sustainability of the resource and maximize returns to resource owners. The establishment of the National Crocodile Management Plan²³⁵ is in line with the act and is aimed at;

- (i) Preventing commercial trade of breeding adults by limiting allowable belly width of harvested skins;
- (ii) Preventing commercial trading of immature adults to encourage ranching (adding value by allowing maturation before harvesting); and
- (iii) Regulating the number of people in the industry by licensing the taking, buying and exporting of crocodiles.

The current monitoring program undertaken by the DEC to monitor wild crocodile population supports the continued harvest of crocodiles from the wild.

2.0 Office of Climate Change & Environment Sustainability (OCCES)

The Office of Climate Change and Environment Sustainability (OCCES) addresses climate change issues in collaboration with international, regional and domestic partners. They deal with basically Carbon Trade and Climate Change with emphasis on policies, projects, adaptation and mitigation. As well as striving to counter the adverse effects of climate change, OCCES attempts to maximize opportunities available from the global trade and work collectively with global community to reduce GHG emissions through a variety of international commitments, especially UNFCCC.

OCESS has been challenged by the PNG Government to address climate change issues after experiencing the tsunami in Aitape, sea level rise in Carteret, the recent King Tides in East Sepik, Kavieng and Manus, cyclone in Oro and the continuous extreme weather patterns that are affecting our lives of people in the country.

The four main strategies to offset these effects include adaptation, mitigation, technology and financing. Adaptation is a process through which societies make themselves better to cope with uncertain future as a result of climate change. Mitigation involves taking actions to reduce GHG emissions into the atmosphere as well as to enhance sinks aimed at reducing the extent of global warming. Technology involves the development, deployment and diffusion, including transfer of sound technologies to significantly reduce emissions and financing which is vital to plan and implement adaptation programs and projects.

3.0 National Fisheries Authority (NFA)

²³⁵ = Solmu, G.C and Sine, R (2005), National Crocodile Management Plan, Department of Environment & Conservation, Waigani, Port Moresby

Fisheries are viewed by the Government as a valuable resource, which because of its renewable nature, is capable of creating sustainable wealth for the country. To reinforce this view the *Fisheries Management Act 1998* directs the Fisheries Minister and NFA to have regard to the following objectives and principles in respect of fisheries waters:

- (i) promote the objective of optimum utilization and long term sustainable development of living resources and the need to utilize living resources to achieve economic growth, human resource development and employment creation and a sound ecological balance;
- (ii) conserve the living resources for both present and future generations;
- (iii) ensure management measures are based on the best scientific evidence available, and are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors including fishing patterns, the interdependence of stocks and generally recommended international minimum standards;
- (iv) apply a precautionary approach to the management and development of aquatic living resources;
- (v) protect the ecosystem as a whole, including species which are not targeted for exploitation, and the general marine and aquatic environment;
- (vi) preserve biodiversity;
- (vii) minimize pollution; and
- (viii) implement any relevant obligations of PNG under applicable rules of international law and international agreements.

The National Fisheries Authority (NFA) is a non-commercial statutory authority that was established in 1998 and operates under the *Fisheries Management Act 1998* and related regulations.

The process of transformation from a Government to a streamlined statutory authority is being undertaken with the assistance of an institutional strengthening project using loan finance from Asian Development Bank as part of a wider PNG Fisheries Development Project that also provides infrastructure development in New Ireland and Manus provinces (See Map of PNG in Annex 2).

The major priority of NFA over the last few years has been to change its corporate culture and turn the Authority into an effective regulator and overseer of the development of the Fisheries Sector. Under its plan, NFA has become a smaller, smarter and more responsive Organization, more clearly focused on management of PNG Fisheries for maximum sustainable benefit for the people of PNG.

At the same time, a separate AusAID funded project is strengthening the National Fisheries College, which operates as part of NFA. This project has seen the development and delivery of new courses specifically designed to meet the needs of the fishing industry and coastal

communities, and to provide the skills needed for developing PNG's fisheries. NFA began operating as an autonomous statutory authority on 1 January 2001. Although the ADB strengthening program is almost completed, the organization is still very young and will need to continue evolving to meet the challenges of creating sustainable wealth for the people of PNG from its valuable fisheries resources.

4.0 Mineral Resources Authority (MRA)

To better assist the Government to effectively manage and administer the mining sector, the Mineral Resources Authority (MRA) was established in 2006 under the *Mineral Resources Authority Act 2005*. The MRA's role is to perform the technical and operational roles relating to the administration and management of the mining sector - functions which were previously under the Department of Mining. The tasks include the regulatory operations of mineral tenements management, responsibility for mining safety and technical and coordination functions of project coordination and liaison, geological survey, and conducting promotional activities on PNG's mineral potential. Mineral Policy matters are undertaken by the Department of Mineral Policy and Geohazard Management.

Seafloor mining presents a potential new source of wealth and growth for PNG. The project will bring benefits in the form of royalties, and improvements in the nation's balance of trade, employment opportunities and potential for new industrial development that will have positive social and economic effects within PNG. In particular, these benefits would be maintained for the nominal Project life and probably beyond.

Seafloor mining also presents a possible source of industry diversification for PNG. Nautilus has exploration licences throughout the Bismarck and Solomon seas and intends to evaluate the potential of these licences and, where appropriate, apply for and mine any additional economic resources that it discovers.

The *Mining Act 1992* is presently the principal policy and regulatory document governing the mining industry in PNG. The *Mining Act* vests ownership of all minerals in or below the surface of land (or under the sea) with the national Government, and governs the exploration, development, processing and transport of minerals. The proposal for deep-sea mining of seafloor massive sulphide deposits in the Bismarck Sea (Solwara 1 Project) is the first of its kind and represents a new activity in environments where potential impacts have not previously been assessed. While the project is located beyond PNG's internal waters, the *Mining Act* allows exploration activities and mining of minerals to be undertaken on the seafloor within PNG territorial waters. The Solwara 1 Project falls into this category.

4.1 International Mandate to Sea Bed Mining

When PNG ratified the UNCLOS on 14 January 1997, it became a party to a set of international regulations that included the defining of maritime zones, and the promotion of marine protection

and preservation through the conservation and management of living and non-living resources²³⁶. Signing UNCLOS was significant for PNG in four ways:

- (i) it gave PNG the right to extend its legal jurisdiction to 200 nautical miles off its coastal shore, establishing an Exclusive Economic Zone (EEZ)²³⁷;
- (ii) within this EEZ, PNG was granted access rights over living and non-living marine resources;²³⁸
- (iii) it made PNG responsible to protect and preserve this marine environment;²³⁹ and
- (iv) it opened PNG to numerous dispute resolutions, including the International Court of Justice at The Hague, if it did not meet its legal responsibilities²⁴⁰.

Importantly, the ratification of UNCLOS by PNG laid down the overall legal framework that allowed the idea of EEZ deep-sea mining to become a reality. The PNG Government took clear ownership title to the seabed along with its minerals, thus allowing the interested developer Nautilus Mineral to go into business with the rightful owner of the resource it potentially wants to extract.

The PNG Government took clear responsibility in the eyes of the global community to make sure the marine environment is not adversely affected by activities under its jurisdiction. As such the PNG Government is now in the process of developing a comprehensive SMS deep-sea mining regulatory regime. Also at the national level the PNG Government is now working with its internal departments to extend terrestrial mining laws to cover deep-sea extraction.

4.2 Policy Options on Sea Bed Mining

The Madang Guidelines²⁴¹ are 19 recommendations (Table 7) such as the collection of baseline environmental data and the continued collection of data throughout the life of an exploration license that address issues related to policy development and legislation regarding offshore mineral exploration and possible development in Exclusive Economic Zones (EEZs). The South Pacific Applied Geoscience Commission (SOPAC) designed the Guidelines to serve as a template for nations preparing their own offshore mineral policy and address impact assessment, stakeholder interests, research, and other issues.

²³⁶ = Division of Ocean Affairs and the Law of the Sea, 2006

²³⁷ = UNCLOS Part V, Article 57; Annexes XII and XIII

²³⁸ = UNCLOS Part V, Article 56

²³⁹ = UNCLOS Part V, Article 61

²⁴⁰ = UNCLOS, Part XI. Section 5, Article 186

²⁴¹ = Madang Guidelines are recommendations from the International Conference on Seabed Mining held in Madang, PNG

Table 12. Subcategories of issues and recommendations that need to be considered when creating an Offshore Mining Policy. Issues and recommendations were identified in the Madang Guideline.

Issue	Recommendation
EEZ National Policy for Offshore Mining	To help countries implement measures under UNCLOS, including the establishment of national jurisdiction, navigation, and dispute resolution.
EEZ Exploration and Development Policy	To develop a comprehensive offshore mining act distinct from terrestrial mining act, and create a licensing regime.
Fiscal Regime	To address the creation of a fiscal regime for offshore minerals that keep in mind pioneering effort and incentives for development
Environmental Consideration	To address environmental assessment and minimization of impacts from exploration and development.
Stakeholders	To identify and address stakeholder concerns.
Fisheries	To address fisheries development and management
Industry	To address creating a Government and human infrastructure for a mining regime.

(Source: Madang Guideline, SOPAC 1999)

The Guidelines emphasize the full implementation of UNCLOS provisions within individual jurisdictions and stress that countries clarify their territorial boundaries and be aware of the boundaries of other countries. Conservative mining measures are encouraged and the development of an *Offshore Mining Act* is recommended²⁴². Possible impacts of having an offshore mining policy as put forth by the Guidelines include a national economic return of maximal value, a timely and conservative mining process, and a resource diversification framework. Ideally, the Guidelines seek to make sure that all stakeholder interests are met and that the least possible physical and social damage is encountered in the process²⁴³.

The International Marine Minerals Society's Code for Environmental Management of Marine Mining²⁴⁴ draws from many sources including Government and industry documents, like the Madang Guidelines, and reviews from marine scientists to offer general principles and operational guidelines to be followed before, during, and after mining. The Code is intended to benefit industry with respect to project development, benefit regulatory agencies with respect to

²⁴² = SOPAC 1999

²⁴³ = Ibid (211)

²⁴⁴ = International Marine Minerals Society 2001, Code for Environmental Management of Marine Mining, Also at: http://www.immsoc.org/IMMS_download/codefeb2002.pdf

policy development, and benefit stakeholders with respect to evaluating a company's environmental actions.

Emphasis is placed on pro-activeness, transparency, and adaptability. The Code encourages a proactive concise by suggesting that a company should, among other things, educate its employees at all levels as well as the community about that company's environmental policies and their application. Transparency is also a trademark of the Code as the Code calls for regular consultations with affected communities and for regular performance reports to be written and made publicly available.

The Code recommends that management strategies be adaptable in light of evolving needs and standards²⁴⁵. Possible impacts of a company adhering to the Code include having a more informed staff and having a viable benchmark for evaluating environmental performance. Likewise, Government agencies and stakeholders have a benchmark for evaluating company performance and Governments have a viable framework for deep-sea mining policy²⁴⁶.

The Madang Guidelines and the Code for Environmental Management of Marine Mining are voluntary. They are only considered binding to the entity that adopts them. Even then, the underlying assumption is that these rules or guidelines will be followed. The Guidelines and the Code stress a precautionary approach to mining and forward thinking about impacts and how to keep those impacts to a minimum, if not eradicate them altogether²⁴⁷.

4.3 Deep Sea Tailings Placement (DSTP)

DSTP is a specialized form of marine tailing placement that is only viable where there are suitable geographic and physical conditions. DSTP is increasingly being seen as a viable alternative to on-land storage of tailings, particularly at island and coastal mine sites where deep water is close to shore, and where geotechnical conditions and social considerations do not favor on-land storage. It is now generally accepted as a feasible option by many countries where suitable conditions exist and is currently being used by several mining operations around the world (e.g. UK, France and Canada).

Mines in PNG which have implemented this mine waste management system include:

- (i) Misima Mines Limited (now ceased operations);
- (ii) Lihir Gold Limited (currently operational);
- (iii) Simberi Oxide Gold Project (currently operational); and
- (iv) RamuNiCo Limited (under construction).

A general guideline for DSTP was made available after the International Conference on Deep Sea Mine Tailings Placement Madang in November 2008. The guideline clearly specifies the following main criteria;

²⁴⁵ =Ibid

²⁴⁶ =Ibid

²⁴⁷ =Ibid

- (i) Competent regulatory authorities with appropriate funding mechanisms to ensure regulatory compliance monitoring in terms of the discharge quality and its environmental effects; and
- (ii) Scientifically robust and transparent methodology for setting sediment and water column Environmental Quality Standards (EQS) for potentially eco-toxic discharge components.

There needs to be a permitting process, under which site specific requirements can be specified. Contemporary best practice for submarine tailings is to place the tailings in a targeted area of sandy or muddy seabed below the euphotic zone²⁴⁸. The target area should be of low resource use and the environmental conditions of the area should be such that maximum deposition of tailings occurs the physical environment ensures adequate flushing, does not experience upwelling and there is a low probability of post depositional redistribution of tailings. In addition, the gradient of the path to the target area must be such that a coherent density current is formed to minimize dispersion to surrounding areas. The delivery of tailings to the target area must be sufficiently deep to ensure;

- (i) No entrainment or advection of tailings into the euphotic zone;
- (ii) Minimal production of plumes due to density differences in the water column; and
- (iii) There is sufficiently small diffusion of dissolved toxic material into the euphotic zone.

The area impacted by the tailings should not include rare or valuable ecosystems. For DSTP to be a viable option for tailings management it must not have a negative impact on sustainable resources such as fisheries, or human health. An assessment of the extent to which marine biological resources can be negatively affected by contaminants introduced with the mine tailings must be made. Furthermore, an assessment of the bioaccumulation of contaminants within the food chain must also be made.

The main aim of the guidelines should be to minimize the impact on the marine environment while achieving sustainable resource development. Potential environmental risks to be considered should include:

- (i) Assessment of the toxicity of the tailings, i.e., they should be stable and where ecotoxic components are present they should be reduced to concentrations below EQS;
- (ii) Assessment of the diffusion and dispersion of any dissolved toxic materials in the water column;
- (iii) Assessment of impact on seabed e.g., increased sediment accumulation, change in grain size, etc.;
- (iv) Assessment of impact on the pelagic zone during the production period e.g., increased turbidity and transfer of toxic components to the pelagic food web;
- (v) Assessment of impact on biodiversity during production period e.g., burial, dilution of natural organic carbon input, bioavailability of toxins, etc.;
- (vi) Influence on Marine resources, e.g. fisheries;
- (vii) Influence on vulnerable ecosystems;
- (viii) Impact of technical failures e.g., pipeline fractures; and

²⁴⁸ = Euphotic zone is the upper layer of a body of water that allows the penetration of enough light to support photosynthesis

- (ix) Potential redistribution of tailings e.g., production of underwater slides of deposited tailings, formation of plumes within the water column.

In terms of site evaluation, each site should be considered on a case by case approach, i.e., the evaluation must be site specific. A full evaluation of all waste management options must be carried out to ascertain whether DSTP is the best option for dealing with tailings waste. This process should involve all available data on every one of the options being considered. If sufficient data is not available then further research should be carried out before a decision is made. After careful scrutiny of the existing data if DSTP is the best available option and is deemed acceptable, then a detailed environmental baseline of the site should be carried out.

The location should be close to the coastline and have safe overland transport and have sufficient depth of water and gradient to achieve a coherent gravity flow. The construction of the DSTP pipeline must be robust and the length of the pipe should ensure that the discharge is at a minimum depth of 120m where the maximum depth of the euphotic zone is 80m or less (Figure 10).

