



SOLOMON ISLANDS STATE OF ENVIRONMENT REPORT 2008



Ministry of Environment Conservation and Meteorology
July 2008

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July 2008

Printed by EN Digital Printing Ltd, Honiara

Cover Design: Environment and Conservation
Division Photo library

ACKNOWLEDGEMENTS

The Pacific Horizons Consultancy Group (PHCG) would like to thank the following for their support and assistance during the production of this report:

The Director of Environment and Conservation Division and his staff for the coordination and provision of relevant information,

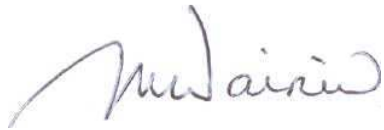
The staff of the following Ministries for their generous provision of data and information:

- Ministry of Forests
- The Ministry of Mines, Energy and Rural Electrification
- The Ministry of Fisheries and Marine Resources.
- The Ministry of Agriculture and Livestock Development
- As well as the Forestry Management Project operating within the Ministry of Forests.

The staff of Environmental Concerns Action Network of Solomon Islands (ECANSI) for logistic support and provision of additional information,

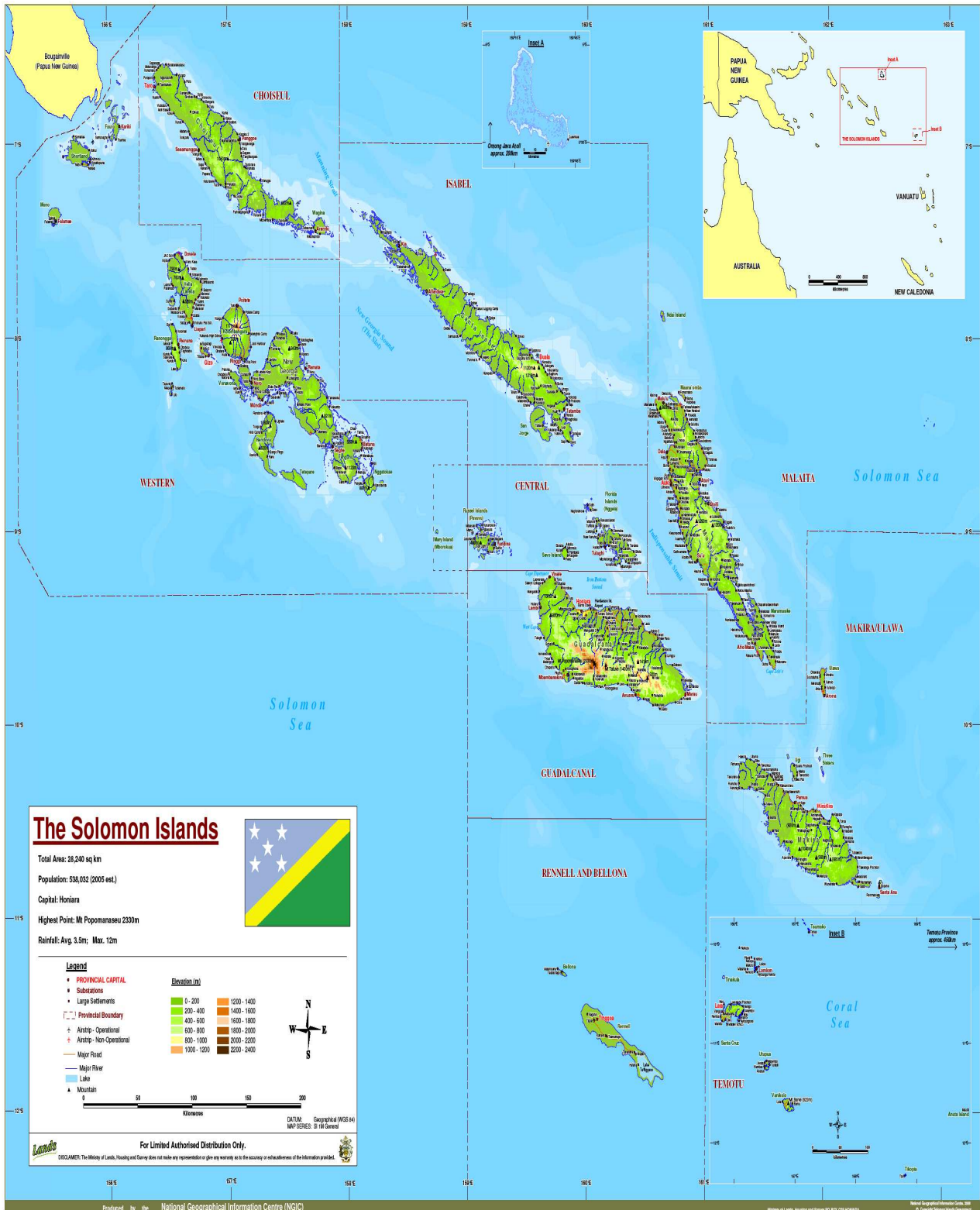
Dr Chris Filardi and Patrick Pikacha for constructive comments on the Draft Report,

and finally to staff and specialists within PHCG for assistance with the report production.

A handwritten signature in dark ink, appearing to read 'Morgan Wairiu', with a large, sweeping initial 'M'.

Dr Morgan Wairiu
PHCG Ltd.

SOLOMON ISLANDS MAP



FOREWORD



The rapid pace and level of exploitation of the country's natural resources cannot be isolated from the environmental challenges with which the country is faced. At the same time, it should be remembered that environmental sustainability is critically important to the country's economic and social development. The Coalition for National Unity and Rural Advancement (CNURA) Government recognizes and attaches considerable importance to ensuring the environment and natural resources of Solomon Islands are protected, managed and sustainably used for the maximum benefit of the people and government of Solomon Islands.

The production of the State of the Environment Report for Solomon Islands through Cabinet endorsement demonstrates CNURA's commitment to promote sound environmental practices in the country. This report which fulfils Section 8 of the Environment Act 1998, is the first such report produced under that Act. The importance of this report lies in its role as a first step in identifying the major environmental issues the country is facing and informing government regarding priorities, policy options and responses to priority issues. It accomplishes this by gathering in one place, the current state of knowledge about the country's environment.

Completion of this long overdue report was identified as a priority in my Ministry's Corporate Plan 2008 – 2010, and it represents a comprehensive reference document for government, one which should enable it to make well considered decisions about increasing human activities and their effects on the environment. It should also be an important vehicle for raising awareness at all levels of government and among the donor community of the importance of environmental issues experienced by the country.

I wish to record my sincere appreciation for the outstanding and professional efforts of staff of my Ministry and in particular the Environment and Conservation Division for their hard work in coordinating the successful production of this report. Also, I wish to extend my appreciation to Pacific Horizons Consultancy Group for the work and efforts put into completing the report despite the very limited timeframe imposed to deliver this product. Its comprehensive nature is a tribute to their efforts.

As a first step in identifying environmental priorities for the country, it is my hope that the findings of the report will be used by all stakeholders in guiding their aspirations for sustainable development in Solomon Islands.

Thank you,

A handwritten signature in black ink, appearing to read 'Gordon Darcy Lilo'.

Hon. Gordon Darcy Lilo, MP

Minister of Environment, Conservation and Meteorology.

EXECUTIVE SUMMARY

The report was commissioned at the end of May 2008 with delivery of the final product by end June 2008. As such, it has been researched and written over a very compressed timeline. Considerable shortcomings and inconsistencies in data needed to be tackled in this period, and so a rapid desk assessment approach was used with limited opportunity for peer review and feedback.