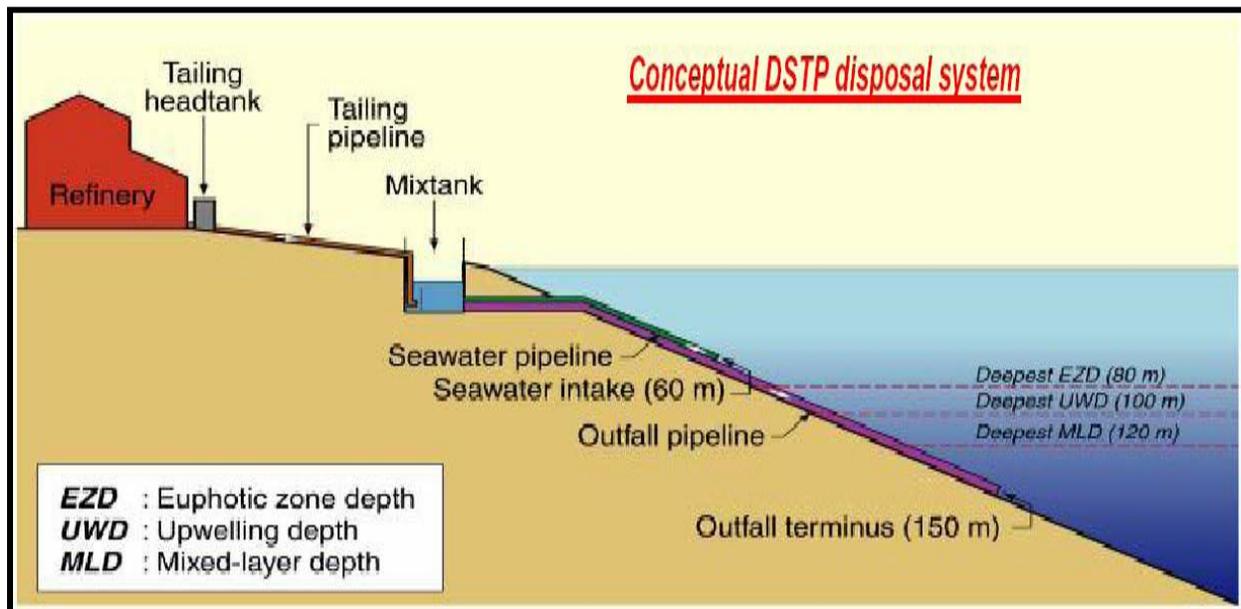


Figure 10. Diagram of DSTP Operation (Source: www.mra.gov.pg)

Where the euphotic zone is deeper than 80m the discharge should be below the maximum observed depths of the surface mixed layer or the euphotic zone, whichever is deepest, +50% of that length. The formation of plumes of tailings in the water column must be minimized. In the event of density changes in the water column occurring the length of the pipe should enable the discharge of tailings to occur below major density changes. Coastal installations, pipelines and mixing tanks must be able to withstand storm damage, include the range of ElNino/Southern Oscillation (ENSO) variability. For mines with a predicted long life, forecasts from a reputable climate model should be used to determine the likelihood of storm increase/decrease due to climate change.

5.0 Department of Petroleum and Energy (DP&E)

Petroleum resources, onshore and offshore, belong to the State, which licenses others to explore for, recover and sell or otherwise dispose of petroleum so recovered.

The *Oil and Gas Act 1998* is the principal legislation that governs petroleum exploration and development and State Entitlement and Benefits in PNG. It spells out the role and purpose of the legislation in key areas including the exploration, development, processing, transportation and makes provisions for grant of benefits to traditional landowners, Local Level Governments and Provincial Governments arising from the production, processing and transportation of petroleum in PNG.

The oil and gas industry in PNG has contributed immensely to improving the economy of the country since the first oil production began at the Kutubu field in the Southern Highlands Province in mid-1992. The Government through the Department of Petroleum and Energy administers the *Oil and Gas Act 1998*, which regulates the industry. Through its Petroleum Policy the Government is looking at various options for developing PNG's gas resources including the Liquefied Natural Gas (LNG) project that is expected to yield large economic benefits, including an increase of around K10 billion in real GDP each year during the operational phase. The project has an expected life of 30 years and is the largest private sector investment that has ever been considered in PNG²⁴⁹. It will lead to large Government revenues and direct cash payments to landowners. Other benefits include the large number of jobs that would be created and the resulting multiplier effect on economy. However, the project also comes with economic challenges, including damages to the environment, which could be detrimental to the other economic sectors. Strong governance and transparent public financial management will be crucial in translating the economic benefits into improved living standards for the population.

In terms of environmental impacts from any proposed development the company must comply with the *Environmental Act 2000*. Also, traditional landowners and the Local Level Governments are included as beneficiaries from the activity.

6.0 National Maritime Safety Authority (NMSA)

The National Maritime Safety Authority was established by an Act of Parliament in 2003 as a not-for-profit statutory authority, to raise standards of maritime safety and prevent and control marine pollution from shipping services within PNG waters.

The Authority's primary responsibilities are to undertake Government regulatory functions on safety of shipping services and to meet expectations of the shipping industry, its customers and coastal communities for a safe, efficient and environmentally responsible shipping sector as it is regarded very crucial to PNG's social and economic development.

²⁴⁹ = Department of National Planning and Monitoring (2010), Medium Term Development Strategy

The Authority's functions and responsibilities as defined in the *NMSA Act 2003* covers two important aspect of two marine environment and are summarized below:

(a). Maritime Safety

- (i) Ensure a fully - functioning and effective network of maritime navigational aids;
- (ii) Ensure the availability of high-quality, up-to-date navigational charts;
- (iii) Ensure that vessels meet the safety standards required by PNG's legislation, regulations and commitments under International Maritime Organization (IMO) conventions; and
- (iv) Ensure seafarers competency through certification and documentation of work experience; Help to coordinate responses to distress calls.

(b). Marine Pollution Control

- (i) Issue and enforce pollution control standards in accordance with international agreements; and
- (ii) Help to coordinate the clean-up of marine pollution.

The NMSA is in the process of enacting new marine pollution laws which will replace the following existing and significantly outdated Acts that are currently administered by NMSA:

- (i) *Prevention of Pollution of the Sea Act 1978* (consolidated in 2003);
- (ii) *Protection of the Sea (Shipping Levy) Act* (consolidated in 2003); and
- (iii) *Dumping of Wastes at Sea Act 1978* (consolidated in 2003).

6.1 New Marine Pollution Bills and Regulations

These new laws are designed to bring PNG into line with international standards as contained in various Conventions of the International Maritime Organization (IMO), and will help to ensure that the valuable coastal and marine resource of PNG are better protected from the ever-increasing threat of marine pollution from marine sources.

There are five new Bills and they are:

- (i) *Marine Pollution (Ships and Installations) Bill & Marine Pollution (Ships and Installations) Regulations*

This Bill is designed to regulate all forms of marine pollution from ships and offshore installations, and implements the MARPOL Convention and Anti-Fouling Systems (AFS) Convention.

- (ii) *Marine Pollution (Sea Dumping) Bill & Marine Pollution (Sea Dumping) Regulation*

This Bill is designed to regulate the dumping of wastes at sea and implements the London Dumping Protocol.

(iii) *Marine Pollution (Preparedness & Response) Bill*

This Bill mandates a comprehensive system for response to and clean-up of oil spills and other marine pollution incidents in PNG, and implements the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) and the OPRC Protocol on Hazardous and Noxious Substances (HNS).

(iv) *Marine Pollution (Liability & Cost Recovery) Bill & Marine Pollution (Liability & Cost Recovery) Regulation*

This Bill provides for the establishment of a National Maritime Pollution Fund and also provides a comprehensive regime for ships to carry compulsory insurance against marine pollution, and for the payment of damages to PNG citizen in the event marine spills. It gives PNG access to major international funds (up to US\$ 1, 105 million) for oil pollution compensation, through the International Convention on Civil Liability for Oil Pollution Damage (92 CLC) and International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund 92).

(v) *Marine Pollution (Ballast Water Control) Bill & Marine Pollution (Ballast Water Control) Regulation*

This Bill provides for the control of harmful aquatic organisms and pathogens carried in Ships Ballast water and sediments, from being introduced into PNG waters. The Bill also integrates into PNG law provisions of the International Convention for the Control and Management of Ships Ballast Water and Sediments.

Administration and enforcement of the new Acts is subjected to consultation. It is proposed that the new marine pollution laws for PNG will be administered primarily by NMSA, with enforcement roles for certain parts being delegated to other Departments and Authorities. It is proposed that in addition to NMSA, officers from the NFA, the DEC, the National Police and other relevant bodies, would be appointed as Inspectors under the new Acts, and that they will receive proper training and capacity building in administering and enforcing the Acts, along with clear guidelines and manuals on investigation and enforcement procedures.

6.2 National Marine Oil Spill Contingency Plan (NATPLAN)

NMSA has developed the National Marine Oil Spill Contingency Plan (NATPLAN) which is aimed at protecting the coastal and marine environment from the threat of marine pollution incidents. The plan outlines the national arrangements for responding to oil spills in the marine

environment and protecting it from oil pollution or, where it is not possible to minimize its effects.

The NATPLAN reflects the essential steps necessary to initiate, conduct and terminate an emergency spill response on, or into the navigable waters of PNG, on the adjoining shorelines, the waters of the contiguous zone or into waters of the EEZ. It also brings together the combined efforts and resources by relevant national and provincial Governments, PNG Ports Corporation Ltd, Oil and Shipping industries, Exploration and downstream processing industries and semi Government organizations to provide a level of preparedness to the threat posed to the marine environment by ship-sourced oil and chemical spills. The Plan prescribes procedures and provides information required to implement the Plan.

6.3 Search and Rescue (SAR)/Emergency Response (ER)

SAR/ER is the department under NMSA responsible for the coordination of SAR Operations and Oil Pollution Operations in the country. Key functions include:

- (i) Control and management of National Plan;
- (ii) Control and maintain inventory of oil pollution combat equipment (National Stockpile); and
- (iii) Coordinate National Plan training exercises & drill.

7.0 Tourism Promotion Authority (TPA)

Tourism has the potential to contribute significantly to the development of the PNG economy. Increased foreign travel into PNG can result in greater foreign currency earnings and reserves, higher employment levels and generate demand for PNG culture and other goods and services resulting in broader economic gains for all people in PNG.

The enactment of the *Tourism Promotion Authority Act 1993* and subsequent establishment of the Tourism Promotion Authority in 1994 was to foster the development of tourism in PNG so as to maximize the economic benefits of the industry to PNG whilst minimizing any disruption to social, cultural and the environmental values.

The development of the tourism industry is reliant on a partnership between the Government, industry, and the people of PNG. The proposed replacement of the PNG Tourism Promotion Authority with an industry dominated body, 'Tourism PNG,' and the chairing of the PNG Tourism Taskforce by the Prime Minister to focus attention on the coordination of the various initiatives that are proposed across a range of Ministerial portfolios and areas of the economy, is an indication of the depth and seriousness of the partnership between Government, industry and the people of PNG.

The TPA is mainly involved in Tourism Policy formulation and implementation, marketing and promotion, sector planning, sector investment and promotion and tourism impact monitoring.

In addition, it is proposed that a new Tourism Policy Secretariat be formed to focus on policy development and to separate the marketing and policy functions. The commitment by Government needs to occur at national and provincial levels to progress tourism substantially as a potential key driver to the national economy. To facilitate the commitment by Government at a national and provincial level, certain structural and policy changes are eminent. Principally however, there needs to be a public commitment of not only Government intentions, but of funding and resources for the implementation of a strategy to see Tourism PNG reaches the vision and overall objectives.

B. OVERVIEW OF PROVINCIAL AND LOCAL LEVEL GOVERNMENT IMPLEMENTATION STRUCTURE

Provincial Governments have been a critical feature of the administrative and political system of PNG. In July 1995 an Organic Law introducing a new system of provincial and local-level Governments was passed in Parliament. The changes came about as a result of long-term disillusionment with a system of provincial Governments that had failed to improve the delivery of services and had been subject to widespread misuse of public funds. The reforms involve a radical restructuring of the system of Government, including the abolition of separately elected provincial Governments and the establishment of Provincial Assemblies. The Provincial Assemblies are to be headed by a governor who also represents one of the provincial electorates in Parliament. Interim arrangements were put in place pending the national elections in 1997. The interim Provincial Assemblies were made up of Parliament members; selected members of the previous provincial Governments and heads of local councils appointed by the Prime Minister on the recommendation of NEC; and three persons nominated by the provincial executive council and the premier of the previous provincial Government.

The Organic Law identifies two levels of administration: the province and the district. Although the composition of the line departments is not specified in the law, it is expected that the major line departments that exist at the national level will be present at the provincial level. That structure is replicated at the district level, with district administrators reporting to the Provincial Administrator and district staff reporting to the District Administrator. Provincial and district treasuries have been established as an extended arm of the Department of Finance. Provincial budgets must be approved by the Minister of Finance and Planning as well as the minister responsible for provincial affairs.

Section 80 of the Law redefines the role of the national departments, giving them the responsibility for: Formulating national policies and coordinating their implementation; providing support to provincial and district administrations to ensure national standards are maintained; supporting research, training and professional development; Developing the capacity to implement public sector investment programmes.

Provinces, in turn, are required to provide support to the activities of the national departments. Administrative functions that have been transferred to the provinces include: the maintenance of roads, bridges and infrastructure; urban roads, public facilities, the environment and waste disposal; Health facilities and programmes; Educational facilities and curriculum; Housing; Water supply.

The reforms were rapidly introduced during the 1993 budget and at present there is considerable uncertainty concerning the funding of national and provincial departments as well as their functions and responsibilities. In particular, there is uncertainty about the lines of authority at the different levels of Government. National departments are responsible for overall planning, policies and monitoring, but it is not clear what powers exist to enable those policies to be enforced in the provinces and districts that are entitled to guarantee independent funding. With respect to environmental and related issues, there is no mention of how decision-making at the national and provincial levels will be coordinated. Operating guidelines that delineate roles and responsibilities are required, together with local representation in the decision-making process to ensure that concerns and policies are taken into account.

1.0 Organic Law on Provincial Governments and Local Level Governments

Until 1995, PNG had three tiers of elected Government, consisting of Local Government Councilors, Provincial Members and National Members of Parliament, with parallel administrative organizations at the district, provincial and national Government levels. At the lowest of these three levels, are districts, each of which in turn are made up of a number of Local Government Councils.

In the 1960's the Australian Administration created these Local Government Councils with the aim to educate villagers in the workings of democracy, while also serving as a local-level mechanism to foster rural development. Each council consisted of a number of elected councilors representing the various communities and an elected president. The Local Government Council worked closely together with the appointed District Manager, and was assisted in his work by village magistrates and committee members. After Independence in 1975, this system was consolidated in the *1977 Organic Law on Provincial Governments*.

Under the Local Level Council System, the District Manager and the Local Level Councils were to work closely together with the Provincial and National Governments in the planning and execution of development activities. The three tiered Government system, however, was expensive and cumbersome and failed to provide much needed services to the rural areas. Funds made available at the top often did not reach the district levels, and the needs of the National Government and urban population, rather those of rural population, dictated priorities. In addition, the separate development of administrative and electoral systems led to a situation where district and council boundaries were not always conterminous, which constituted an ongoing source of confusion.

In 1995, National Parliament amended the constitution and passed the *Organic Law on Provincial Governments and Local-Level Governments (OLPG&LLG)*. This law replaced the

1977 Organic Law on Provincial Governments. The aim of the new act is to prove the delivery of services to the rural areas through a process of decentralization, putting more responsibilities and funds in the hands of the newly formed Local Level Governments, which are more likely to be responsive to local people's needs and wants. Part of this process is the drive to cut back on staff numbers within the central Government departments, relocating civil servants from the urban to the rural areas. These reforms reduced the number of elected tiers of Government to two.

2.0 The Political Structure of the Provincial Government

Under the OLPG&LLG the Provincial Government and Administration now consist of a number of bodies and positions, which will be dealt with in this section. The administrative functions of the provincial Government have been detailed in the *Provincial Governments Administration Act (1977)*.

- (i) **The Provincial Assembly:** The assembly is made up of all elected Members of parliament from the province, the heads of the LLGs in the province and a number of appointed members from women's, youth and church groups. Local representatives have a far greater influence than under the previous system. All members have voting powers and the Assembly has to meet at least four times a year. The provincial assembly has lawmaking powers on a wide range of issues.
- (ii) **The Provincial Governor:** The Provincial Governor is the Regional Member of Parliament and serves as chairman of the assembly. The Deputy Governor is elected from among the heads of the LLGs.
- (iii) **The Provincial Executive Committee (PEC):** This is the executive arm of the provincial assembly. The PEC consists of the Governor, the deputy Governor and the Provincial Treasurer and the chairpersons of a number of thematic committees. The PEC is responsible for the implementation of the laws and policies handed down by the Provincial assembly and the national parliament.
- (iv) **Assembly Committees:** The Assembly has several committees dealing with specific issues, covering issues such as health, education, law and order and finance. The Provincial assembly can name its own committees, to deal with issues. A key committees required under law is the Joint Provincial Planning and Budget Priorities Committees (JPPBPC).

3.0 Administration of the Provincial Government

The most important administrative figure is the Provincial Administrator (PA) who is responsible for enacting the policies handed down by the provincial and national politicians. The PA runs the provincial civil service, and is responsible for reporting and liaison. Two deputies and a number of district administrators depending on number of districts in the province support the PA.

3.1 Structure of Local-Level Governments

The New Organic Law on Governments and LLGs has not changed the number of districts and electoral constituencies. Where necessary boundaries were redrawn to match the administrative and electoral systems. The law came into effect in October 1997 when elections for the councilors of the new LLGS were held. Each of the 89 districts in the country now consists of three to four LLGS.

3.2 District Administration

The districts play a crucial role in the New Organic Law, as they constitute the forum where bottom-up planning processes within the LLGs link up with the provincial administration. It is at the district level that the funds made available to provinces and the LLGs are used to implement the plans, policies and laws of the various LLGs.