Information was limited and the report depends significantly on grey literature and unpublished materials produced by a range of organizations within the country. Although not satisfactory from a formal scientific viewpoint, this information has been used wherever it is deemed credible and preferable to no information at all.

Detailed description of the current status of the environment is given with equal focus on both the terrestrial and marine environments. It also includes minerals and mining, land resources and soils. The report highlights the country's development reliance on the environment from both subsistence and monetized perspectives, and the significant impacts of this reliance on the status of the environment.

A brief overview of the national and environmental context is provided to set the scene for further synthesis and analysis of the causes of environment changes or trends and associated consequences. Major causes include rapid population growth and pressures, commercial plantation agriculture and forestry, logging, urbanization, mining fishing, pollution, energy production and use and climate change. The socioeconomic changes visited on Solomon Islands due to environmental change include: Fresh water stress, soil stress and degradation, forest depletion, loss of biodiversity, fish stock depletion and coral reef degradation. The social, cultural and economic changes include: urban drift, diet change, malnutrition and diseases,

community conflict over resources, and shifting cultivation intensification.

Current or ongoing national programmes are presented which include both national initiatives and those under international environmental agreements which Solomon Islands is a signatory. These are mainly enabling activities which include development of strategies and capacity assessments to meet the country's obligations under the conventions. They do however, complement and directly support national initiatives and environment protection and management.

The current institutional arrangements, policy and legal framework for environment protection and management are also described. It highlighted weak institutional capacity, inadequate legal framework and lack of clear policy directives to manage and safeguard the countries environment and resources there in. As a result, the country's resources have been over used with little benefit to the country.

Major environmental issues were highlighted, major barriers identified and set of recommendations made to adopt broader national policy and development on environment and recognized the importance of environmental management and protection.

ACRONYMS

AAGR	Average Annual Growth Rate
APACE	Appropriate Technology for the Community and Environment
ARDS	Agriculture and Rural Development Strategy
AMCA	Arnavon Marine Conservation Area
BD	Biological Diversity
BSSE	Bismarck Solomon Seas Ecoregion
CBD	Convention on Biological Diversity
CBO	Community Based Organisations
CBSI	Central Bank of Solomon Islands
CDC	Commonwealth Development Corporation
CI	Conservation International
CITES	Convention on Illegal Trade in Endangered Species of Flora and Fauna
CMS	Convention on Migratory Species
CNURA	Coalition for National Unity and Rural Advancement
CST	Central Solomons Terrain
CUSO	Canadian University Services Overseas
EBA	Endemic Bird Area
ECD	Environment and Conservation Division
EEZ	Economic Exclusion Zone
EIA	Environmental Impact Assessment
EIS	Environment Impact Statement
EPPCL	Eagon Pacific Plantation Company Limited
EHD	Environmental Health Division
EA	Enabling Activity
ECD	Environment and Conservation Division
FSM	Federated State of Micronesia
FSPI	Foundation for the People of South Pacific International
GCC	Grand Coalition for Change
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPPOL	Guadalcanal Plains Palm Oil Limited
ICLARM	International Centre for Living Aquatic Resources Management
INGOs	International Non-Government Organizations
IUCN	World Conservation Union
JICA	Japan International Cooperation Agency
KFPL	Kolombangara Forest Products Limited
kW	Kilo-Watt (Thousands of Watts of power)
LMMA	Locally-Managed Marine Area
LMOs	Living Modified organisms
MECM	Ministry of Environment, Conservation and Meteorology
NAPA	National Adaptation Plan of Action
NBF	National Bio-safety Framework
NBSAP	National Biodiversity Strategy and Action Plan
NCSA	National Capacity Self-Assessment

NERRDP	National Economic Recovery, Reform and Development Plan
NGO	Non-Governmental Organization
NIS	National Implementation Strategy
OFCE	Overseas Fishery Co-operation Foundation of Japan
OJPT	Ontong Java Plateau Terrain
PER	Public Environment Report
PHCG	Pacific Horizon Consultancy Group
RIPEL	Russell Islands Plantation Estates Limited
RR	Restricted Range
SIEA	Solomon Islands Electricity Authority
SIFMP	Solomon Islands Forest Management Project
SIG	Solomon Islands Government
SILMMA	Solomon Islands Locally Managed Marine Areas Network
SIPL	Solomon Islands Plantation Limited
SIVB	Solomon Islands Visitors Bureau
SIVCE	Solomon Islands Village Electrification Council
SIWA	Solomon Islands Water Authority
SLM	Sustainable Land Management
SOE	State of Environment
SOPAC	South Pacific Applied Geoscience Commission
SPPL	Sylvania Plantation Products Limited
SPREP	South Pacific Regional Environment Programme
SSMT	South Solomon MORB Terrain
TDA	Tetepare Descendants Association
TNC	The Nature Conservancy
UK	United Kingdom
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
US	United States
VFEP	Village First Electrification Programme
WPTA	Western Province Tourism Association
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund

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1.0 NATIONAL CONTEXT

1.1. Geography and Climate

Solomon Islands forms an archipelago of approximately 990 islands with a total land area of 28,000 square km located in the Southwest Pacific about 1,900 km northeast of Australia. The terrain ranges from rugged mountainous islands to low-lying coral atolls. The country stretches in a 1,450-km chain southeast from Papua New Guinea across the Coral Sea to Vanuatu. The main islands of Choiseul, New Georgia, Santa Isabel, Guadalcanal, Malaita, and Makira have rain forested mountain ranges of mainly volcanic origin, deep narrow valleys, and coastal belts lined with coastal forest and fringed by reefs. The smaller islands are atolls or raised coral reefs. The Solomon Islands region is geologically active, and earth tremors are frequent.

The islands' ocean-equatorial climate is extremely humid throughout the year, with a mean temperature of 27° C (80° F) and few extremes of temperature or weather. The annual rainfall is about 305 centimeters (120 in.). More than 90% of the islands are forested, with cover especially concentrated on the interiors of the large islands. Soil quality ranges from extremely rich volcanic to relatively infertile limestone. The Exclusive Economic Zone extends to 200 nautical miles and forms a total area of 1.34 million square km.

1.2 Human settlement and history

Solomon Islands is inhabited by approximately 506 thousand people (SPC, 2008) which are predominantly indigenous to the islands. While sharing indigenous status, these people have highly diverse and layered origins. The

indigenous inhabitants of the modern Solomon Islands have been formed as a result of two ancient migrations and the subsequent interactions of their descendants.

The initial migratory wave is understood to have taken place as long ago as 50,000 BC, as Palaeolithic peoples spread south and west from mainland Asia across a series of ice-age land bridges extending as far east as the islands of Guadalcanal and Makira. As this land mass was fragmented into separate islands by rising sea levels, populations were isolated, a factor believed to eventually contribute to the development of a range of highly differentiated populations.

Against this pre-existing tapestry of settlement, the peoples associated with the Lapita cultural complex spread across the islands in a series of sea migrations approximately 4000 years BC, interacting to varying degrees with extant peoples and contributing to changed language, gene pools and cultural practices.

These layers of migration, isolation and contact have led to a situation of extreme cultural and biophysical diversity, with more than 70 surviving indigenous languages and many more dialects.

These peoples settled in tribal villages and made a living through hunting and gathering. The primary social structure was small in scale and territorial spread; tribes or clans ruled themselves as discrete units with a chief as head of the tribe.