A District Administrator responsible to the Provincial Administrator leads the district and is also the Chief Executive Officer of the LLGs. The District Administration supports the LLGs within the district prepare a five-year District Development Plan and, through its Joint District Planning & Budgeting Priorities Committee, distributes the available funds among the various LLGS.

The District monitors LLG performance and finances, collects data and maintains financial records. The District also provides health services and extension and support services in the fields of agriculture, fisheries, commerce and industry, environment management and women and youth services. It is explicitly not the intention of the New Organic Law that various bodies of Government deliver all services themselves. They are stimulated to contract specialized bodies to deliver services, with the Government bodies at various levels play a contracting and monitoring function.

Unlike the case with previous Local Government Council presidents, the presidents of LLGs are not elected directly, but chosen from among the ward councilors. The president of the LLGs becomes members of the provincial assembly. The lawmaking arm of rural LLGs consists of the president and all ward councilors plus two women's representatives.

Each LLG in turn is divided into a large number of wards. The country now counts 5,747 wards, an average of 20 per LLG. The differences in the number of wards per LLG however are large. Some LLGs have 4 wards, others 40. Each ward in turn may cover a number of villages, hamlets, clans or other social groupings.

In many areas of the country, wards have their own Ward Development Committees (WDCs) to help define and solve problems. Unlike the LLGs the WDCs do not have lawmaking and law-enforcing powers.

Local-Level Governments have the right under section 25 of the Organic Law to establish Government committees tasked with certain duties. Thus LLGs interested in conservation could set-up a Conservation Management Committee responsible for monitoring conservation-related activities within the LLG.

3.3 Ward Development Committees

The *Local Level Government Administration Act* of 1997 stipulates that each Ward shall have a so-called WDC consisting of the member for the Ward, who sits on the Local Level Government and up to five associate members appointed by the members of the Ward²⁵⁰. Of these five positions women will fill at least two. These positions are without remuneration²⁵¹. Section 34 of the *Local Level Governments Administration Act* stipulates that the functions of the WDC are to:

- (i) Be the main advisory unit representing the Ward at the level of the LLG; and
- (ii) To determine the needs of the Ward in terms of services, programmes and infrastructure;

The Wards often reflect committees, or clan groups on a one to one basis, thus making them more or less representative of community interests. This makes the WDCs an interesting vehicle for managing community interests in the field of resources management. If it comes to area-based forms of conservation such as those developed under the *Fauna Act* or the *Conservation Areas Act* requiring a separate management committee, then consideration should be given to making the WDC in charge of area and resource management issues.

4.0 Law-making Powers of Provincial and Local-Level Governments

The new OLPG&LLG has not only transferred services delivery mechanisms to the provinces and the LLGs, but has also given them certain taxation and law-making powers which can be applied to marine resource management.

4.1 Provincial and Local-Level Government Law-making Powers with Regard to Environment and Conservation matters

Under Section 42 of the OLPG&LLG, the Provincial Legislature retains law-making powers over a large number of issues among which the following are related to conservation activities:

- (i) 42 (r) Land and land development including provincial titles and leases;
- (ii) 42 (s) Forestry and agro-forestry;
- (iii) 42 (t) Renewable and non-renewable natural resources; and
- (iv) 42 (y) Parks, reserves, gardens, scenic, and scientific centers.

For example, the Provincial Government of West New Britain has passed a provincial law, to protect the Kimbe Bay and look at revenue raising options under the New Organic Law and the licensing of the dive industry.

In essence the new LLGs constitute an elected third level Government. The LLGs have a constitution and the right to make laws, collect taxes and levies and spend money on activities within the territory of the LLG. LLG have law-making powers with regard to a range of issues relating to the area from which they are responsible²⁵².

²⁵⁰ = Section 26 & 27 of the Local Level Government Administration Act (1997)

²⁵¹ = Section 33, LLG Administration Act (1997)

²⁵² =Section 44 of OLPG&LLG

Issues to which the LLGs have law making power under Section 44 of the OLPG&LLG and which are relevant in the context of sustainable marine environment are:

- (i) 44 (i) Dispute settlement;
- (ii) 44 (p) Local environment;
- (iii) 44 (s) Domestic animals, flora and fauna;
- (iv) 44 (z) Protection of traditional sacred sites; and
- (v) 44 (ab) The imposition of fines for breaches of any of its laws.

These sections provide room to draw up local-level marine resource management laws which stipulate the establishment of set-asides, the seasonal closure of fishing areas or matters of policy vis-à-vis dive boat operators, foreign fishing vessels and intruding fishermen from other areas.

Law making powers with regard to those themes not specified under Section 42 and 44 of the OLPG&LLG are retained by the National Government. Provincial and Local Level Government laws have to be consistent with higher provincial and national laws. In case of inconsistency the “higher” laws overrule “lower” laws.

If an act passed by national parliament is deemed of national interest, such an act overrules existing Provincial and LLG laws. For example, the *Fisheries Management Act 1998* is deemed of national interest²⁵³ which overrules all attempts by the Provincial Governments to regulate archipelagic fisheries in its Provincial waters through Provincial legislation.

5.0 Funding the Provinces and the Local-Level Governments

Funding for the provinces and LLGs takes place through a complex system of grants based on population numbers and land areas. These grants do not cover salary costs of civil servants, as all civil servants of provincial and national departments have been merged into one national civil service. A Joint Provincial District Planning & Budgeting Priorities Committee (JPD&PBPC) chaired by the electoral MP and including the Provincial MP, the heads of the LLGs in the district and up to three appointed members plays a crucial role in approving the expenditure of these grants at the levels of the district.

5.1 Sources of funding for Provincial and LLGs

The most important grants for the Provinces and LLGS are:

- (i) The Minimum Provincial and Local Level Administration Support Grant under section 92, covers the administrative costs at Provincial, District and LLG levels (Schedule 2; OLPG&LLG).
- (ii) The Minimum Provincial Infrastructure Development Grant under section 93 can be spent on infrastructure development activities (Schedule 3; OLPG&LLG);
- (iii) The Minimum Town and Urban Services Grant under Section 94, is spent on town infrastructure and urban services (Schedule 4; OLPG&LLG);

²⁵³ =Section 1(2) of *Fisheries Management Act 1998*

- (iv) The Local Level Government and Village Service Grant/District Support under Section 95A can be spent on activities by the LLG after approved by a Joint District Planning & Budgeting Priorities Committee: (Schedule 5; OLPG&LLG);
- (v) The Provincial Support Grants under Section 95B which can be spent on activities by the Province after approval by the Joint Provincial Planning & Budgeting Committee; and
- (vi) With the new Value Added Tax regime of 10% on all traded goods, some 3% is supposed to flow back to the Province through the derivation grant.

These funds together are considered insufficient to provide services and run the operations of most provinces; this means that priority is given to those policies that generate revenue.

C. CONCLUSIONS

From discussions on provincial and local level Government administration, it is obvious that the effective implementation of any national integrated marine program depends on the capacity of provincial and local administration in the maritime provinces.

The key national departments and agencies identified all play specific roles in regards to the marine environment and must assist provinces in terms of capacity building within their respective sectors. The OLPLLG provides an improved model for service delivery in PNG through the decentralization and devolution of functions and responsibilities from the National Government to Provincial and Local Level Governments. However, there is a need to strengthen Provincial and Local Level Governments and for them to have a stronger role in, and greater capacity to support, service delivery.

Although a number of public sector reform initiatives have being implemented which aim to strengthen the capacity of Provincial and Local Level Governments, however matters dealing with environment and resource management is still lacking.

The OLPG&LLG provides for the establishment of committees in the provinces to plan and implement national programs on natural resources and environment. Therefore, the establishment of Provincial Environment Committee in each province to oversee planning and implementation of the regional marine plans is the best available approach.

This will allow the National Coordinating Committee of the PNG National Marine Program to deal directly with this Provincial Environment Committee in terms of:

- (i) formulation of integrated marine policy and coordination of the implementation actions in the provinces;
- (ii) providing support to the Provincial and District Administrators with marine planning; and
- (iii) providing support in research, training and professional development and capacity building in marine affairs.

PART FIVE

CONTEXT FOR AN INTEGRATED MARINE ENVIRONMENT MANAGEMENT IN PAPUA NEW GUINEA

Urban and infrastructure development in the coastal areas and land based resource developments, together with marine industries, continue to place increasing demands on the marine environment. The emphasis to date has been on actions within the separate sectors. While progress has been made, until now management and decision making have not been integrated across the various sectoral interests. Management of our oceans purely on an industry-by-industry basis will not be sustainable for future generations. Activities discussed in previous sections of this paper such as fishing, tourism, shipping, aquaculture, coastal development, sea bed mining and petroleum production must be collectively managed to be compatible with each other and with the ecological health of the marine environment.

A. INTEGRATED ECO-SYSTEM-BASED PLANNING AND MANAGEMENT APPROACH

With this approach, the DEC is introducing a refinement of the commitment to ecologically sustainable development. The Government pledged its commitment to integrated ecosystem-based planning and management for multiple uses of the marine environment by signing up to UNCLOS and CBD. To pursue this approach requires improved coordination between the National and the maritime provincial Governments to ensure that jurisdictional boundaries do not hinder effective planning and management.

1.0 Regional Marine Planning based on Priority Seascapes

The National Government's commitment to integrated and ecosystem-based planning and management must be implemented through the introduction of a major Regional Marine Planning process. The process must be designed to improve linkages between different sectors and across jurisdictions. Major marine Regions identified in PNG are the three seas; Bismarck, Solomon and Coral Seas (Figure 11).

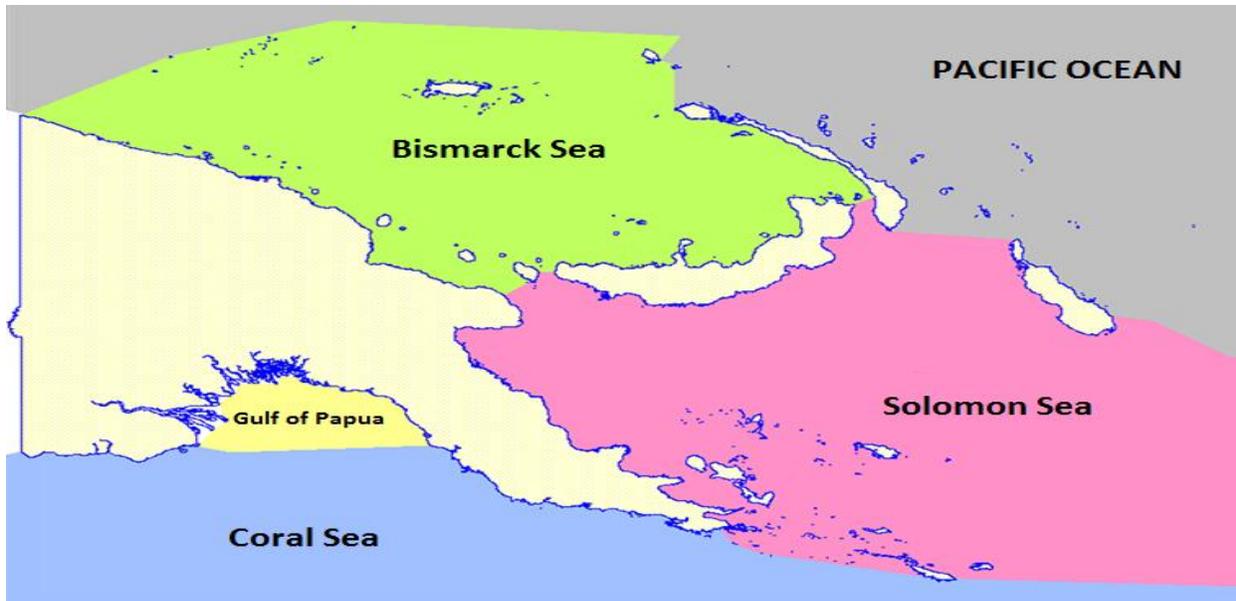


Figure 11. Identification of Regional Seas in PNG (Source: Modified from NMSA 2007)

Regional Marine Plans based on large marine ecosystems or seascapes must integrate sectoral commercial interests and conservation needs (Figure 12). In developing Regional Marine Plans, the National Government must seek the participation of the relevant Provincial and Local Level Governments, to ensure, as far as possible, the integration of planning and management across National and Provincial levels. Such approach has not been undertaken in PNG before, therefore many integrated management approaches proposed by the Government has never been implemented effectively.

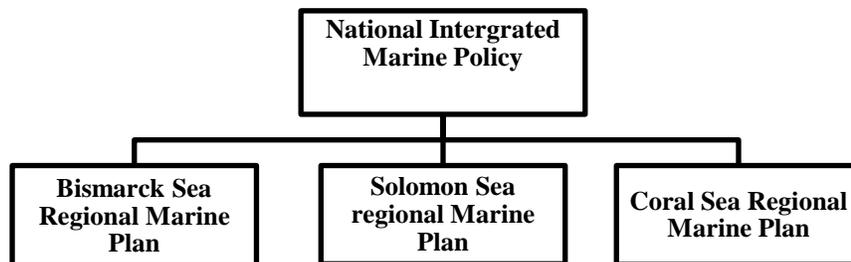


Figure 12. Regional Marine Planning Process (Source: Author)

Sea and land-based uses must not threaten marine ecosystem health. The objective is to manage actions to:

- (i) ensure continuing marine ecosystem wellbeing;
- (ii) maintain marine biological diversity;
- (iii) encourage sustainable marine industries;
- (iv) provide increased confidence and long term security for all marine users; and
- (v) ensure the establishment of a national system of marine protected areas.

All relevant sectors will be required to abide by the outcomes of the Plans. In developing the framework for Regional Marine Planning, the Government will have to identify and consult with relevant stakeholders to form a statutory base for the development and implementation of the Regional Marine Planning.

2.0 Important Steps in Planning and Management

Wise management of ocean resources requires an orderly process of oceans planning and management. The Government must establish planning and management arrangements which are capable of accommodating the following steps, including developing a regionalization of oceans based on large marine ecosystems, to underpin the preparation and implementation of Regional Marine Plans. For each marine region there will be a need to:

- (i) assess ocean resources on a biogeographical basis;
- (ii) understand the current uses of those resources and the emerging pressures on them;
- (iii) evaluate what is needed to maintain ecosystem health and integrity, and the implications for sectoral activities and conservation reservation;
- (iv) propose allocations of ocean resources, delivered principally through existing responsible sectoral management arrangements, using multiple use principles to generate income and employment and to optimize long-term benefits to the local community;
- (v) assess and control the external impacts of proposed resource development activities;
- (vi) continually monitor the performance of ocean planning and management processes; and
- (vii) maintain flexibility to respond to emerging information within this broad framework.

3.0 Content of Regional Marine Plans

The development of Regional Marine Plans based on functional seascapes must provide a structured and orderly process for the ecosystem-based allocation of resource access and use across and within sectors.

Key interest groups and Government agencies must be represented in any Regional Planning Committee (RPC) established to oversee the implementation of each Regional Marine Plan. Extensive community consultation must be undertaken, to ensure an open and transparent process.

Provincial Governments will therefore be invited and encouraged to participate in the process so that the Regional Marine Plans cover both National and Provincial waters. All National agencies will be required to operate in accordance with the Plans. For each marine region the Regional Marine Plan will, broadly:

- (i) identify ocean resources and economic and other opportunities;
- (ii) identify current and emerging threats to ecosystem health and determine planning and

- management responses to those threats;
- (iv) set out what is known of ecosystem characteristics and a broad set of objectives for those systems;
- (iv) identify the requirements and priorities for environmental baseline and basic biological inventory and other surveys in the development of Regional Marine Plans;
- (v) identify priorities and put in place measures to meet conservation requirements and determine those areas that should be assessed for marine protected area declaration;
- (vi) identify community and sectoral interests, including the interests of traditional communities;
- (vii) identify priorities for industry and economic development of the region; put in place a planning regime to prevent conflict between different sectors over resource access and allocation;
- (viii) provide a framework within which there is increased certainty and long-term security for marine-based industries; and
- (ix) establish indicators of sustainability and requirements for monitoring, reporting and performance assessment.

Effective planning and management for multiple ocean uses and the maintenance of ocean ecosystem health requires integration across economic, environmental and social and cultural objectives. An example of the content of Regional Marine Plan for the Bismarck is shown below (Figure 13). The content of the three Regional Seas will differ depending on the socio-economic situation and ecosystem relevant.