Some common characteristics may be identified within this diversity of cultures: small size, kin-based relationships, an emphasis on reciprocity and generally low degree of hierarchy. Governance arrangements within these societies more commonly emphasised redistribution and

efficacy than inherited status. These governance structures ensured adequate resources, social trading possibilities, and exchange of gifts. Participation was considered the foundational to the traditional governance system in most of these societies; it provided the underpinnings for social sustainability, economic productivity and intragroup relations. Traditional governance structures serve to manifest solidarity of tribe members, give recognition and moral support, offer protection and keep people together as one tribe. Individual participation unified members and promoted collective ownership, pride and prestige. The concept of tribal ownership of land and property facilitated access to resources and expedient completion of particular tasks. Since they lived in discrete social units with limited interdependence, there was little higher level political organisation or pan-island identity. Settlements were often inland and of limited size, or in inaccessible locations to ensure security and allow space for hunting and food gathering.

Alvaro de Mendana named the Solomon Islands after discovering the area in 1568. A combination of poor map-making on the part of this explorer, difficult initial contact with locals and depredations of malaria all served to limit European contact until the latter part of the 19th century. The Solomon Islands were declared a British Protectorate in 1893 (Smit, 2002). In time, British officials established systems of modern government, including mechanisms for village and district administration. The British appointed village constables and district headmen who were responsible for maintaining law and order according to colonial rules. Slowly they established facilities for service provision to the people and also introduced the cash economy which also almost dependent on the same resources that people derive their livelihood from. Tribes moved from inland

areas to settle in coastal villages in close proximity to Government services and to opportunities for a growing trade in industrial goods such as metal implements, tobacco and firearms. Christian missions were influential in the conversion of the population to Christianity and also provided significant basic services including health and education.

The majority of modern Solomon Islanders and their cultural group, particularly the inhabitants of the main islands are classified as Melanesian, with three cultural groups defined as Polynesian located in islands to the southeast (Tikopia-Anuta), southern (Rennell and Bellona) and northern (Sikaiana and Ontong Java) extremes of the Solomons.

A significant contribution to cultural diversity in the country occurred with the introduction in the 1950s of a population of Kiribati settlers, relocated to Solomon Islands from the Phoenix Islands during the colonial administration. This population of i-Kiribati was settled in Gizo and Wagina in the western Solomons, and now forms a significant part of the country's cultural diversity.

Pijin is the lingua franca and English is the official language for business and communication and all formal education is conducted in English. The country's population has an annual growth rate of 2.8%, putting it amongst the highest in the world (SIG Population Report, 2000). If the current growth rate is maintained, the population is projected to double by around 2025. Approximately 41% of the total population is under the age of 15 years, indicating a very high youth dependency ratio. The rate of population growth over the past 20 years has well exceeded the economic growth rate, causing serious concern about the country's capacity to cater for the increasing population. About 86% of the population lives in rural villages comprising of 65,000

households; the average household size is six (SIG Population Report, 2000). The family is the basic social unit; members of extended families live together in hamlets, villages as clans and continue with subsistence production to meet their village livelihood. However, subsistence production is currently under stress due to population increase and pressure from the cash economy through heavy reliance on natural resources extraction.

While the fabric of Solomon Islands society is the village, there are significant changes taking place – most notably out-migration to Honiara and other urban centres as people go in search of paid employment as they move into the cash economy and at the same time exploit their resources through manipulation of the state, private companies and individuals.

2.0 INTRODUCTION, APPROACH AND METHODS

Solomon Islands has witnessed major environmental changes since Independence as a result of its ongoing reliance on extractive industries, rapid population growth and underlying political difficulties. The impacts of such environmental change are not widely recognized, nor are the options and priorities for response. In order to make rational management conservation and environmental management decisions to guide government policy, it is critical for policymakers to access reliable information and analysis on the environmental changes that have taken place, the drivers of these changes and ongoing trends that influence them.

This is imperative especially when the country is an island developing country with its dual economy (subsistence and commercial) are

heavily and directly dependent on natural resources. Thus understanding the relationship between these increasing human activities and the environment helps the country to enhance its ability to make well informed decisions on the path to sustainable development. Understanding the resilience of the country's environment to natural phenomena is equally important for environmental reporting. Natural disasters contribute significantly to environmental degradation in Solomon Islands. Further, the state of environment report is imperative because it assists environment managers and policy makers in monitoring of environmental changes and that routinely updated data is vital in facilitating the identification of trends, for instance, trends in natural resources exploitation. This report will enable the ministry to fulfill its mandate to ensure sound environment management in a more considered manner as management decisions will not be taken in an information vacuum.

2.1. Background to this report

This report was commissioned by the Environment and Conservation Division of the Ministry of Environment, Conservation and Meteorology in fulfilment of its mandate to produce a State of the Environment Report (SOE) every three years. Under section 8 of the Environment Act 1998, the Division is required to produce the State of Environment (SOE) Report for Solomon Islands every three years. Although the first ever national SOE report was produced in 1993, this report is the first such produced under the 1998 legislation.

This report also represents part of an emerging recognition within the SIG of the importance of environmental management

and policy to broader national policy and development. While the 1993 report was produced with the financial and technical assistance of the Asian Development Bank and World Conservation Union, this is a nationally designed, funded and produced report.

Current international conditions of high oil prices and food prices, together with a new urgency regarding climate change have compelled renewed and serious attention to the issues of food and energy security and rural development in Solomon Islands. It has become increasingly apparent that these critical themes have common basis in the environment and environmental dynamics, and that national development policy will need to place much more central consideration to the environment in its future plans.

There are significant interconnections between narrowly “environmental” issues and the wider development arena and the development of this report has attempted to reflect this. The Terms of Reference for this report required attention to a wider range of factors and processes than those “purely” to do with the environment.

- 1) Review the 1993 state of the environment report taking into consideration the environmental changes that have since occurred in the intervening period;
- 2) Assess the current state and condition of the major natural resources of Solomon Islands including geology, vegetation, fauna and marine resources;
- 3) Assess the socio-economic situation of the country as it relates to the country’s environmental resources;
- 4) Review programmes and activities implemented by the private sector,

public authorities and non-government organizations that have a direct or indirect bearing on the functions of the Division;

- 5) Examine trends in economic analysis and of cost-effectiveness of controls associated with any of its functions and responsibilities;
- 6) Identify and discuss the major environmental issues faced in Solomon Islands; and
- 7) Any general recommendations for future legislative or other action which the Director considers appropriate to carry out the Division's functions and responsibilities

This report describes the condition and changes in the Solomon Islands environment, and details pressures resulting from activity in major economic sectors such as agriculture, forestry, fisheries, manufacturing and transport as well as pressures arising from energy production and use, population change, and urban growth. It also examine the mechanism via which such pressures effect changes to atmospheric, terrestrial, inland aquatic, marine and urban environments. Furthermore, the report will examine specific thematic issues covering the areas of water, air/climate, biodiversity, wastes, and land degradation.

2.2. Approach and methodology

PHCG Ltd was commissioned at the end of May 2008 by the MECM, to produce the report by end June 2008. As such, it has been researched and written over a very compressed timeline. Considerable shortcomings and inconsistencies in data needed to be tackled in this period, and so a rapid desk assessment approach was used

with limited opportunity for peer review and feedback.