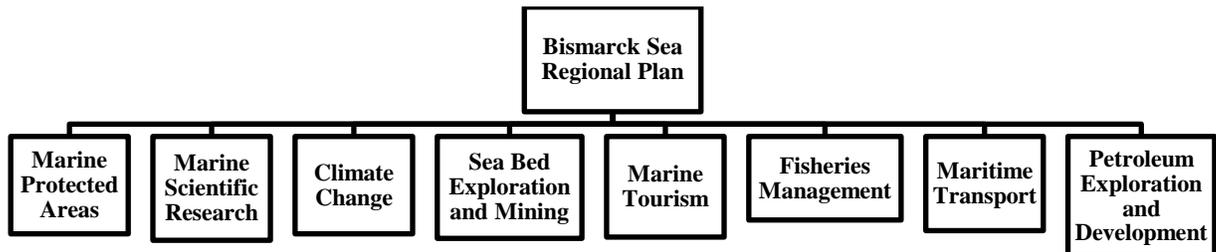


Figure 13. Contents of a Regional Marine Plan from the Bismarck Sea (Source: This author)

4.0 Structure of Regional Marine Plans

4.1 Bismarck Sea Regional Marine Plan

Bismarck Sea region encompasses seven maritime provinces; Madang, East Sepik, West Sepik, Manus, East New Britain, West New Britain, and New Ireland (Figure 14).



Figure 14. Maritime Provinces in the Bismarck Sea Region (Source: This author)

It is envisaged that the integrated sectoral approach will incorporate all provincial development plans and strategies under a Provincial Marine Plan from all seven provinces which will make up the overall Regional Marine Plan (Figure 15).

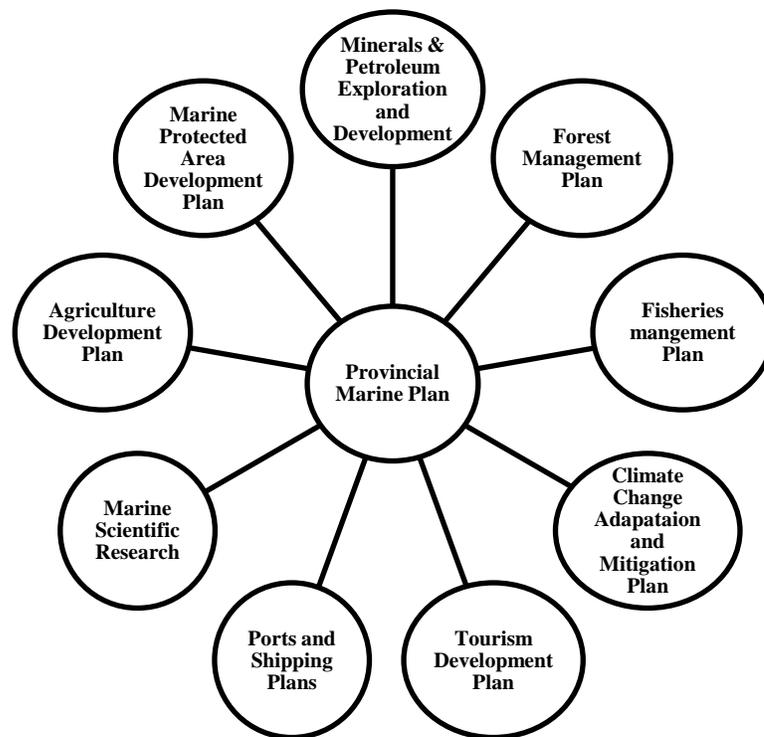


Figure 15. Contents of Provincial Marine Plans (Source: This author)

Provincial sectoral plans for key marine based industries and identified critical ecosystems, traditional interests, and emerging issues like climate change and maritime security must be collated and incorporated in to the Provincial Marine Plan.

4.2 Solomon Sea Regional Marine Plan

The Solomon Sea in the eastern part of PNG, covers seven provinces; Morobe, Oro, Milne Bay, Bougainville, West New Britain, East New Britain, and New Ireland (Figure 16). The three

provinces, New Ireland, West New Britain, and East New Britain are also in the Bismarck Sea and as such will contribute to both Regional Marine Plans.

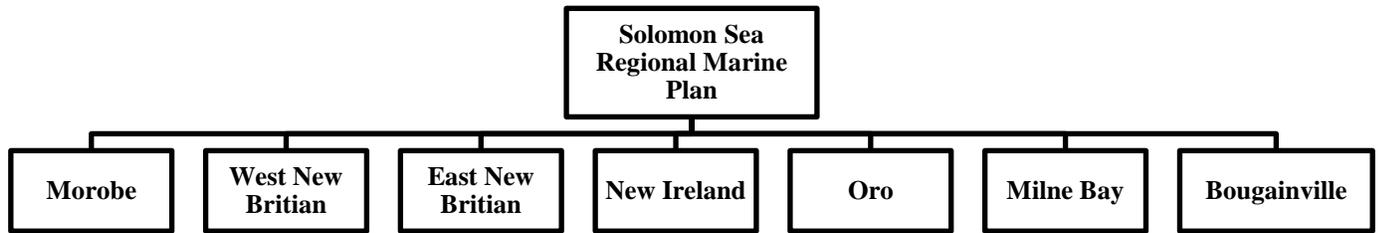


Figure 16. Maritime Provinces in the Solomon Sea Region (Source: This author)

4.3 Coral Sea Regional Marine Plan

The Coral Sea which is located in the southern part of PNG and shared with Australia, covers four provinces; Milne Bay, Central, Gulf, and Western (Figure 17). The National Capital District is not considered here, although it is regarded as a province on its own.

The Coral Sea includes sensitive areas like Torres Strait Treaty Protected Zone and the Gulf of Papua where all major tributaries drain out.



Figure 17. Maritime Provinces in the Coral Sea Region (Source: This author)

5.0 Establishment of Demonstration Sites within Seascapes

The establishment of demonstration sites within the Regional Marine areas is a key initial step forward that must be undertaken to focus on regional planning as the way forward.

Four sites are located in the Bismarck Sea (Manus, New Ireland, Madang, and Kimbe Bay) while three sites in the Solomon Sea (Milne Bay, Morobe Coast and Bougainville) and three sites in the Coral Sea Region (East Hiri Coast, Gulf of Papua, and Torres Strait Region) (Figure 18).

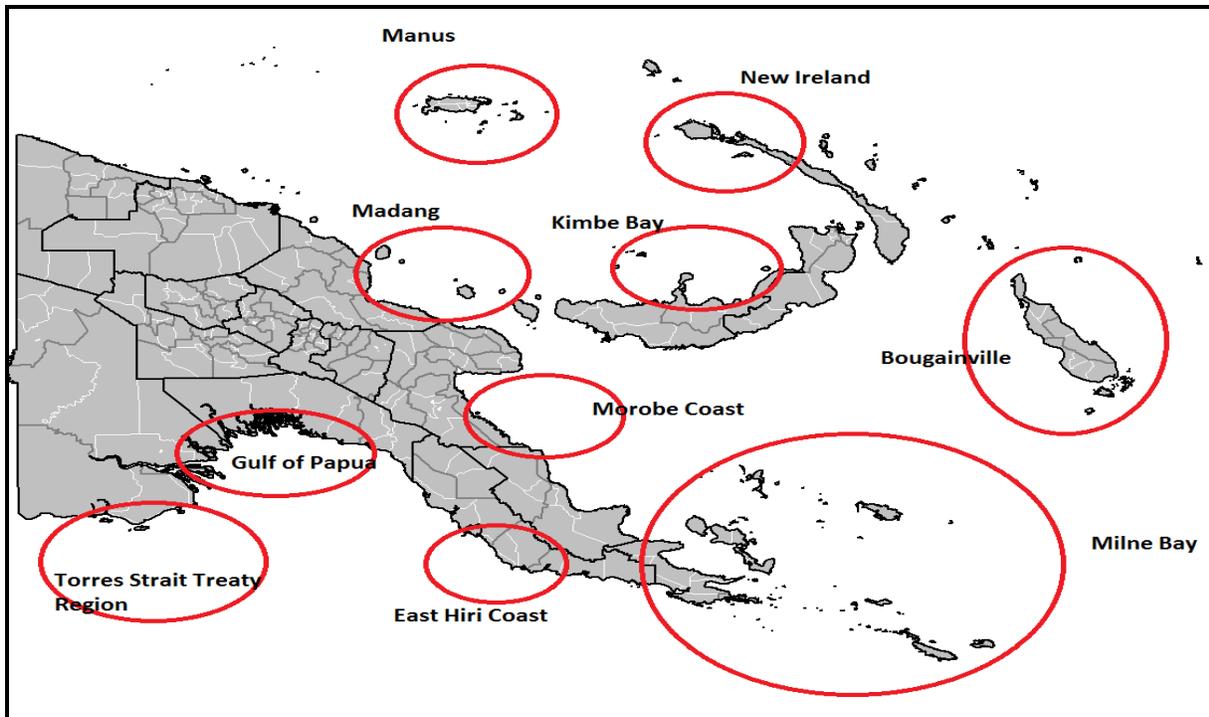


Figure 18. Proposed Demonstration sites in the within the three Regional seas (Source: This author)

The identification, designation and effective management of these demonstration seascapes is a cross cutting approach that undergirds important goals like Ecosystem Approach to Fisheries Management, Marine Protected Areas, Climate Change Adaptation, and Threatened Species (Figure 19).

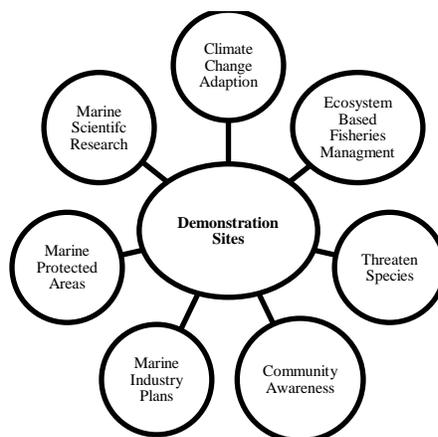


Figure 19. Goals of Demonstration Sites (Source: This author)

The series of demonstration sites have been identified so that the policies and management actions can be “ground truthed”. These demonstration sites allow Government, NGOs and communities access to on-ground activities that can develop “best practices” that are applicable to the situation. The demonstration sites have been selected in conjunction with already existing

NGO, industry, and Government programs so as to capitalize on existing information, experience and community participation.

The demonstration sites within the seascapes will showcase and model management approaches for expansion in the future. These learning areas will cover a variety of themes such as community-based ecotourism, sustainable fisheries management, MPA effectiveness, species conservation, climate change adaptation models, etc. Seascapes are large, multiple-use, scientifically and strategically defined marine areas, in which Government authorities, private organizations and stakeholders cooperate to conserve the diversity and abundance of marine life and to promote human well-being.

6.0 Proposed Management Approach

The Regional Marine Plans will have to draw on available environmental, resource and economic and social information. They must be able to provide the increased security required by industry and other users and the capacity to respond adaptively to new information, to new opportunities, and to unforeseen impacts on ocean systems.

There is a need to develop innovative approaches to deal with the scale and complexity of marine ecosystems. Existing major planning and management tools that can be drawn on in the development of Regional Marine Plans include:

- (i) development of clear regional objectives for uses, resources and ecosystems;
- (ii) zoning for multiple or single uses, including sequential and seasonal uses;
- (iii) resource-specific allocations for access and use, through the existing responsible sectoral management arrangements;
- (iv) complementary planning and management requirements implemented by individual sectors;
- (v) outcome-based measures, with industry or user-determined mechanisms for implementation; and
- (vi) sustainability indicators, monitoring, reporting and adaptive development of management controls.

These planning and management tools can be used singly or in combination. Regional Marine Plans must be developed to accommodate the different circumstances that will apply amongst PNG's very diverse regional marine environments.

6.1 Marine Spatial Planning

Marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process (Figure 20).

Characteristics of marine spatial planning include ecosystem-based, area-based, integrated, adaptive, strategic and participatory²⁵⁴.

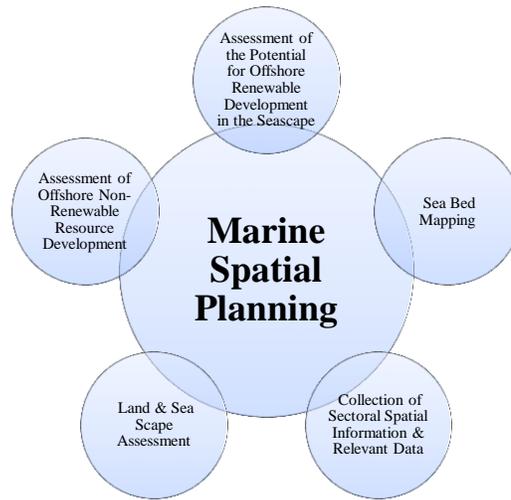


Figure 20. Elements of Marine Spatial Planning (Source: The author)

Marine spatial planning is a practical way to create and establish a more rational use of the marine environment and the interactions between its uses, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives in an open and planned way²⁵⁵.

The Government needs to build up on its current capacity to take on board the management tools offered by the marine spatial planning approach. There already exist the necessary data in many national institutions, for example, sea bed map with MRA, tuna migratory routes with NFA, etc. The integrated approach can be seen as the best way for sharing information for nation building.

B. CONCLUSIONS

The proposed Regional Marine Planning approach is the way forward for PNG. Even if an Integrated National Marine Policy is not feasible, still the Regional Planning approach can be implemented within the context of existing administrative arrangements at the provincial and local level is a preparatory step towards any future marine policy development. The time is right given the funding and political support to trial out this approach.

Marine spatial planning is an important tool used by many countries who have implemented integrated ocean policies. The tool serves well with the support of GIS capacity in the key institutions dealing with marine environment. The DEC currently has a Spatial Data

²⁵⁴ = Ehler, Charles, and Fanny Douvere. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO. 2009 (English).

²⁵⁵ =Ibid

Management Branch that deals with GIS and data management of terrestrial environment. However, this can be expanded in due course to cover the marine environment.

The success of the regional planning approach centers around two main issues; (i) the establishment and effectiveness of regional and provincial committees to implement its responsibilities; and (ii) the success or failure of the demonstration sites.

Also, it is worth noting that some programs areas that have separate funding support from development partners, like Ecosystem-based Management, Coastal Fisheries Development project or marine protected areas will play a significant role in the outcome of the demonstration sites as well as the overall regional planning and management approach.

PART SIX

CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

A straight forward approach to the concept of Integrated Marine policy should not be taken by PNG. Instead, the national Government must work on improving the administrative structure and capacity at the provincial and local level Governments to implement this approach. The way forward is the empowerment of maritime provincial Governments to cooperate on the Regional Marine Planning approach. Only then when maritime provinces are working together to promote the concept of sustainable regional marine areas, that eventually leads to the national Governments agenda of national integrated marine policy (Figure 21).

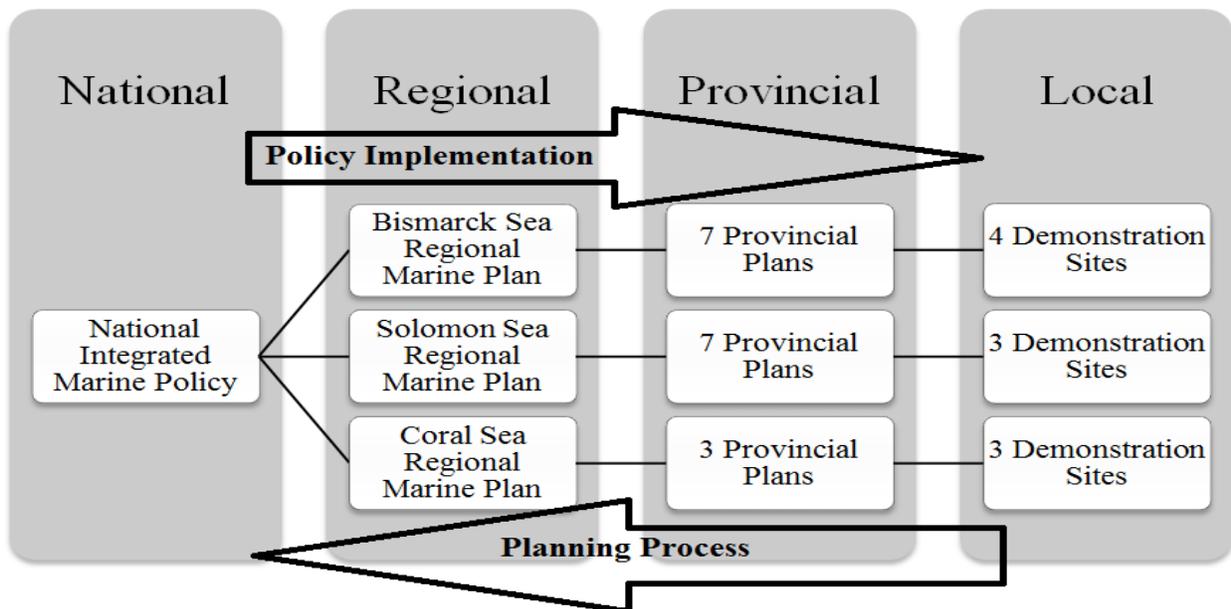


Figure 21. Overall Policy Implementation and Planning Process (Source: This author)

To implement the regional marine approach, the Government must turn its attention to improving the existing out dated biodiversity conservation legislations. Conservation policy has not worked effectively in PNG, despite the country having signed and/or ratified a number of international treaties and conventions related to biodiversity conservation. The three conservation acts: the *Conservation Areas Act*, the *National Parks Act*, and the *Fauna (Protection and Control) Act*, have proven ineffective in terms of their current implementation. The future of sustainable marine development rests on these outdated legislations that urgently need to be updated.