Due to a systemic absence of information management systems and research capacity in Solomon Islands, and particularly in the public sector, the report is heavily reliant on:

- **Secondary data sources of variable coverage, recency and relevance**

Without a functioning data gathering process or staffing, the Environment and Conservation Division does not generate or collect primary data of its own. Data and information used in this report therefore is gathered from a range of ad hoc reports which have been commissioned by third parties such as international NGOs (INGOs), donor agencies and academic organizations. Because of the variety of institutional stances, timeframes and thematic interests, this data is not harmonized in terms of time, geographic or classification coverage, or alignment to SIG policy approaches and institutions. Considerable interpolation and interpretation has been necessary in using this data, although there has been a consistent attempt to highlight gaps in information and the foreseen uncertainties arising from these.

- **Grey literature and informal communications**

Without a functional national academy or scientific organization, the production of primary and peer reviewed research of any sort has been a long term shortcoming within the country. The same institutional gaps prevent access to such research literature produced elsewhere. This report depends significantly on grey

literature and unpublished materials produced by a range of organizations within the country. Although not satisfactory from a formal scientific viewpoint, this information has been used wherever it is deemed credible and preferable to no information at all.

- **The voluntary provision of information from individuals and organizations**

Given the lack of formalized information and information management, this report has benefited greatly from the voluntary cooperation of a range of individuals and organizations, both through provision of information materials and through personal assistance in the assessment of information sources, reliability and relevance.

3.0 STATUS OF THE ENVIRONMENT

3.1. Geology and Geomorphology

The Solomon Islands (excluding the Santa Cruz group) is divided into three geological provinces: a Pacific Province, a Central Province and a Volcanic Province (Falvey et al. 1991). The volcanic geological province includes the New Georgia group of islands. Other islands with recent extinct volcanoes are also found in this province which included the north western tip of Guadalcanal, the Russell Islands, Shortlands and Savo. The volcanic geological province is much younger and consists of Late Miocene to Holocene volcanics, which are only five to six million years old.

Two distinct stages of arc growth occurred within the Solomon block from the Eocene to the Early Miocene. Stage 1 arc growth created

the basement of the central part of the Solomon block (the Central Solomon Terrain, (CST), which includes the Shortland, Florida and Isabel islands. Stage 2 arc growth led to crustal growth in the west and south (the New Georgia terrain) which includes Savo, and the New Georgia and Russell islands. Both stages of arc growth also added new material to pre-existing crustal units within other terrains. The present-day highly oblique collision between the Pacific and Australian plates has resulted in the formation of rhombohedral intra- and back-arc basins.

Most of the islands are comprised of a complex collage of crustal units or terrains formed and accreted within an intra-oceanic environment since Cretaceous times. Predominantly Cretaceous basaltic basement sequences are divided into three major terrains;

1. A plume-related Ontong Java Plateau terrain (OJPT) which includes Malaita, Ulawa, and northern Santa Isabel;
2. A 'normal' ocean ridge related South Solomon MORB Terrain (SSMT) which includes Choiseul and Guadalcanal; and
3. A hybrid 'Makira terrain' which has both MORB and plume/plateau affinities. The OJPT formed as an integral part of the massive Ontong Java Plateau (OJP), at 122 mya and 90 mya, respectively, was subsequently affected by Eocene–Oligocene alkaline and alnoitic magmatic, and was unaffected by subsequent arc development.

The higher islands are of volcanic origin with mountainous and steep sided slopes and deep valleys. The lower regions usually have stability while the upper regions become more unstable with outcrops of volcanic rocks. There are usually large drainage

systems dissecting the larger islands which become narrow and steep sided towards the interior of the islands. The largest of the islands is Guadalcanal which also has the highest point in the country at approximately 2500m above sea level.

3.2. Minerals, land resources and soils

This section outlines the current state and conditions of the major aspects of the Solomon Islands environment including both terrestrial and marine environments and resources. The section also outlines the exploitation state of these environmental elements. Detailed analysis of pressures and trends resulting from use of these resources is further discussed in section 4.1 and 4.2 under Environmental Causes and Consequences.

3.2.1. Mineral deposits

Government mineral studies conducted during the colonial period identified mineral deposits of likely economic potential include gold, nickel and bauxite. Gold deposits in the Gold Ridge area of Guadalcanal has been the only site where mining operations have been commenced. Alluvial gold in the Chovohio River which drains Gold Ridge area has been worked by landowners for more than 40 years and is still being sold to gold dealers in Honiara. Considerable quantities of low-grade nickel have been reported from eastern San Jorge, Jejevo and Tataka in southern Isabel, and a Japanese company Sumitomo Solomon Islands Limited is currently undertaking prospecting in this area. Bauxite clays formed on upraised reef limestones of west Rennell, Wagina, Santa Cruz, and Munda in New Georgia are the most likely to be of economic value.

Recent exploration has revealed considerable mineral occurrence on other major islands of Solomon Islands. A number of companies are at present undertaking prospecting exploration in the country as shown on the **tenement areas map**.

Box 3.1: Undersea minerals - new prospecting in SI waters

A Canadian-listed company called Nautilus Minerals (NMO) has acquired exploration and prospecting rights to an area of the SI EEZ roughly southwest of New Georgia. These areas form part of what the company calls its "Solwara" projects, spanning seafloor areas in the PNG, Tongan and SI EEZs. The Solwara project has a number of different fields (Solwara 1- 8) and aims to exploit seafloor sediments called SMS deposits, which are rich in gold, silver, copper and zinc.

Seafloor massive sulphide (SMS) deposits are a class of minerals deposits at the centre of a new mining industry focusing on the seafloor. They are formed during a process called hydrothermal circulation, in which seawater enters deep cracks in the earth's crust below the seafloor. The water is superheated and returns to the ocean via underwater volcanic vents called *black smokers*. The water carries with it considerable deposits of minerals which are then deposited on the ocean floor. These deposits are found anywhere from a few metres to more than a kilometre under the sea surface. Considerable deposits have been identified in SI EEZ waters.

According to Nautilus sources, they have been granted more than 10 thousand square km of tenements by the SI government. As of November 14, 2007 Nautilus had been granted 14 tenements covering 10,641 square km in the Exclusive Economic Zone of

the Solomon Islands, continuing the Company's tenement holding in the highly prospective Woodlark Basin to the east of PNG. The licences granted in the Solomon Islands are an extension of the highly prospective Woodlark Basin tenements to the east of PNG. All of the Solomon Island licenses are 100% owned by Nautilus. The tenements stretch for a considerable distance south and southwest from the Western Province islands of Ranonnga, Rendova and New Georgia.

Given a national mining scene that is attracting increasing attention, and with significant economic pressures forecast from the imminent collapse of logging, this development will continue to attract the attention of a range of stakeholders.

3.2.2. Mineral exploration and exploitation

Commercial development of mineral resources in Solomon Islands is quite recent with only one site – Gold Ridge – ever having achieved production. Interest from foreign minerals firms is increasingly rapidly, with four licenses at present having been issued for commercial mining operations. Applications have been submitted for new exploration licenses at fourteen new potential sites.

Additional gold deposits have been identified in the Gold Ridge area on Guadalcanal, and prospecting for other minerals is occurring in other parts of the country, including several areas of Western, Choiseul, Isabel and Malaita Provinces.

The re-development of the Gold Ridge Mine on Guadalcanal has been a priority project of successive governments. However, unresolved issues such as land acquisition, resettlement scheme, the tailings dam, landowners' demands, and political risk have

led to continued delays in a return to production. The company is currently concentrating on constructing housing and security infrastructure, resolving outstanding landownership issues and raising finance overseas. Significant progress has been made, and production is now forecast to begin in 2010. Informal alluvial panning activities are occurring mainly at the Gold Ridge area on Guadalcanal with limited activities also occurring in the Western province.

A major environmental concern for the Gold Ridge mining development is the tailings dam dewatering process and its likely environment consequences. After a number of consultations between land owners, the company and government, an independent study has been made by the Commonwealth Secretariat at the request of the government. The key recommendations of the study are currently being discussed with the respective parties.

3.2.2.1. Aggregate Mining

Aggregate mining in the country occurs in the urban centers mostly around Honiara. There is some mining ongoing at a relatively small scale in Gizo in the western province. Lungga River situated about 8.5 km to the east of Honiara and has been the most active extraction site for sand and gravel supply to Honiara and nearby areas. Tetera Beach located about 38 km to the east of Honiara has small-scale sand extractions taking place on site. Aggregate extraction from Ranadi Beach has been the most extensive, going on for about 25 years. SOPAC has been actively involved in the coastal monitoring of Ranadi Beach since the mid- 1980s including a comprehensive study and data compilation carried out between 1990 and 1992. An assessment undertaken by SOPAC on potential sites for aggregate mining also found that Poha west of Honiara also

possesses good quality river sand and gravel deposits.

3.2.2.2. Petroleum

No developments are currently being done in relation to petroleum in country. The current data as stated in the state of environment report 1993 remains from a survey in the 1960s as no new survey has been undertaken since. Coleman (1989) stated that 25,000 square km of sea bed has been surveyed of which has of the fair to excellent to quality. There is however the need for further surveying to improve data quality. The following areas were identified as potential sites for petroleum exploration.

1. Mbokokimbo Basin and marine extension eastern Guadalcanal
2. Flanks of Iron Bottom Sound Basin, north of Honiara and between Guadalcanal and Florida
3. Southern flank of the high between Florida and San Jorge
4. Manning straight between Isabel and Choiseul
5. Parts of the shelf and uppers slope areas Choiseul to Shortlands.

There are possibilities that exploration will be undertaken in the not too distant future.

3.2.3. Land resources and soils

A land resources study of the country's resources was conducted at reconnaissance level from 1967 to 1976. This was conducted with the assistance from the Land Resources Division, Ministry of Overseas Development of United Kingdom in close co-operation with Solomon Islands Government departments, and a range of research institutes, universities and international organizations concerned with land resources assessment and development planning. The result of the work

was production and publication of a series of eight volumes of reports detailing the landforms of all major islands in the country (Hansell and Wall, 1976). The reports describe the physical geography, climate, soils, vegetation and agriculture opportunity areas of the country. The study classified soil types according to the U.S. soil classification scheme.

Soil fertility varies widely between and within the islands, ranging from quite infertile and mildly toxic soils, to highly fertile soils in limited areas derived from volcanic ash and alluvial deposits. Most upland soils have good structures, but either lack one or more major nutrients or have a strong nutrient imbalance. Potassium deficiency is commonly associated with calcareous and limestone parent

Table 3.1: Physical Features of the Solomon Islands

Island	Land area & agricultural utilisation	Landforms	Soil type
Guadalcanal	5,320 km ² 8.5 %	Ridge volcanic mountains, karst, moderately, narrow and lightly dissected ridges, low terraces, flood plains and colluvial fans	Mixture of volcanic and sedimentary rocks, humus-rich, base- poor, shallow loams and clays at high altitudes and young loams, clays and peats in valleys and coastal plains
Malaita	4,200 km ² n/a	Volcanic cones, steep, dissected narrow ridges, fluvial plains, karst, valleys, swamps and coastal landforms	Strongly weathered and leached soils with low base status to slightly and moderately weathered leached soils, organic with decomposed peat.
Santa Isabel (Bugotu)	4,121 km ² 2.3 %	Low amplitude rounded hills and ridges with steep sides and crests, small areas of karst and some cuestas	Moderately to strongly weathered and leached soils with low base status, organic with well decomposed peat
Makira	3,090 km ² 2.5 %	High to irregular rounded ridges, rolling hills, fluvial plains, fans and beaches	Moderately to strongly weathered and leached soils with low base status, slightly weathered with little horizon development and organic with well decomposed peat
Choiseul	3,837 km ² n/a	Hills and mountains with steep sided ridges and stable to unstable slopes and stable narrow crests, some being former volcanic centres	Slightly to strongly weathered leached soils with little horizon development to leached with low base status
New Georgia	2,145 km ² 3.1 %	Volcanic centres, out wash fans, ridge plateaux, karst, fluvial plains and swamps and extensive reef lagoon complexes	Organic, young and slightly to strongly weathered and leached soils with low base status

Notes: Source is Hansell & Wall, 1976 except agricultural utilisation is Cheatle, 1987. n/a is not available

material, while phosphorus deficiency is frequent over volcanic rocks.

The most fertile soils are found on the floodplains of northern Guadalcanal and these therefore are the most significant agriculturally. They are rich in nitrogen, phosphorous and organic carbon, but relatively deficient in potassium and magnesium.

Pockets of good soil fertility are evident also in the New Georgia group, Santa Isabel and Choiseul Provinces.

Uncontrolled land clearing through logging, intensive agriculture and to a lesser extent the extension of subsistence farming as a result of increasing population, all place extreme pressures on the soil resources. Most of the accessible soils have fertility and/or micronutrient deficiencies and increased exposure results in soil leaching and erosion.

About 87% of the land resources described in the land resources study are under customary land tenure where ownership is held by tribes. Customary land tenure was not a subject of the land resources study but it has great implications for how land resources are utilised under both subsistence and cash economies of the country.

3.2.4. Water resources use

3.2.4.1. Drinking and household use

The island ecosystem context is dominated by the factors of remoteness, small size and exposure to climatic instability. Therefore most of the country's water resources face a high level of vulnerability. These threats include climate (or meteorological) hazards, natural disasters and drought. The major

issues of concern for water resource management in the country include;

1. Lack of, or inundation of water resources
2. Impacts of pollution on water quality
3. Saltwater intrusion into aquifers
4. Impacts of extreme weather on watershed
5. Impacts of sea level rise or storm surges on aquifers or watersheds
6. Deforestation impacts on watershed function (logging, fuel wood and expanding shifting cultivation)

Deforestation has been a major threat to major water sources such as watersheds, streams, rivers and coastal water environments. Large scale logging has been observed to be having considerable impact in areas of activity. In areas of high population density, fuel wood gathering together with slash and burn shifting cultivation practices are denuding forest to the extent that watershed function is suffering, particularly when faced with intense rainfall events.

Solomon Islands has abundant rainfall and water resources in nearly all provinces which could be developed to provide adequate and quality water supply to the entire population.

Most villages use water for drinking and household directly at or from source like streams and rivers. Those who do not have access to streams and rivers use ground water from wells or springs and from rain catchment tanks. Over the last two decades with donor support, Government and some NGOs have provided pipe water supply to many communities including those in urban centres. There is now an increasing use of pipe water supply. The Village Resources Survey 1996/97 and Solomon Islands National Census conducted in 1999 documented the status of water use and sanitation in the provinces.

3.2.4.2. Power generation:

There is substantial potential for hydropower from water resources on at least seven islands but little effort have been made to evaluate the resource. The JICA-funded *Master Plan Study for Power Development in Solomon Islands* was carried out in 1999-2000 and identified nearly 330 mega watts (MW) of hydroelectric potential on seven islands. The first hydro scheme to be developed in the Solomons was a micro hydro (Pelton turbine) plant installed in 1976 serving a church mission and health centre at Atoifi on Malaita. The turbine has a rated capacity of 75 kW and generates about 32 kW.