The Government must revisit the legislative review undertaken in 1995 under the AusAID-DEC Strengthening Project²⁵⁶ which highlighted specific areas of the *Biodiversity Conservation Legislations* that needs to be amended. Thus the DEC as the national Government's mandated authority on environment and conservation matters has only amalgamated the three environment legislations but has not undertaken any changes to the conservation legislations.

A new legislative framework needs be developed that takes into account more effective approaches to sustainable marine environment such as local and community-based wildlife management area, including specifications for Marine Protected Areas (MPAs) and integrated conservation and development programmes, and other biodiversity conservation methodologies. This will be difficult in PNG with its customary system of clan-based land tenure and many competing land use forms. Some compromise will be necessary. The National Biodiversity Strategy and Action Plan (NBSAP) is currently not compatible with the existing outdated legislations, and needs to be updated in line with the CBD Strategic Plan 2011- 2020.

Under the *Organic Law on Provincial and Local-Level Governments Act*, most of the responsibility for marine biodiversity conservation appears to have been passed to the provincial and local-level Governments. However, these bodies do not have the capacity or resources to carry out their responsibilities. As a consequence, national Government's involvement in this sector appears to be in a state of limbo at the moment, unclear of its role and the direction it should take.

In the absence of Government action on the ground, there has been increased involvement by national and international NGOs in marine conservation in recent years. This NGO activity has mainly focused on working closely in the field with local communities on the implementation of integrated conservation and development (ICAD) activities and the establishment of wildlife (biodiversity) management areas. It's about time the national Government should take an active integrated approach to work closely with NGOs and the local community through the regional marine planning system.

The future of any integrated marine policy approach to be undertaken by the PNG Government depends on the establishment of a Regional Marine Planning and Management Body within the DEC to implement this responsibility. The role of the regional planning body is to collate, manage, and analyze provincial developments plans. The marine spatial planning tool is recommended as the best available approach to be taken by PNG. The formulation of regional marine plans must be transparent and involve all interest groups.

To start off the process of integrated marine policy approach, the national Government must endorse DEC and key departments involved in the marine sector like NMSA, NFA, MRA, DPE, DAL, PNGFA to form a governing body at the ministerial level with the establishment of a National Task Force on Oceans with working groups appointed to develop regional marine plans for the country.

²⁵⁶ = Kathy Whimp (1995). Legislative Review Report 2, Department of Environment & Conservation Strengthening Project, AUSAID Project, Port Moresby

B. RECOMMENDATIONS

The following list of recommendations is put forward for further deliberation by the DEC in order to improve sustainable management of PNG marine environment through the regional planning approach:

- (i) Establishment of Provincial Environment Committee in line with OLPG&LLG;
- (ii) Appoint Regional Marine Planning Committee;
- (iii) Review proposed amendments by Kathy Whimp²⁵⁷ on Biodiversity Conservation Legislations to determine possible inclusion, of marine environment governance mechanisms;
- (iv) Capacity Development in GIS technology, towards Marine Spatial Planning process;
- (v) Continue to seek assistance from development partners to support the operation of provincial and regional committee activities.

²⁵⁷ =Ibid

REFERENCES

- ADB. 1998. Technical Assistance to Papua New Guinea for the Road Asset Management System. Manila (TA 3004-PNG, approved on 3 April for \$1.0 million JSF Financing); and ADB. 2000. Technical Assistance to Papua New Guinea for the Road Asset Management System in the Provinces. Manila (TA 3378-PNG approved on 28 December for \$581,000 JSF Financing).
- ADB 2009. Proposed Multitranches Financing Facility Papua New Guinea: Civil Aviation Development Investment Programme, Project Number: 43141, October 2009.
- Alcorn, J. B. (ed), 1993. Papua New Guinea Conservation Needs Assessment Vol. 1. Biodiversity Support Program, Government of Papua New Guinea, Department of Environment and Conservation. Corporate Press Inc., Landover, Maryland.
- Australian Agency for International Development (AusAID). 1999. Department of Environment and Conservation Institutional Strengthening Project, Papua New Guinea Project Completion Report. Port Moresby: Australian Agency for International Development.
- Ball, I. R. and H. P. Possingham, 2000. MARXAN (V1.8.2): Marine Reserve Design Using Spatially Explicit Annealing, a Manual pdf (267KB)
- Beehler, B. M. (ed), 1993. Papua New Guinea Conservation Needs Assessment Vol. 2. Biodiversity Support Program, Government of Papua New Guinea, Department of Environment and Conservation. Corporate Press Inc., Landover, Maryland.
- Bellamy, J. A. and J. R. McAlpine. 1995. Papua New Guinea: inventory of natural resources, population distribution and land use handbook. 2nd edition. Papua New Guinea Resource Information System (PNGRIS) Publication 6. Australian Agency for International Development (AusAID): Canberra, Australia.
- Benson, S. R., K. M. Kisokau, L. Ambio, V. Rei, P. H. Dutton, and D. Parker. 2007. Beach use, interesting movement, and migration of leatherback turtles, *Dermochelys coriacea*, nesting on the north coast of Papua New Guinea. *Chelonian Conservation and Biology* 6:17–14
- Bridges, K. W., Phillips, R. C., and Young, P. C. (1982). Patterns of some seagrass distributions in the Torres Strait, Queensland. *Australian Journal of Marine and Freshwater Research* 33, 273-83
- Brouns, J.W.M. & Heijs, F.M.L (1985). Tropical seagrass systems in Papua New Guinea. A general account of the environment, marine flora and fauna. In Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen C88, 145-182
- Bryan, J., Shearman, P.L., Ash, J., and Kirkpatrick, J.B., (2010). Estimating rainforest biomass

- stocks and carbon loss from deforestation and degradation in Papua New Guinea 1972-2002: best estimates, uncertainties and research needs. *Journal of Environmental Management*. 19, 995-1001
- Business Advantage (2009). LNG in PNG, Also available at www.businessinternational.com
- Carew-Reid, J., R. Prescott-Allen, S. Bass and B. Dalal-Clayton. (1994). *Strategies for National Sustainable Development. A Handbook for their Planning and Implementation*, IUCN and IIED. London: Earthscan.
- Chatterton, P., Yamuna, R., Higgins-Zogib, L., Mitchell, N., Hall, M., Sabi, J., Jano, W., Duguman, J., Mogina, J., Mowbray, D., Melick, D. and Leggett, M. (2009) An assessment of the effectiveness of Papua New Guinea's Protected Areas using WWF's RAPPAM Methodology. WWF.
- Cicin-Sain, B., and Knecht, R.W., (1998). *Integrated Coastal and Ocean Management: Concepts and Practices*, Island Press, Washington D.C, USA
- Cinner, J.E., and T.R. McClanahan. (2006). Socioeconomic factors that lead to overfishing in small-scale coral reef fisheries of Papua New Guinea. *Environmental Conservation* 33 (1): 73-80. Foundation for Environmental Conservation
- Collins, P., Carol Logan, Martha Mungkaje, Rebecca Jones, Katie Yang, and Cindy Lee Van Dover (2007). *Characterization and Comparison of Macrofauna at Inactive and Active Sulphide Mounds at Solwara I and South Su (Manus Basin)*. Duke University Marine Laboratory, Beaufort, NC, USA.
- Commonwealth of Australia (1997) *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*.
- Dahl, A.L (1980). *Regional ecosystems survey of the South Pacific area*. South Pacific Commission, Noumea. Technical Paper 179. 99 p. (1980).
- Dahl, A.L. (1986). *Review of the protected areas system in Oceania (including Oceania island list)*. International Union for Conservation of Nature and Natural Resources, Gland and Cambridge. 239pp.
- Department of Agriculture and Livestock (2007). *National Agriculture development Plan (2008-2016)*
- Department of Community Development (2009). *Informal Sector Policy, NEC Decision, Waigani*
- Department of Education (2008). *State of Education Report, May 2008, Port Moresby*. Also available at: <http://www.education.gov.pg/>

Department of Education (2000). National Education Plan

Department of Environment and Conservation and Department of Foreign Affairs. (1992). The PNG Response to Rio. Report of the Post-United Nations Conference on Environment and Development (UNCED) Seminar for Sustainable Development in Papua New Guinea. Port Moresby.

Department of Environment and Conservation and National Forest Authority. (1995). Key Standards for Selective Logging in Papua New Guinea. In Towards Sustainable Forest Management, ed. National Forest Authority. Port Moresby: National Forest Authority.

Department of Environment and Conservation, (2007), National Biodiversity Strategy and Action Plan

Department of Environment and Conservation, (2007), New Strategic Directions

Department of Environment and Conservation. (1996a). Managing Papua New Guinea's Unique Environment: Strategic Directions 1996–1998. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (1996b). Proposed Environmental Regulation Framework. A Discussion Paper. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2004a). Environment Act 2000 Operational Manual. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2004b). Guideline for Conduct of Environment Impact Assessment and Preparation of Environment Impact Statement. Information Guideline DEC Publication GLEnv/02/2004. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2004c). Guideline for Preparation of Environment Inception Report. Information Guideline DEC Publication GL-Env/01/2004. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2004d). Notification of Preparatory Work on Level-2 and Level-3 Activities. Information Bulletin DEC Publication IB-ENV/01/2004. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2006). National Implementation Plan for Management of Persistent Organic Pollutants in PNG. A plan of action for Government of Papua New Guinea in fulfilling its obligations under the Stockholm Convention in POPs. Draft Report. Port Moresby: Department of Environment and Conservation.

Department of Environment and Conservation. (2009), DEC Corporate Plan 2009 – 2010

- Department of Environmental Science, University of Papua New Guinea and Policy Co-ordination and Monitoring Committee, Department of the Prime Minister and NEC. (1993). *StretimNauBilongTumora* (in English, TokPisin and HiriMotu editions). Port Moresby: Salvation Army Press.
- Department of Health (2000) National Health Plan (2001-2010), Port Moresby
- Department of Health (2006) Demographic Health Survey, Port Moresby
- Department of Health (2008), Annual Health Sector Review, Port Moresby
- Department of National Planning and Monitoring, 2010. Papua New Guinea Development Strategic Plan 2010- 2030.
- Department of National Planning and Rural Development. 2004. Medium Term Development Strategy 2005–2010. Our Plan for Economic and Social Advancement. Port Moresby: Department of National Planning and Rural Development.
- Department of National Planning and Monitoring. (1999). Papua New Guinea National Population Policy 2000–2010. Port Moresby: Population and Human Resource Branch, Department of Planning and Monitoring.
- Department of Petroleum and Energy (2003) The Petroleum Policy, Port Moresby
- Department of Transport, Government of Papua New Guinea. 2006. Review of the National Transport Development Plan 2001–2010, Document One. Port Moresby.
- Department of Transport, Government of Papua New Guinea. 2006. Review of the National Transport Development Plan 2001–2010, Document One, Introduction. Port Moresby.
- Department of Transport, Government of Papua New Guinea. 2006. National Transport Development Plan 2006–2010, Volume One (Policy), Summary. Port Moresby.
- Department of Transport, Government of Papua New Guinea. 2006. National Transport Development Plan 2006–2010, Port Moresby.
- Dilley, Max, Robert S. Chen, UweDeichmann, Arthur L. Lerner-Lam, and Margaret Arnold ‘Natural Disaster Hotspots; A Global Risk Analysis’ World Bank 2005.
- Ellis, J. -A. 1997. Race for the Rainforest II. Applying Lessons Learned from Lak to the Bismarck-Ramu Integrated Conservation and Development Initiative in Papua New Guinea. Port Moresby: Department of Environment and Conservation (PNG) and UNDP-GEF UNOPS-PNG/93/G31.
- Food and Agricultural Organization (FAO). 2003. International Code of Conduct on the

- Distribution and Use of Pesticides. Rome: FAO.
- Frielink, A.B.J (1983). Coastal Fisheries in Papua New Guinea, the current situation. Research Report 83-10. Department of Primary Industry, Papua New Guinea, Port Moresby.
- The National Newspaper, 25th November 2009. Peter Korugl, PNG's National fisheries Authority updating list of fishing vessels, also available at www.pacificbusinessonline.com
- Galkin, S.V. (1997). Megafauna associated with Hydrothermal Vents in the Manus Back-arc Basin (Bismarck Sea). *Marine Geology* 142 (1997): 197-206
- Game, E. T., C. Groves, M. Anderson, M. Cross, C. Enquist, Z. Ferdana, E. Girvetz, A. Gondor, K. Hall, J. Higgins, R. Marshall, K. Popper, S. Schill, and S. L. Shafer (2009) Incorporating climate change adaptation into regional conservation assessments. The Nature Conservancy. Arlington, Virginia.
- Game, E. T., Watts, M. Wooldridge, S., and Possingham, H. 2008. Planning for persistence in marine reserves: a question of catastrophic importance. *Ecological Applications* 18:670-680.
- Gerald R. Allen (1991). Field Guide to the Freshwater fishes of New Guinea. Madang, Papua New Guinea, Publication of Christensen research Institute; No: 9
- Gerald R. Allen, J.P Kinch, S.A Mckenna (2000). A Rapid Marine Biodiversity Assessment of Milne Bay Province, Papua New Guinea-Survey II (2000). RAP Bulletin of Biological Assessment 29. Conservation International, Washington, DC. USA.
- Green A.L & Mous P.J., (2008) Delineating the Coral Triangle, its ecoregions and functional Seascapes; Report on an expert workshop, held at the Southeast Asia Center for Marine Protected Areas, Bali, Indonesia (April 30-May 2, 2003); The Nature Conservancy.
- Geoff Lipsett-Moore, Edward Game, Nate Peterson, Earl Saxon, Stuart Sheppard, Allen Allison, John Michael, Rose Singadan, James Sabi, Gaikovina Kula and Roselyn Gwaibo (2010) Interim National Terrestrial Gap Analysis for PNG; Report No. 1/2010. 80 pp.
- Geoff Lipsett-Moore, Edward Game, Nate Peterson, Earl Saxon, Stuart Sheppard, Allen Allison, John Michael, Rose Singadan, James Sabi, Gaikovina Kula and Roselyn Gwaibo (2010) Interim National Terrestrial Conservation Assessment for Papua New Guinea: Protecting Biodiversity in a changing Climate; Pacific Island Countries Report No. 1/2010.
- Georges, A., Alacs, E.A. and Kinginapi, F. (2007). Freshwater turtles of the Kikori (with special reference to the pig-nosed turtle). Report to Oilsearch Pty Ltd, Sydney and World Wide Fund for Nature (WWF), by the Institute for Applied Ecology, University of Canberra. January 2007.

- Gladman, D., D. Mowbray and J. Duguman. 1996. From Rio to Rai: Environment and Development in Papua New Guinea. Six volumes. Port Moresby: University of Papua New Guinea Press.
- Government of Papua New Guinea and United Nations in Papua New Guinea. 2005. Millennium Development Goals — Progress Report for Papua New Guinea 2004. Port Moresby.
- Government of Papua New Guinea. 2004. Papua New Guinea's National Assessment Report on the Implementation of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States. Port Moresby.
- Hammermaster, E. T. and Saunders, J.C. (1995) Forest Resources and Vegetation Mapping of Papua New Guinea. PNGRIS Publication No 4. (Ausaid: Canberra.) 294 pp
- Heijs, F.M.L & Brouns, J.W.M. (1986). A survey of seagrass communities around the Bismarck sea, Papua New Guinea. In Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen C89, 11-44
- Huber, M.E. (1994). An Assessment of the Status of the Coral Reefs of Papua New Guinea. *Marine Pollution Bulletin* 29:69-73
- Hudson, B (1980). Dugong myth and Management in Papua New Guinea. In: Morauta et.al. (eds) (1980). "Monograph 16. Traditional Conservation: Implications for Today" IASER, Port Moresby, PNG
- Hughes, T.P., Bellwood, D.R, & Connolly, S.R. (2002). Biodiversity Hotspots, Centres of Endemicity and the Conservation of Coral Reefs. *Ecology Letters* 5:775-784
- Independent State of Papua New Guinea (1998). Local-Level Government Administration Act, No.33 of 1997, Certified on 22nd January 1998
- Independent State of Papua New Guinea (1976). Fauna (Protection and Control) Act, No.54
- Independent State of Papua New Guinea (1998). Local-Level Government Administration Act, No.33 of 1997, Certified on 22nd January 1998
- Independent State of Papua New Guinea (1998). Local-Level Government Administration Act, No.33 of 1997, Certified on 22nd January 1998
- Independent State of Papua New Guinea (1998). Oil and Gas Act
- International Tropical Timber Organisation (2007). Achieving the ITTO Objective 2000 and Sustainable Forest Management in Papua New Guinea: Report of the Diagnostic Mission-Executive Summary. International Tropical Council, Forty-second session, 7-12

- May 2007, Port Moresby, Papua New Guinea (available at: http://www.itto.or.jp/live/live_server/3227/E-C42-7.doc).
- IUCN (World Conservation Union).2008. Species Survival Commission. Red List Database 2008 (Available at: <http://www.iucnredlist.org/>)
- Jenkins, A.P. and G. Kula. 2000. Marine Protected Areas in PNG. Chapter 7 in: Munday,P.L. ed The Status of Coral Reefs in Papua New Guinea Global Coral Reef Monitoring Network. Australian Institute of Marine Science. Townville. 104pp. (also available at www.reefbase.org/Summaries/National81.htm)
- Jenkins, A.P, 2002 (a). Sinub Island Marine Wildlife Management Area Plan of Management. Wetlands International – Oceania. John Gorton Building, Canberra, ACT 2601. 49 pgs.
- Jenkins, A.P, 2002 (b). Tab Island Marine Wildlife Management Area Plan of Management. Wetlands International – Oceania. John Gorton Building, Canberra, ACT 2601. 58 pgs.
- Jenkins, A.P, 2002 (c). Tabad Island Marine Wildlife Management Area Plan of Management. Wetlands International – Oceania. John Gorton Building, Canberra, ACT 2601. 53 pgs.
- Jenkins, A.P, 2002 (d). Laugum Marine Wildlife Management Area Plan of Management. Wetlands International – Oceania. John Gorton Building, Canberra, ACT 2601. 52 pgs.
- Johns, S.M., C.J.Yeats, R.M.Hough, R.A.Binns and G.W.Rouse (2007). Baseline Environmental Study, Eastern Manus Basin, Papua New Guinea: Module 3. Ms. Submitted to Nautilus Minerals Niugini, Ltd, Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) Exploration and Mining, North Ryde, New South Wales.
- Johnstone, I.M and Frodin, DG (1982). Mangroves of the Papuan Subregion. In: J.L Gressitt; (editor), Biogeography and Ecology of New Guinea, Dr. W Junk, The Hague. Pp.513-528
- Johnstone, I.M (1982). Ecology and Distribution of seagrasses. Gressitt (ed.) Biogeography and Ecology of Papua New Guinea. Dr. W. Junk, The Hague. Pp. 513-528
- Kisokau, K. M. 2004. Community based conservation and monitoring of leatherback turtles (*Dermochelyscoriacea*) at Kamiali Wildlife Management Area, Morobe Province, Papua New Guinea. Final report to Western Pacific Fisheries Management Council, Honolulu, HI 14 pp.
- Kolkolo, U. 2000. Summary of Government laws and legislation pertinent to reef conservation. In: Munday,P.L. ed The Status of Coral Reefs in Papua New Guinea Global Coral Reef Monitoring Network. Australian Institute of Marine Science. Townville. 104pp. (also available at- www.reefbase.org/Summaries/National81.htm)
- Kumoru L. and Koren. L. 2006. Tuna Fisheries Report. Papua New Guinea National Fisheries

- Authority, Port Moresby, PNG July 2006.
- Kumoru, L. 2003. The Shark Longline Fishery in Papua New Guinea. Report prepared for the Billfish and By-catch Research Group, Mooloolaba, Queensland.
- Kumoru, L., and Koren, L. 2007. Tuna fisheries report - Papua New Guinea. Report prepared for the 3rd Science Committee Meeting, Honolulu, Hawaii.
- Kwa, E. 2004. Biodiversity Law and Policy in Papua New Guinea. Port Moresby: Papua New Guinea Institute of Biodiversity.
- Limpus, C and C.J.Paramenter (1991), The Sea Turtle Resources of the Torres Strait Region, http://www.gbrmpa.gov.au/_data/assets/pdf_file/0012/4008/ws008_the_sea_turtle_resources.pdf
- Limpus, C.J., Miller, J.D., Parmenter, C.J., Reimer, D., McLachlan, N., and Webb, R. 1992. Migration of green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles to and from Eastern Australian rookeries. *Wildlife Research*, 19:347-358.
- Loffler, E. (1977). Geomorphology of Papua New Guinea. CSIRO & The Australian National University Press, Canberra, Australia.
- Marsh, H. and W. K. Saalfeld. 1989. The distribution and abundance of dugongs in the northern Great Barrier Reef Marine Park. *Australian Wildlife Research* 16:429-440
- Martin, R. 1999. Integrating Conservation and Development in a Papua New Guinean Community. Monash Publications in Geography and Environmental Science Number 52. Melbourne: Monash University.
- Miller, J.D and Limpus, C.J. (1991). Torres Strait Marine Turtle Resources, Queensland National Parks and Wildlife Service. In: Torres Strait Baseline Study Conference. pp. 213-226
- MMSD (2002). Mining for the Future. Appendix H: OK Tedi Riverine Disposal Case Study, No. 68a, April 2002
- Marsh, H. 2006. Dugong dugon. A WWW publication accessed on 5 August 2008 at www.iucnredlist.org. International Union for Conservation of Nature.
- Marsh, H., Eros, C., Corkeron, P., and Breen, B. 1999. A conservation strategy for dugongs: implications of Australian research. *Marine and Freshwater Research* 50:979-990.
- Marsh, H., Penrose, H., Eros, C., Hugues, J. 1996. Dugong: Status report and action plans for countries and territories. A report compiled for the IUSN/SSC Sirenia specialist group.
- MRA. 2007. Corporate Profile. A WWW publication accessed on 17 May 2008 at

<http://www.mra.gov.pg/LinkClick.aspx?fileticket=uYX%2FTVEM7Jg%3D&tabid=36&mid=444>

- Mullineaux, L.S., Mills, S.W., and Goldman, E. 1998. Recruitment variation during a pilot colonization study of hydrothermal vents (9°50'N, East Pacific Rise). *Deep Sea Research Part II: Topical Studies in Oceanography* 45:441-464.
- National AIDS Council Secretariat (2010). Papua New Guinea – 2010 Country Progress Report to UNGASS March 2010. Also available at: <http://www.nacs.org.pg>
- National Education Board (2008). Annual Report-2008, Policy, Planning & Research Division, Dept. of Education, Waigani. Also available at: <http://www.education.gov.pg/>
- National Fisheries Authority (2004). Corporate Plan 2005-2007, Port Moresby, Papua New Guinea
- National Statistical Office of PNG (2000). PNG Census 2000 National Report. National Statistical Office of PNG, Port Moresby, Papua New Guinea
- Nautilus Minerals (2008). Environment Impact Statement Volume A: Solwara 1 Project. Available at: <http://www.cares.nautilusminerals.com>
- Nicholls, S. 2002. The Priority Environmental Concerns of Papua New Guinea. Draft Report. Strategic Action Programme for the International Waters of the Pacific Small Island Developing States. Port Moresby: Global Environment Facility, United Nations Development Programme and South Pacific Regional Environment Programme.
- Office of National Planning. 1999. Papua New Guinea Human Development Report 1998. Port Moresby: Government of Papua New Guinea and United Nations Development Programme.
- Paijmans, K and Rollet, B (1977). The Mangroves of Galley Reach, Papua New Guinea. *Forest Ecology and Management* Vol:1 1976-1977, pp. 119-140
- Papua New Guinea Chamber of Mines and Petroleum at www.pngchamberminpet.com.pg
- Papua New Guinea Fisheries Regulations 2005, Coastal Fisheries Management and Development Project and the Secretariat of the Pacific Community, Fisheries Information Section.
- Papua New Guinea Tourism Promotion Authority (2006). Papua New Guinea Tourism Sector Review and Master Plan (2007-2017)
- Papua New Guinea Conservation Trust Fund Limited. 2000. Papua New Guinea Mama Graun Conservation Trust Fund. Operations Manual. Port Moresby.

- Percival, M and Womersley, J.S (1975). Floristics and Ecology of the mangrove vegetation of Papua New Guinea, Botany Bulletin No.8, Papua New Guinea National Herbarium, Dept. of Forest
- Piest, U. and J. Velasquez. 2003. Environmental Governance in Papua New Guinea: A Review — Interlinkages: Synergies and Coordination among Multilateral Environmental Agreements. Tokyo: United Nations University.
- Quarrie, J. ed.) 1992. Earth Summit '92 The United Nations Conference on Environment and Development Rio De Janiero 1992. London: The Regency Press.
- Quinn, N and B. Kojis (1985). Leatherback turtles under threat in Morobe Province, Papua New Guinea. *Pacific Life and Environmental Studies* 1: 79-99
- RamuNico Management Company. 2007. Environment Impact Statement for Ramu Nickel Project, Submitted to Department of Environment and Conservation
- Remarks by Prime Minister Rt. Hon. Grand Chief, Sir Michael Somare On the Occasion of the PNG LNG Project Sanction Inauguration 8 December 2009, Parliament House.
- Saulei, S. and J. -A. Ellis. 1997. The Motupore Conference: ICAD Practitioner Views from the Field. Port Moresby: Department of Environment and Conservation and UNDP.
- Sekhran, N. and S. Millar. 1994. Papua New Guinea Country Study on Biological Diversity. Port Moresby: Conservation Resource Centre, Department of Environment and Conservation and Africa Centre for Resources and Environment (ACRES).
- Shearman, P.L, (2008). Recent Change in the Extent of Mangroves in the Northern Gulf of Papua, Papua New Guinea
- Shearman, P. L., Bryan, J. E, Ash, J., Hunnam, P., Mackey, B., and Lokes, B. (2008). The State of the Forests in PNG: Mapping and condition of forest cover and measuring the drivers of forest change in the period 1972- 2002. Port Moresby: University of Papua New Guinea
- Shearman P.L. Ash J., Mackey B., Bryan J.E., Lokes B. (2009). Forest conversion and degradation in Papua New Guinea 1972 – 2002. *Biotropica*. 41, 379-390.
- Shearman, P.L., Bryan, J.E, 2010, A bioregional analysis of the distribution of rainforest cover, deforestation and degradation in Papua New Guinea. *Austral Ecology* (2010)
- Secretariat of the Pacific Community (2005). Pacific Islands Regional Ocean Policy and Framework for Integrated Strategic Action (Available at www.spc.int/piocean)
- Sine, R (2007). Overview of CITES Management in Papua New Guinea, Department of Environment & Conservation, Waigani, Unpublished Report

- Sine, R and Nundima J.,(2009). Update on Saltwater Crocodile Aerial Survey Results, Department of Environment & Conservation, Waigani, Unpublished Report
- Solmu, G.C and Sine, R (2005), National Crocodile Management Plan, Department of Environment & Conservation, Waigani, Port Moresby
- SPREP (1999). Regional Wetlands Action Plan for the Pacific Islands, Quality Print Ltd, Suva, Fiji
- Spring, C.S (1982). Status of Marine Turtle Population in Papua New Guinea. In: Bjorndal, K.A, editor. Biology and conservation of sea turtles, Washington, D.C. Smithsonian Institution Press.pp.281-289
- Sullivan, M.E (1991). The Changing Climate in Paradise: Feasibility Study on Climate Monitoring and Impacts in the South West Pacific, Bureau of Meteorology, 145pg
- Swartzendruber,J.F., (1993). Papua New Guinea Conservation Needs Assessment: Synopsis Report, Government of Papua New Guinea Department of Environment & Conservation
- Transport Sector News February 2008, Issue 1 Also available at: <http://www.pgtssp.com/>
- United Nations Development Programme (UNDP). 1994. YumiWankain: Report of the United Nations Joint-Inter-Agency Mission to Papua New Guinea on Sustainable Development. Port Moresby: United Nations Development Programme.
- University of Papua New Guinea, 2002. Papua New Guinea National Assessment Report: Response to Rio and Agenda 21. In From Rai to Johannesburg, ed. D. Mowbray. Port Moresby: University of PNG Printery.
- Van Dover, C.L (2000) The Ecology of Deep-Sea Hydrothermal Vents. Princeton UP, 2000
- Werner, T. B., and G.R. Allen, eds. 1998. A rapid biodiversity assessment of the coral reefs of Milne Bay Province, Papua New Guinea. RAP Working Papers 11, Conservation International, Washington, D.C.
- Whimp, K (1995). Legislative Review Report 2: Conservation. Department of Environment and Conservation Strengthening Project, An AUSAID Project, Port Moresby, Papua New Guinea
- Whitehouse, F.W (1973). Coral Reefs of the New Guinea region. In Biology and Geology of Coral Reefs, Vol.1: Geology1 (O.A. Jones&R.Endean.eds).pp. 169-186. Academic Press, New York.
- World Fishing and Aquaculture 18 August 2009. PNG Purse Seiners certified Friends of the Sea. Available at [http:// www.worldfishing.net/](http://www.worldfishing.net/)

World Statistics Pocketbook Small Island Developing States Department of Economic Series V No. 24/SIDS and Social Affairs Special Issue Statistics Division Preliminary -2007 update.

World Wide Fund for Nature (WWF) and Department of Environment and Conservation (DEC). (1992). Review of the Management and Status of Protected Areas and Action Plan. Papua New Guinea Protected Areas Programme. Port Moresby: World Wide Fund for Nature and Department of Environment and Conservation.

World Wide Fund for Nature (WWF) and Department of Environment and Conservation (DEC). 1993. Papua New Guinea Conservation Areas Strengthening Project 1994–2000, Project Document. Port Moresby: World Wide Fund for Nature, South Pacific Program and Department of Environment and Conservation.

Annex II. Map of Papua New Guinea



Source: www.un.org/depts/cartographic/map/profile/papua.pdf

PREAMBLE

WE declare our First Goal to be for every person to be dynamically involved in the process of freeing himself or herself from every form of domination or oppression so that each man or woman will have the opportunity to develop as a whole person in relationship with others.

WE declare our Second Goal to be for all citizens to have an equal opportunity to participate in, and benefit from, the development of our country.

WE declare our Third Goal to be for Papua New Guinea to be politically and economically independent, and our economy basically self-reliant.

WE declare our Fourth Goal to be for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all and are replenished for the benefit of future generations.

WE declare our Fifth Goal to be to achieve development primarily through the use of Papua New Guinean forms of social, political and economic organization.

*Preamble, Constitution of the Independent State
of Papua New Guinea, 16 September 1975*



Annex IV: The Guiding Principles of the Medium Term Development Strategy 2005-2010

1. Private Sector-led Economic Growth

To trigger the private sector, including ordinary Papua New Guineans in rural communities, to become productively engaged in growing the economy, by harnessing the entrepreneurial spirit.

2. Resource Mobilisation and Alignment

To mobilise and align land, labour and financial resources to support priority development programs and activities.

3. Improvements in the Quality of Life

To translate the gains from economic growth into higher living standards for all Papua New Guineans.

4. Natural Endowments

To maximise the value of our natural resources and environment, through sustainable primary production and downstream processing, with a focus on agriculture, forestry, fisheries and tourism supported by mining, petroleum and gas.

5. Competitive Advantage and the Global Market

To focus interventions on resources, products and commodities in which Papua New Guinea enjoys a competitive advantage in global markets.

6. Integrating the Three Tiers of Government

To closely integrate the national, provincial and local level Governments to support the implementation of the MTDS.

7. Partnership through Strategic Alliances

To enhance strategic alliances between key partners, including the private sector, donors, churches and community-based organizations, to deliver the MTDS.

8. Least Developed Areas Intervention

To facilitate strategic impact project interventions in least developed districts and provinces with a particular focus on the 'poverty corridor'.