Solomon Islands Electricity Authority (SIEA), a quasi-government organization developed and implemented two hydro schemes in 1986 and 1996 respectively. The first, was installed on the Malu'u River on Malaita. It has a rated turbine capacity of about 32 kW, a maximum load of about 15 kW. It supplied power to a health centre, a store and several residential houses. It was funded by New Zealand Aid but was closed for some time due to local land disputes. The current status is not known. The second was constructed in Buala on Santa Isabel in 1996. It has a 185 kW turbine capacity which supplies some 150 kW to a hospital, a school, retail stores, a fish storage and number of residential houses. It was part of a German (GTZ)-funded and Forum Secretariat managed project. Three hydro schemes with a total capacity of approx. 0.5 MW are reportedly currently under consideration at Huro river on Makira, Sorave river on Choiseul and Rori river on Malaita.

An Australian organization, APACE (Appropriate Technology for the Community and Environment) has involved in developing micro-hydro systems in the Solomon Islands for over twenty years. APACE has recently

established the Village First Electrification Programme (VFEP) under a local incorporated NGO called the Solomon Islands Village Electrification Council (SIVVEC) to coordinate micro-hydropower development in the country. The first village-based micro-hydro system (10 kW) was installed in Iri settlement on Kolombangara Island in Western Province in 1983.

3.2.4.3. Agricultural use:

In agriculture production, water is required for irrigation. Most of Solomon Islands, however, is classified as wet due to high rainfall. While the rainfall requirements and tolerance of extremes vary from crop to crop, a working figure for the southwest Pacific is that a mean annual rainfall of 1800–2500 mm is optimal for agricultural production (Bourke at al. 2005), which mean annual rainfall of over 4000 mm is somewhat higher than optimal for crop growth and there is no requirement for irrigation. The recent introduction of paddy rice cultivation by Chinese Agriculture Technical Mission (CATM) of the Republic of China (ROC) would require water for irrigation.

3.2.4.4. Industrial use:

Although demands are still relatively small there is very considerable potential for future growth in usage. At the moment a few companies in Honiara use water in production. These include Solomon Brewers Ltd which require water for beer production whilst Total Water Services, Szetu Enterprises and Blue Water purified municipal water for sale. Quality may be an important factor, particularly whether the water contains dissolved salts, which will affect equipment such as boilers in industrial processes.

3.3. Terrestrial environment

3.3.1. Vegetation

Assessment of the Solomon Islands vegetation has identified different vegetation types in the country. The report by Mueller and Dubois (1998) on Vegetation of the Tropical Pacific Islands builds on earlier publication on the flora of Solomon Islands by Walker (1948), Whitmore (1966, 1969a, 1969b), The Danish Rennell and Bellona Expedition (Wolff, 1958), the Royal Society Expedition, Hansall and Wall (1976), Henderson and Hancock (1991) and Lewis and Crib (1991) as documented in the 1993 state of environment report.

The latest assessment of the vegetation covers for Solomon Islands was carried out in 2006 (SIG-URS, 2006) and found a national forest stands at 2,805,200 ha. The assessment is done by province and includes non-commercial forest and cleared areas, unlogged commercial natural forest, logged over commercial natural forests and plantations. Currently Solomon Islands two formal protected areas, Queen Elizabeth Park which is largely degraded is 1093 ha and East Rennell World Heritage site is 37,000 ha. There also exist conservation areas with out formal protection and this includes Tetepare Conservation area, Makira Conservation, Simbo Conservation area, Komarindi Catchments area and Arnavon Conservation Area.

The Solomon Islands herbarium collection has been relocated to Suva in Fiji for safe-keeping during the recent social unrest and has since has not been returned as result of a lack appropriate facilities. The 1993 state of environment report (Leary, 1993) stated that the Herbarium collection contains more than 30,000 plant specimens collected during the period 1965-1972 by forestry workers, E. S Brown from the Agriculture Division (1954-

1956), Geoff Dennis (1965-1972) and D. Glenny and M. Qusa (1990-1991).



Fig 3.1 Montane cloud forest – Guadalcanal – Photo: P.Pikacha

The botanical garden close to Honiara contains a number of local plants but has been hugely under threat and slightly degraded. It is however remains intact and the Ministry of forestry, Honiara city council and the Honiara Beautification Organisation has been collaborating in managing the site. The Ministry of Forests is currently reviewing project proposals for the redevelopment and upgrading of the National Herbarium and Botanical Garden infrastructure.

3.3.1.1. Endemism and diversity

In 1998, global experts undertook the first comparative analysis of biodiversity on every major habitat type across the five continents of the world and its oceans (Olsen and Dinnerstein, 1998). The Solomon Islands Rain Forests Eco-region is firmly included in this Global 200 list and is ranked in the highest category of “Globally Outstanding”. This is a reflection of the significance of the biodiversity of the country.

The Solomon Island forests vegetation has about 4500 species of plants recognized as one of the World’s great Centers of Plant

Diversity rich in unique palms, orchids and climbing pandanus. Approximately 3,200 species of higher plants described with some groups exhibiting significant endemism (e.g. orchids and palms);

16 threatened under IUCN Red Data criteria. Solomon Islands plants generally exhibit low endemism relative to Western Melanesia, specific plant families, such as the palms, orchids and climbing pandanus families exhibit high degree of species endemism. For example, 57% of palms, 50% of orchids (230 species) and 75% of the climbing pandanus species are endemic. The ancient plants (the most primitive group of flowering plants), such as the Winteraceae family which has 4 endemics in Solomons and the pea family (Lees et. al.1990).

3.3.1.1. Vegetation types

Mueller and Dubois (1998) study on the vegetation of the South west Pacific recognize 7 vegetation types in Solomon Islands. Whitmore (1966) has earlier identified six lowland rainforest types. The major vegetation types are further summarized in appendix 1.

Coastal strand vegetation (saline swamps) - are found on lands subject to inter-tidal flooding, such as estuaries and foreshores. These are primarily mangrove areas that occur on 2.3% of Solomon Islands land area and are poor in species diversity (dominated by *Bruguiera spp.* and *Rhizophora spp.*). Extensive areas of this vegetation type are

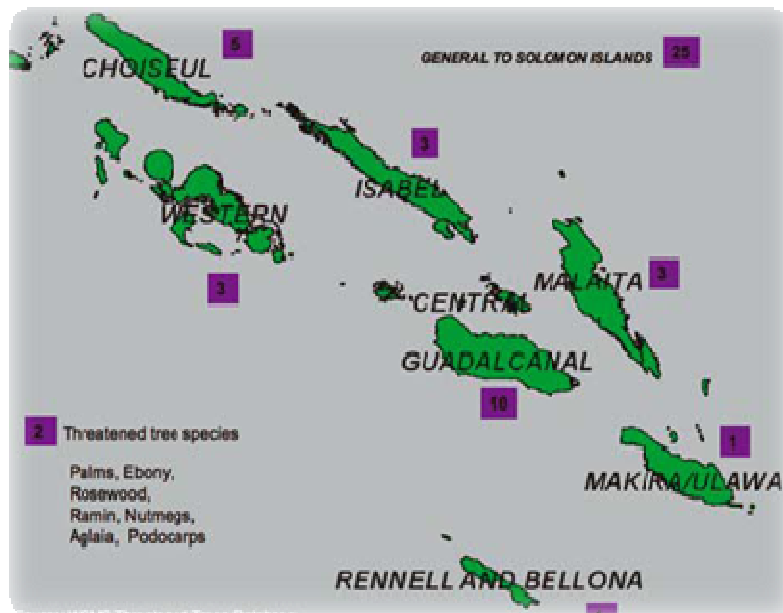


Fig 3.2 Threatened tree species for Solomon Islands (source): WCNC threatened tree species database

found on Isabel, New Georgia, Malaita, Marovo lagoon, Makira and east Guadalcanal. Saline swamps play critical roles as food and cultural resources for rural communities.