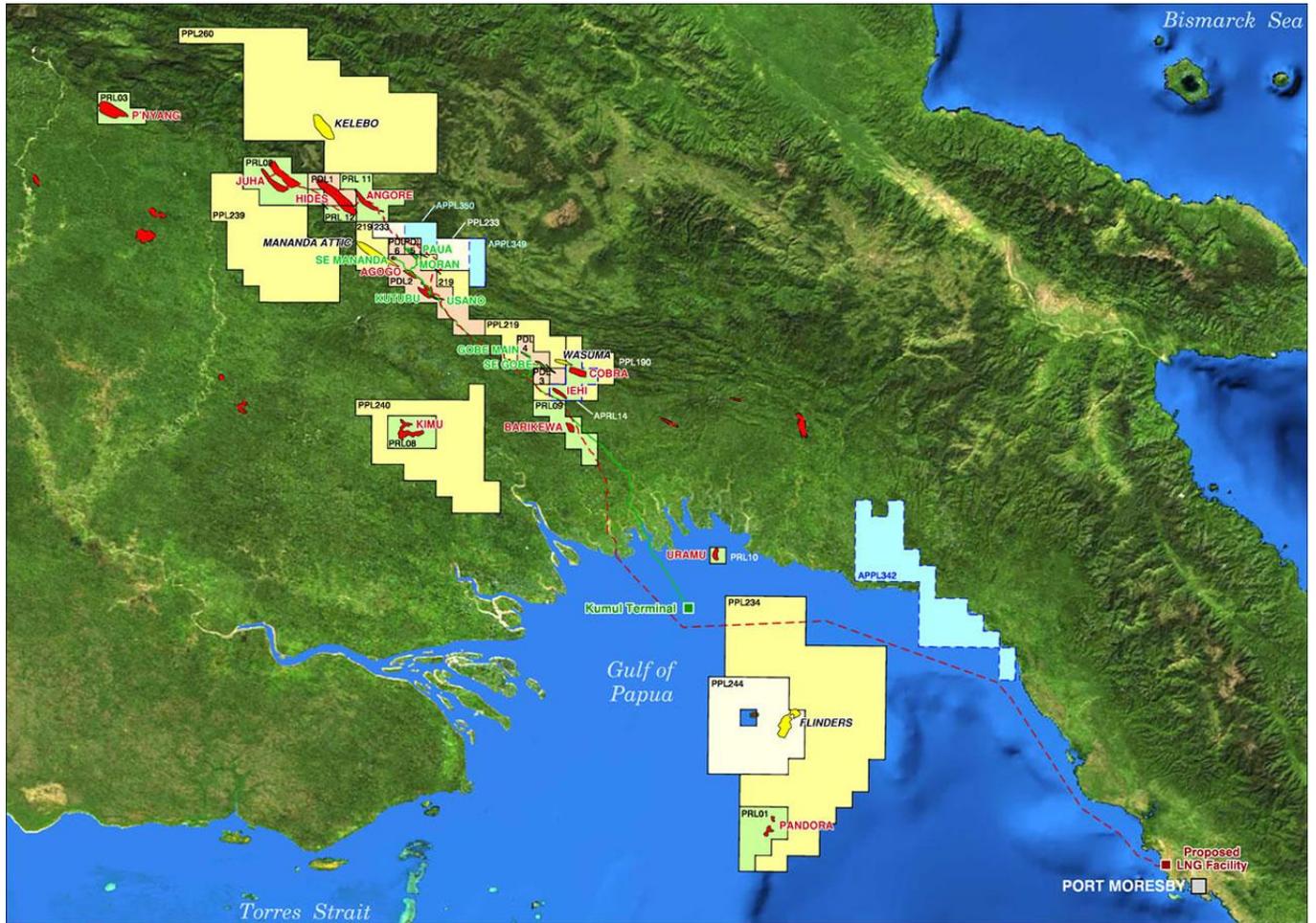
9. Empowering Papua New Guineans and Improving Skills

To help Papua New Guineans to help themselves through improving access to basic health and education services, information, markets and appropriate technology, with a special focus on the needs of those in the informal sector.

10. 'Sweat Equity' and Papua New Guinean Character

To encourage and assist Papua New Guineans to contribute to national development by investing 'sweat equity', consistent with our noble virtues and traditions.

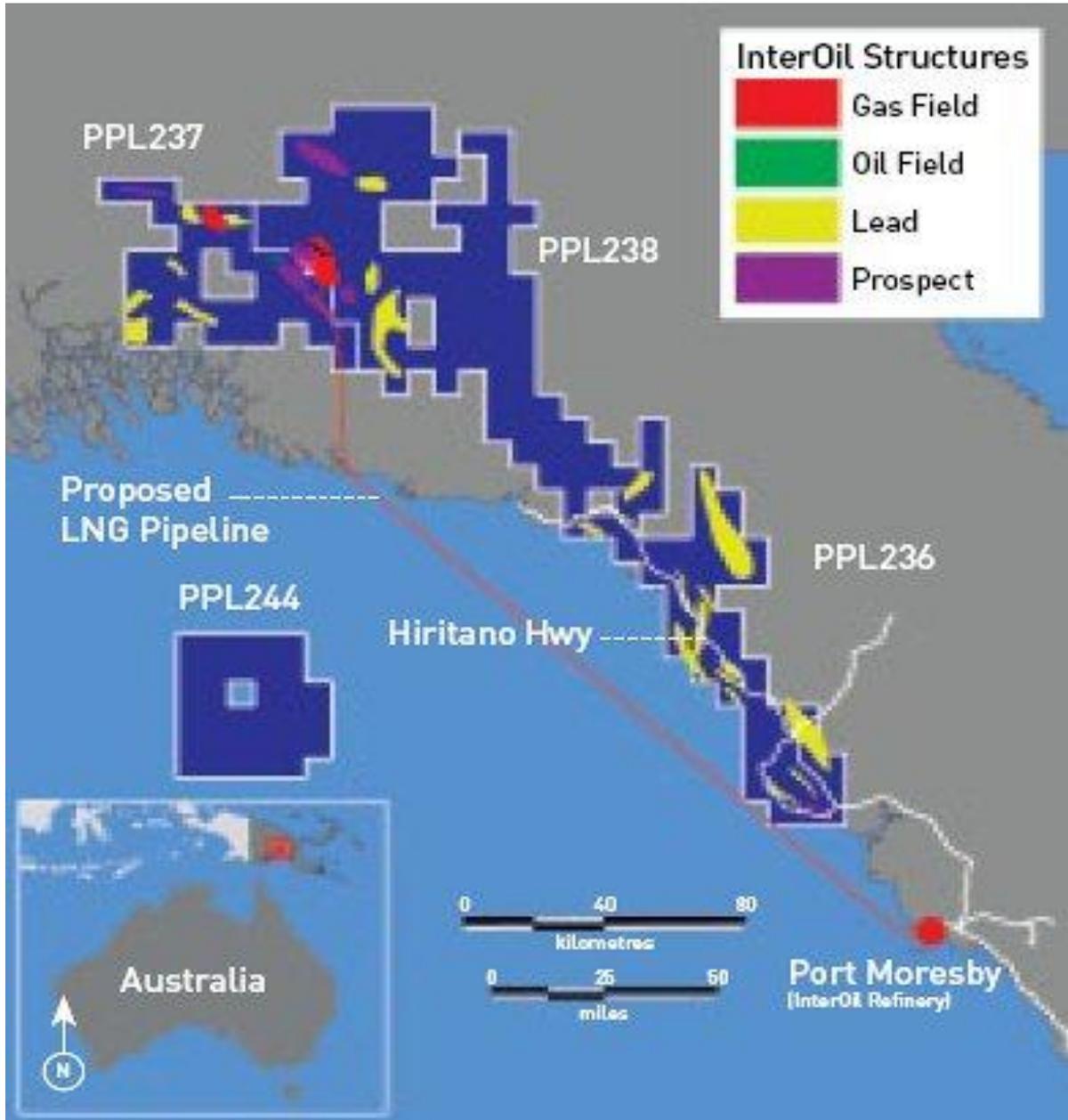
Annex. V. First LNG Project in the Sothern Highlands: Exploration and Production Sites



- OSH operated licence
- OSH interest in licence
- Petroleum Development Licence
- Petroleum Retention Licence
- OSH Petroleum Application
- Oil field
- Gas field
- Oil & gas field
- Prospect
- Oil pipeline
- Gas pipeline
- Proposed gas pipeline

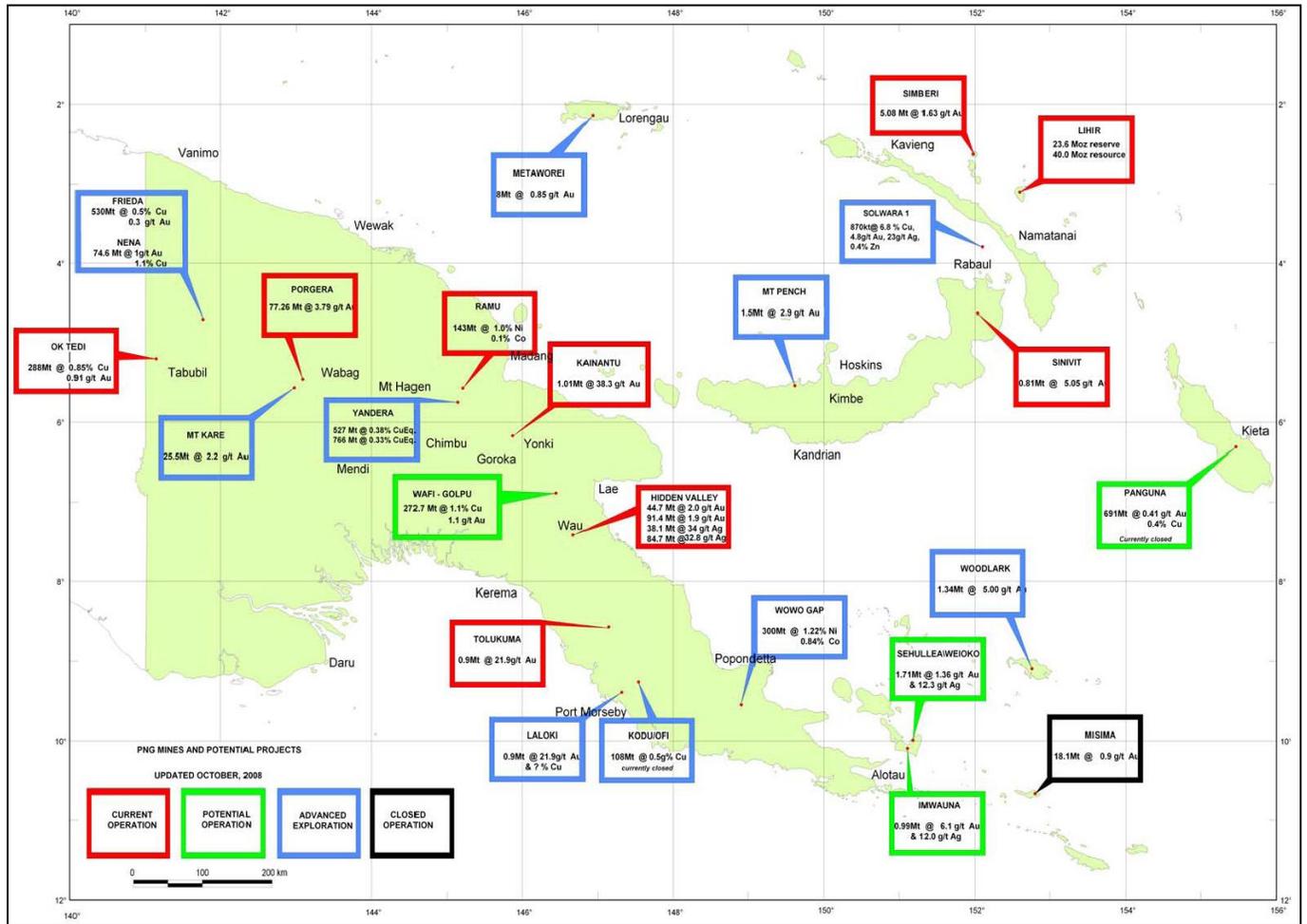
Source: <http://www.oilsearch.com/Our-Activities/Location-Maps.html>

Annex VI: Second LNG Project by InterOil Corporation



Source: InterOil, available at <http://www.interoil.com>

Annex VII. Existing and Potential Mines in PNG



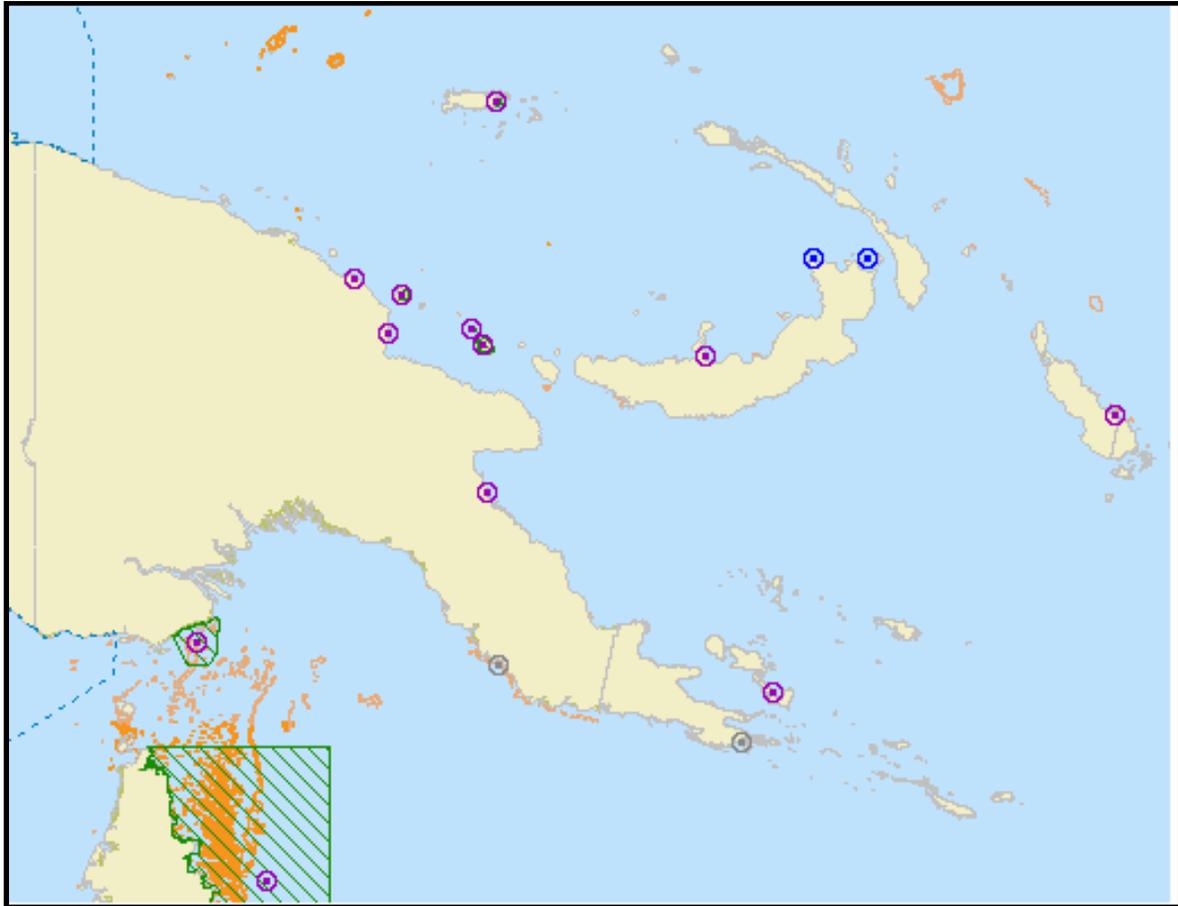
Source: Mineral Resources Authority, available at <http://www.mra.gov.pg>

Annex VIII. Coral Triangle Initiative Region



Source: Coral Triangle Initiative, Regional Plan of Action, 2007

Annex IX. Location of Existing MPAs in PNG



Source: Reefbase available at <http://www.reefbase.org>

Annex X. List of IMO Conventions signed by PNG

Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter, 1972 (London Convention)

The London Convention regulates the dumping and incineration of waste or other matter at sea which might adversely affect the marine environment. It generally allows dumping at sea except that certain substances, as listed in three annexes, are subject to regulation through to prohibition.

Annex I lists prohibited substances, Annex II lists substances that need a special permit before they can be dumped at sea and Annex III list substances that require a general permit before they can be dumped at sea. Special exemptions allow for emergencies and where life, vessel or platforms are endangered.

1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (96 Protocol)

The 96 Protocol significantly changes the 1972 London Convention by seeking to eliminate pollution of the sea by dumping. It reverses the approach taken by the earlier Convention. Rather than allowing dumping in general and prohibiting or regulating certain substances listed in three annexes, the 96 Protocol prohibits all dumping at sea, except for a limited list of substances specified in Annex I. The 96 Protocol also bans the incineration of wastes at sea.

The 96 Protocol seeks to incorporate the precautionary and preventative principles as well as promoting sustainable use and conservation of marine resources.

MARPOL 73/78

MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978. ("MARPOL" is short for marine pollution and 73/78 short for the years 1973 and 1978.)

MARPOL 73/78 is one of the most important international marine environmental conventions. It was designed to minimize pollution of the seas, including dumping, oil and exhaust pollution. Its stated object is: to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.

The original MARPOL Convention was signed on 17 February 1973, but did not come into force. The current Convention is a combination of 1973 Convention and the 1978 Protocol. It entered into force on 2 October 1983. As of 31 December 2005, 161 countries, representing 98% of the world's shipping tonnage, are parties to the Convention.

All ships flagged under MARPOL contain 6 annexes, concerned with preventing different forms of marine pollution from ships. A State that becomes party to MARPOL must accept Annex I and II while Annexes III-VI are voluntary annexes;

Annex I (Oil) entered into force on 2 October 1983. Annex II (Noxious Liquid Substance) entered into force 6 April 1987. As of October 2009, 150 countries representing almost 99.14% of the world's tonnage had become party to Annexes I and II.

Annex III (Harmful Substances carried in Packaged Form) entered into force on 1 July 1992 and (as of October 2009) 133 countries representing over 95.76% of the world's tonnage had become party to it.

Annex IV (Sewage) entered into force on 27 September 2003 and (as of October 2009) 124 countries representing over 81.62% of the world's tonnage had become party to it.

Annex V (Garbage) entered into force on 31 December 1988 and (as of October 2009) 139 countries representing over 97.18% of the world's tonnage had become party to it.

Annex VI (Air Pollution) entered into force on 19 May 2005 and (as of October 2009) 56 countries representing over 46% of the world's tonnage had become party to it. Countries that are signatories to MARPOL are subject to its requirements, regardless of where they sail, and member nations are responsible for vessels registered under their respective nationalities.

Intervention Convention: International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969

The Intervention Convention provides powers to Coastal States to take action against a vessel on the high seas in respect of marine casualties resulting in or likely to result in major environmental or economic damage within the Coastal States jurisdiction.

Protocol Relating to the Intervention on the High Seas in Cases of Oil pollution by Substances Other than Oil, 1973

The 73 Protocol extends most of the provisions to not only oil but other substances listed in an annex. Coastal States are also able to take action for substances not in the annex provided they can show that at the time of intervention the substance could 'reasonably pose a grave and imminent threat' similar to those posed by substances in the annex.

OPRC 90: International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990

OPRC 90 is a treaty designed to help Governments combat major oil pollution incidents. The Convention recognizes that, in the event of a pollution incident, prompt, and effective action is essential. This in turn depends upon the establishment of oil emergency plans on ships and offshore installations, and at ports and oil handling facilities, together with national and regional contingency plans as appropriate. The Convention is intended to encourage this process and at the same time to establish a framework for international co-operation in responding to pollution emergencies which will enable maximum resources to be mobilized as quickly as possible.

The Convention is designed to facilitate international co-operation and mutual assistance in preparing for and responding to a major oil pollution incident and to encourage States to develop and maintain an adequate capability to deal with oil pollution emergencies.

CLC 92: International Convention on Civil Liability for Oil Pollution Damage, 1992

CLC 92 requires compulsory insurance on oil tankers to cover compensation claims for oil pollution damage suffered by Coastal States. Tanker owners' liability is strict but limited, and claims can be made up to US\$85 million. CLC 92 only applies to pollution damage from heavy oils carried by tankers. CLC 92 is closely linked to FUND 92.

FUND 92: International Convention on the Establishment of an International Fund For Compensation for Oil Pollution Damage, 1992

FUND 92 establishes an international fund to cover claims for oil pollution damage that exceed compensation available under CLC 92. Compensation is available up to US\$192 million.

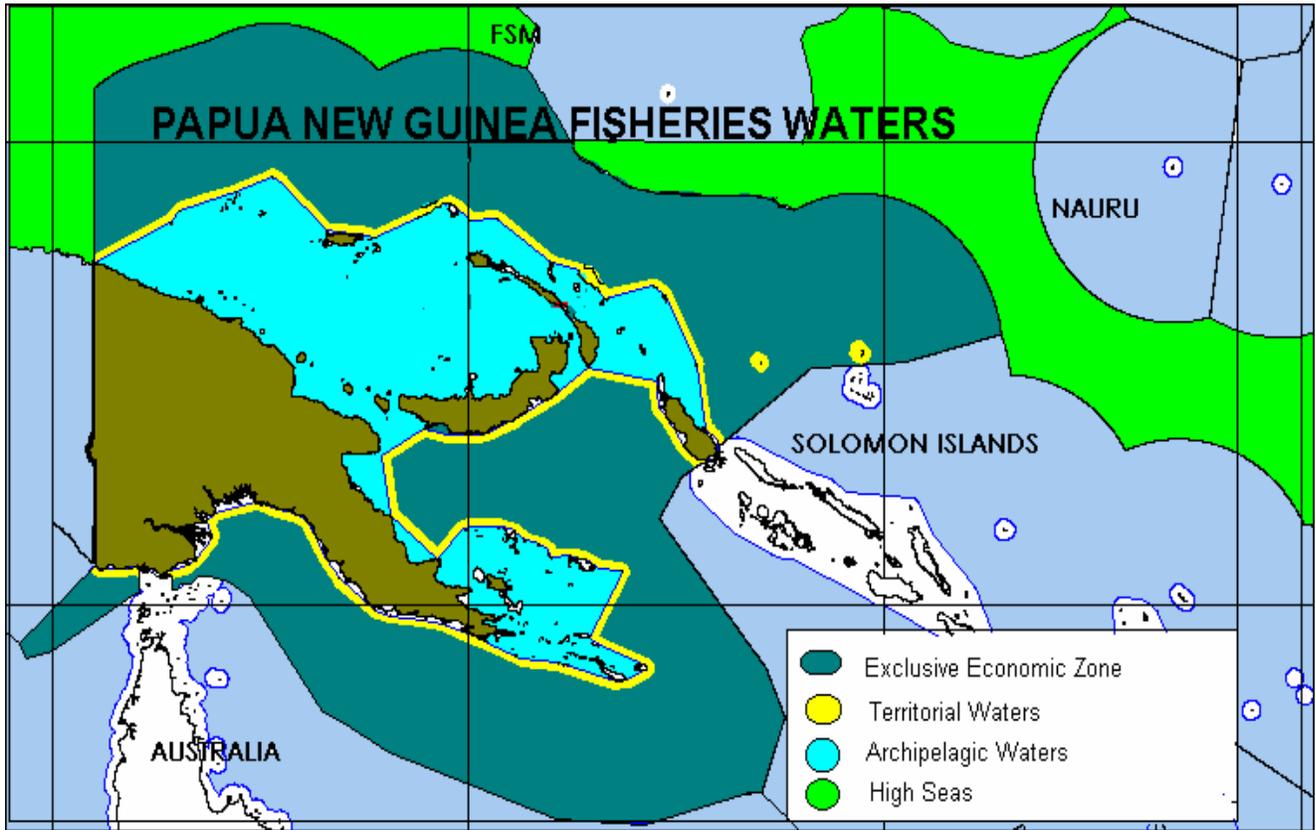
To be a party to FUND 92, a country must first be a party to CLC 92. The benefits to pacific island countries of being a party to FUND 92 are enormous. The fund is contributed to only by oil companies that import 150,000 tonnes or more of crude or heavy oil by sea each year. No pacific island country fits this category, so coverage by the fund is free .

HNS Convention: International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996

The HNS Convention is similar to CLC 92 and FUND 92 in that it establishes a compensation regime for victims of marine pollution damage, albeit in this case in the event of pollution from the escape or release of dangerous substances other than oil. The Convention provides for a fund and liability to both ship and cargo owners .

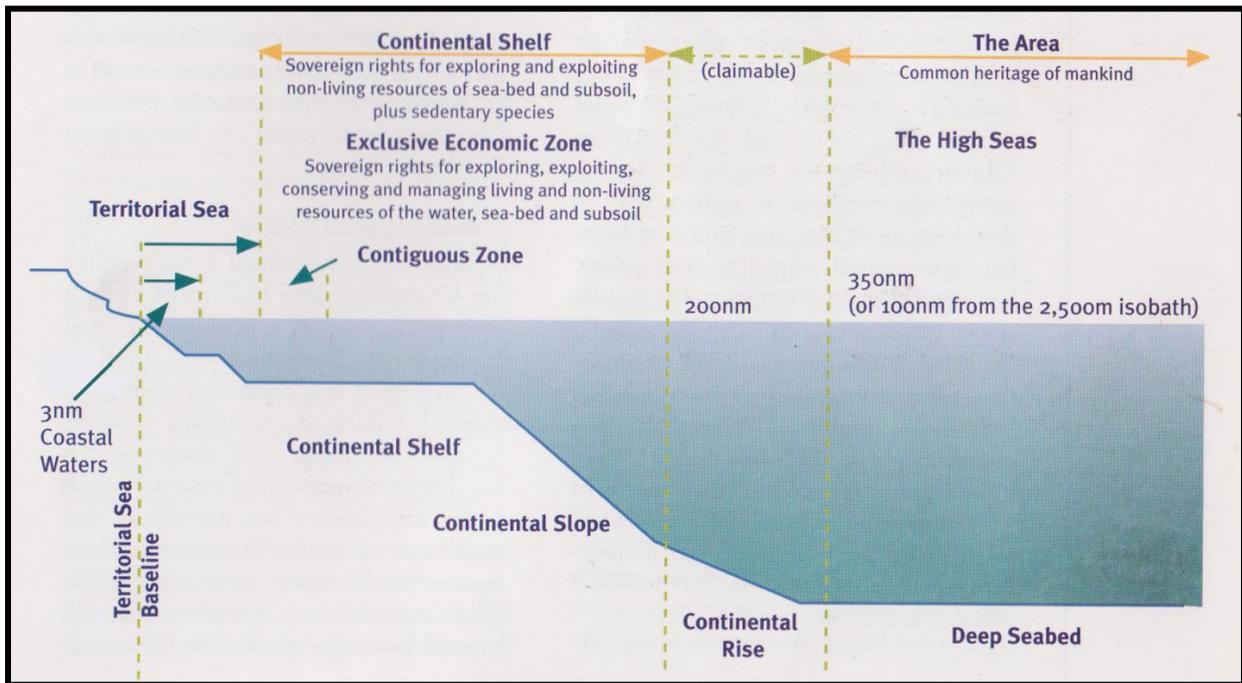
Source: Compiled from IMO and National Maritime Safety Authority

Annex XI. Declared PNG Fishing Waters



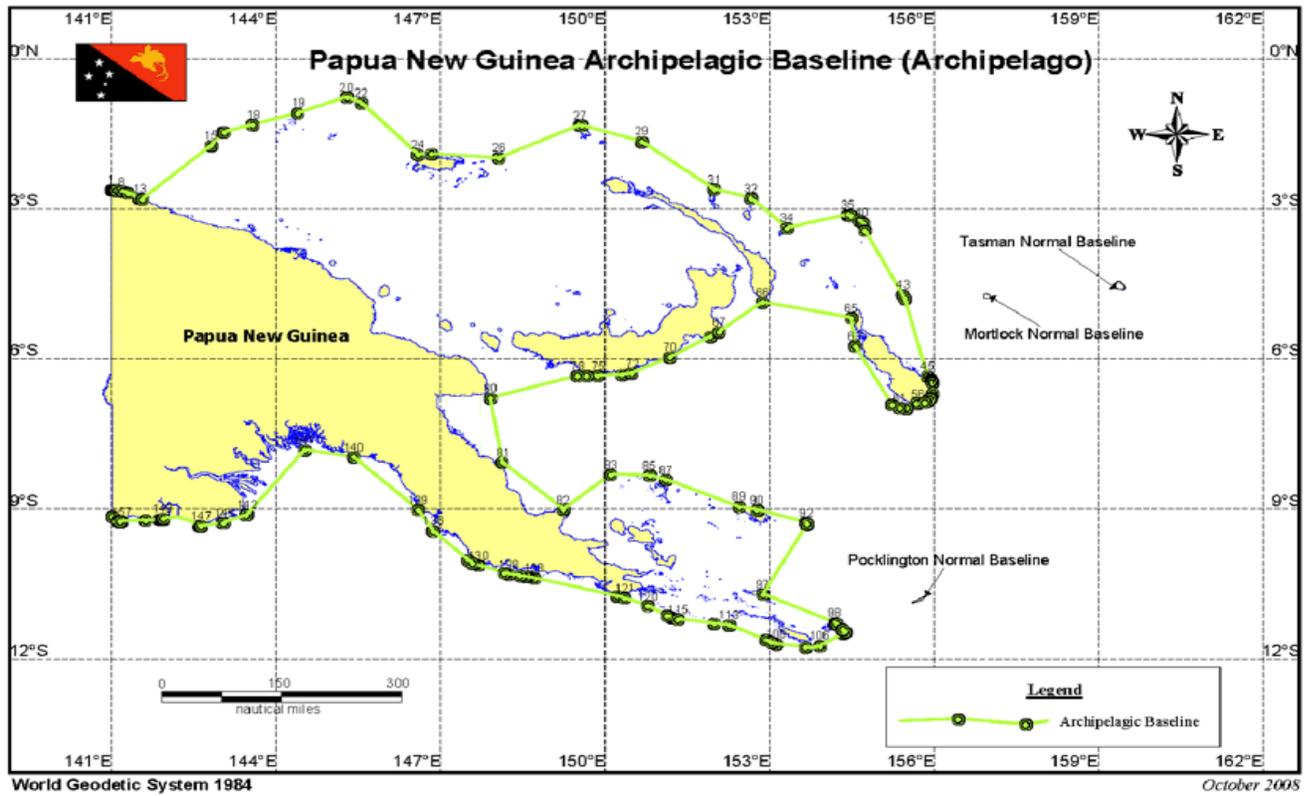
Source: National Fisheries Authority, Corporate Plan 2007

Annex XII. Designated Maritime Zones in PNG



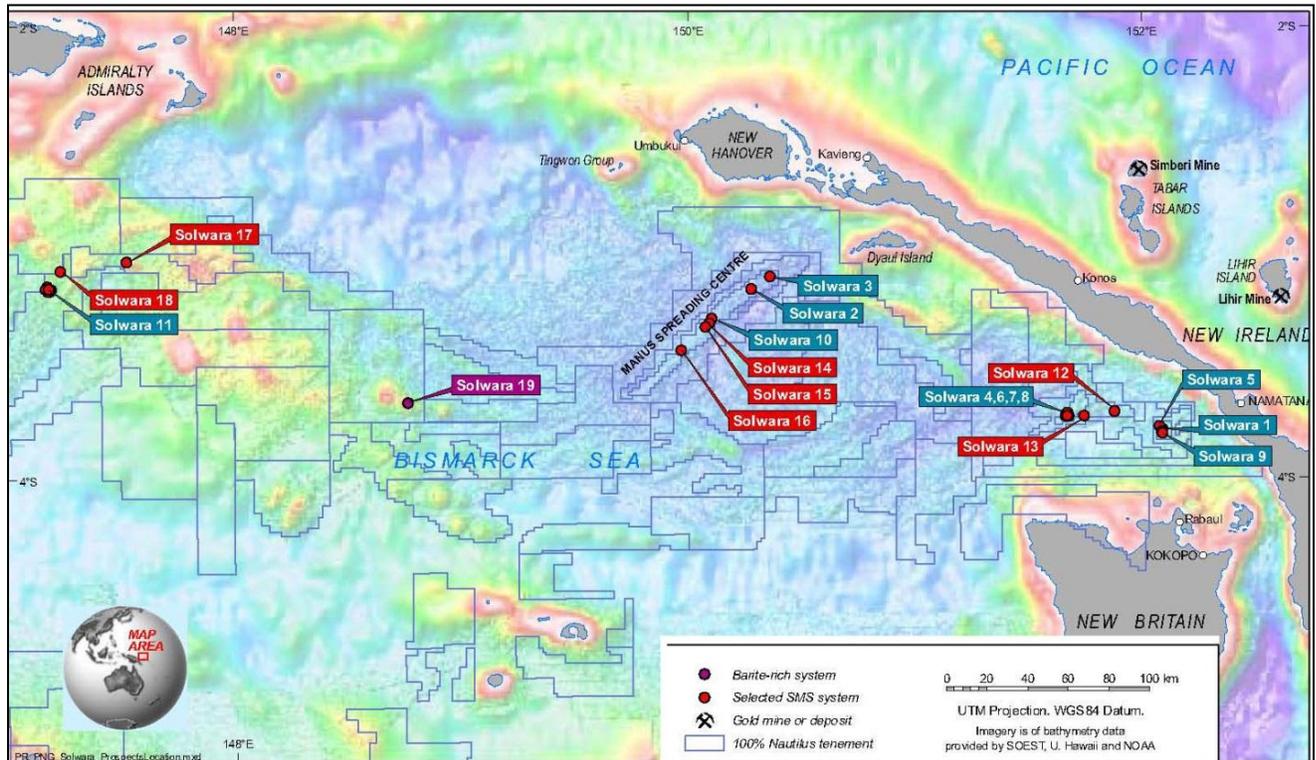
Source: PNG National Maritime Safety Authority, 2007

Annex XIII. PNG Archipelagic Baseline Map



Source: SOPAC at www.sopac.org

Annex XIV. Sea Bed Mining Site (Solwara 1) including potential sites



Source: Nautilus Minerals 2008 available at <http://www.cares.nautilusminerals.com>