Riverine forests (freshwater swamps) - are characterized by mixed herbaceous species, palms, Pandanus spp. and other wetland or wet ground species such as sago and rosewood. Such areas are particularly sensitive to soil compaction from logging. Lauvi Lagoon area of Guadalcanal and west-central Makira are notable areas of this vegetation type.

Lowland forest - including hill forest, is the climax vegetation and the most common forest type in the country. Lowland forest forms the bulk of commercial forest in Solomon Islands, This flora has close affinity to Malaysia, Philippines, Indonesia, and PNG

forests although there are fewer genera and species and trees are smaller. There are 60 major tree species, twelve of which form the canopy layer. Hill forest is lowland forest found on higher slopes and well drained sites. It has a *Pometia* dominated canopy. The lower slopes of Mt. Maetambe in Choiseul are a good example of lowland hill forest.

Montane, or cloud forest - occurring at higher altitudes is present in Solomons as low as 700m. No clear lower montane forest zone is distinguishable, while upper montane comprises stunted moss covered trees such as *Dacrydium* and *Eugenia*. There is little commercial exploitation of this area. Kolombangara Crater and Popomanaseu on Guadalcanal are good examples.

Non-forest communities, such as the seasonal dry forests or grasslands cover 1-2% of Solomon Islands land area. These are believed to be human induced landscapes from the use of fire. Detailed breakdown of the above vegetation zones, including zone components and species is provided in the following chart.

3.3.1.2. Endangered plant species

Solomon Islands has over 25 threatened tree species, including ebony, rosewood, rattan and some palms. Ebony (*Diospyros insularis*) is listed as critically endangered. The status of many other forest plants is still unknown. While these exist endangered species throughout the country, the greatest number is in Guadalcanal and Choiseul. Introduced grass species, such as *Themeda australis* (kangaroo grass) & *Imperata cylindrica* dominate. These are located mostly in northern plains of Guadalcanal and the Florida Islands.

3.3.1.3. Invasive alien species

Terrestrial and aquatic, invasive alien species of, flora, fauna and microorganisms in the Solomon Islands, though not well documented is becoming a threat to the environment. The impact caused by some of these invasive species, have great economic impact and a deterrent to farming, transport ways, and potential future markets. The alien invasive species in the country can be categorized as intentional or unintentional introduction. Plants have been introduced mainly for three reasons: i) agriculture purposes, ii) forestry purposes, and iii) ornamentals.

Table 3.2 Dominant plant invasive species

<i>Scientific Name</i>	<i>Common Name</i>	<i>Habit/Habitat</i>	<i>Purpose of introduction</i>
<i>Acacia faneriana</i>	Ellintons curse	Thorny	Agriculture
<i>Eichhornia crassipes</i>	Water Hyacinth	scrub, Aquatic	Ornamental
<i>Lantana camara</i>	Mulberry Tree	herb on wetlands	Forestry
<i>Makania grass</i>	Lantana	Tree	Ornamentals
<i>Macrantha</i>	Mile-a-minute	wetlands	Accidental
<i>Mimosa invasa</i>	Giant sensitive grass	dry land	Accidental
<i>Mimosa pudica</i>	Sensitive grass	shrub on	Accidental
<i>Psidium guajava</i>	Guava	Vine	Accidental
<i>Solanum torvum</i>	Prickly solanum	Thorny spinny	Accident
<i>Solanum mauritianum</i>	Tobacco Weed	shrub	Accident
<i>Stachytarpheta jamaicensis</i>	Blue rats tial	Spinny	
<i>Sida rhombifolia</i>	Narrow leaf sida	scrup Tree	
<i>Sida acuta</i>	Broom weed	Shrub	
		Shrub	
		Shrub up to 1m	
		pasture invader	
		Shrub weed at road side &pasture	
		Shrub weed at road side &pasture	

Table 3.3 Dominant Micro-organism invasive species

<i>Scientific Name</i>	<i>Common Name</i>	<i>Habit/Habitat</i>	<i>Remarks</i>
<i>Phytophthora colocasiae</i>	Taro Leaf Blight	Fungus. Attacks taro	Accidental from PNG

Table 3.4 Aquatic Vertebrates and Invertebrates Invasive Species

<i>Scientific Name</i>	<i>Common Name</i>	<i>Habit/Habitat</i>	<i>Remarks</i>
<i>Tilapia spp</i>	Tilapia Common	Fish- fresh water fish	Introduced
<i>Bufo marinus</i>	toad	Toad- water	Introduced to control mosquito
	Minor bird	Bird	Introduced
	Seaweed	Seaweed	Introduced
<i>K. alverezii</i>			

Source: Wairiu M and Wagatora D. 2003

While problems associated with invasive alien species exist, there are no formal programs, management efforts or awareness on invasive species in existence in the country. They also impact inland aquatic environment.

The most common invasive plant species in the country include paper mulberry (*Browsonaetia papyrifera*), *Merremia peltata*, African tulip tree, wild tamarind (lead tree), guava, giant sensitive plant and rain tree etc. Some native species have also been known to become alien invasive in other countries.

3.3.1.4. Forest resources

SIG-URS (2003) made a quantitative estimate of the area of commercial forest available for harvest using forest undertaken in 2003 estimates a total commercial area of 600,000 ha. Wood flow model simulates harvesting of the current standing volume of 7.8 million cubic m at an annual rate equivalent to the average annual logging rate for 2004 and 2005 of approximately 1.02 million cubic m

per year. The natural forests export decline is predicted to begin to occur in 2011 and will escalate until 2014 and then it is expected that total exhaustion will have occurred by the end of 2015.

The SIFMP II (2006) Forestry Division (FD) Licensing Audit report documents overlapping license boundaries as a key issue, finding that of 219 pending applications, 39 applications overlap other concession applications. The assessments find that it is unlikely that the current rate of harvesting will drop significantly before 2010. Licenses have already been issued which would allow companies to harvest at significantly more than the current harvest rate. This is coupled with strong international demand for logs and easy access to relatively cheap harvesting equipment and labor in the Solomon Islands.

The 2006 assessment also forecast dramatic decline in the natural forest woodflow will have a significant fiscal impact on the Solomon Islands Government (SIG) and landowners, given the current reliance on round log exports to generate 60-70 % of the total foreign export earnings and as the national government's major source of non-donor income (in the form of export duties). This will also impact on rural employment. Currently it is estimated that the industry employs 1 in 6 of the formally employed population.

3.3.1.5. Non-Timber forest resources

The non timber forest trees endemic/indigenous timber plants to Solomon Islands include 63 species trees with export quality and 145 species of local construction timber trees (Leipzig. 1996). The endemic/indigenous plants Solomon Islands with custom uses includes 79 firewood plant species, 33 species of rope plants, 58 useful wood species (can be used for weapons, tools, and other utensils),

35 species of plants with useful leaves, 29 plant species used for handicrafts (mats, baskets, dyes, hats, fans and others), 105 miscellaneous plant species (for decoration, custom clothing, fish poisons and children's toy), 159 ornamental plant species and 140 local medicinal plants (Leipzig. 1996).

The endemic/indigenous agricultural crops to Solomon Islands include 39 species of multi-purpose tree, 2 species of cover crops, 25 species of pasture including grasses and legumes, 205 agricultural important weed species and 69 miscellaneous plant species which include plants with pesticidal properties (Leipzig 1996).

Leipzig (1996) Technical report to FAO reported for Solomon Islands endemic/indigenous food plant species to Solomon Islands include 22 species of staple food, 72 species of vegetables, 45 species of edible fruits, 18 species of edible nuts, 12 species of spice/herbs, 11 species of traditional food plants and 38 species of miscellaneous plant including cash crops (Leipzig. 1996).

The three commercially important plantation crops that are for Solomon Islands are coconut (*Cocos nucifera*), oil palm (*Elaeis guineensis*) and cocoa (*Theobroma cacao*).

3.3.2. Terrestrial fauna

3.3.2.1. Birds

Solomon Island is a hotspot for bird diversity, recognised for the degree of speciation and population variation between islands. Diamond (1976) notes in his early research on bird diversity "...that there is no other place in the world, not even the Galapagos Islands, where speciation and population variation

between islands is so marked as in the Solomon Islands" (Diamond 1976). More recent reports have highlighted endemism in country as well (McClatchy, W. C. et al, 2005).

Birds are by far the most studied animal group in Solomon Islands. The Whitney South Seas Expedition from 1927 to 1930 resulted in 38 publication on birds in Solomon Islands. Although the expedition visited every major island of the country the ecology and current status of many of the species identified remains to be understood. A considerable body of studies has since developed on the birds in different parts of the Solomon Islands, most recently summarised in the 1999 publication "Birds of the Solomons, Vanuatu, and New Caledonia" by Doughty, Day and Plant. Current expedition activity is relatively intense with species discovery continuing to flow from these.

Endemism and Diversity

The Solomon group Endemic Bird Area (EBA; including Bougainville, excluding Rennell and Bellona and the Santa Cruz islands; Stattersfield et al. 1998) has the greatest number of Restricted Range (RR) bird species of all the world's EBAs. Significantly, virtually all of the larger islands have their own endemic species and/or subspecies (the New Georgia group has 10 endemic species, Malaita 3, Guadalcanal 3, Makira 13, Kolombangara 2, Vella Lavella 1, Ranongga 1, Ghizo 1, Rennell 5, Santa Cruz 3). In total, the Solomon Islands (including Rennell, Bellona and the Santa Cruz Islands) have 94 RR bird species, 16 of which are classified as threatened. This means that Solomon Islands have more unique restricted range and unique bird species by area than any other place on earth.

Makira Island is high in bird endemism. A bird known as New Georgia monarch is found in Mt Mariu Trial, Gatokae Island, Solomon Islands. Drongo (*Dicurus solomennesis*) is found in Bauro Highlands, Makira Island. Among endemic birds are the Solomons sea eagle (*Haleetus sanfordi*) and the Ghizo white-eye (*Zosterops luteirostris*) arguably the most restricted range full-species eagle and passerine birds on earth;

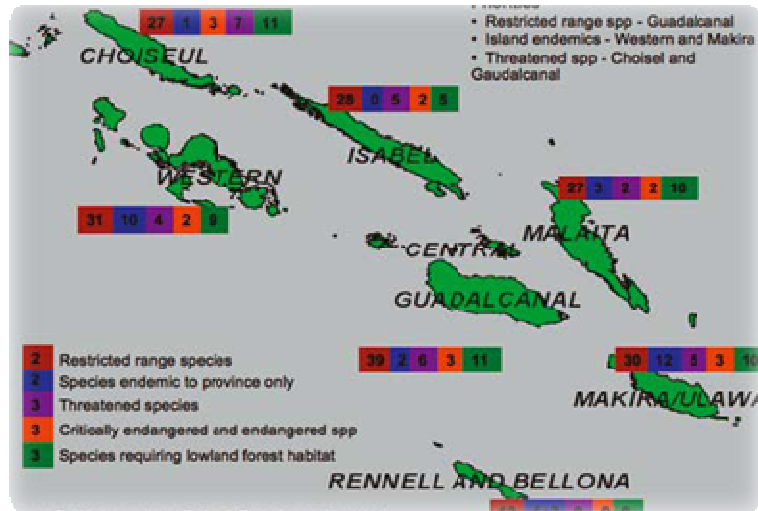


FIG 3.3 Endemic birds of Solomon Islands (Source: birdlife international endemic bird areas of the world) Endangered species

The recent IUCN 2007 endangered birds species for Solomon Islands shows, Two avian extinctions in Solomons (*Gallucolumba salomonis*, *Microgoura meeki*), Two critically endangered species (*Gallinula sylvestris*, *Pseudobulweria becki*) Three endangered species (*Columba pallidiceps*, *Zosterops luteirostris*, *Gallucolumba sanctacrucis*), 14 bird classified as vulnerable and 23 near threatened birds. However four (4) species of birds of concern recently are the Makira Moorhen, the Thick billed Ground-dove, Beck’s Petrel and the Ghizo White-Eye.

Birds are abundant especially doves, including the Crested cuckoo dove (*Reinwardtoena crassirostris*) which is endemic to Solomon Islands. Some endemic birds that are found around the area includes the Noisy hornbills (sea-eagle), Steel-blue flycatcher (*Myiagra ferrocyanea*), Grey –throated white eye (*Zosterops rendovae*), Finch’s pygmy-parrot (*Micropsitta finschii*) and many others.

Critical wintering and breeding habitat for a variety of internationally threatened or rare and poorly known waterbird species such as bristle-thighed curlew (*Numenius tahitensis*) which relies on the Solomons for wintering and pre-breeding habitat; Beck’s Petrel (*Pseudobulweria becki*) and Heinroth’s shearwater (*Puffinus heinrothi*) are very likely to build their yet to be discovered nesting burrows somewhere in the currently unprotected montane forests of the Solomons.

3.3.2.2. Mammals

Mammals from the 1991 state of environment report have been particularly poorly studied with much information available from past studies focused on taxonomy. These include Whitney South Seas expedition, Troughton of the Australian Museum, the US Medical Field Services, and the Templeton Crocker expedition.

A study on the mammals of Solomon Islands by the Mammal department of Australia in

1987 in collaboration with the Environment and Conservation Division visited all the major Islands of the country. This study result in the identification of 5 new species of mammals this include two new species of monkey faced bats , a better description of the Blossom Bat , new species of fruit bat and a new Tube-nosed Bat. A survey was done for terrestrial mammals on Isabel and Choiseul provinces by TNC in collaboration with the Environment and Conservation Division in 2000.

A recent publication by Tim Flannery on Mammals of the South – West Pacific has given a lot of detail and well described a lot of the known mammal species in Solomon Islands in terms of ecology and distribution. This has been by far the most comprehensive mammal publication covering Solomon Islands.

Endemism and Diversity

Solomon Islands archipelago is recognised as harbouring more mammal species than most Pacific island countries with 53 known species of mammals, mostly bats, rats and possums, of which 20 are endemic (including several Macrochiropterans such as the *Pteralopex* spp. complex) and 20 are identified as threatened (3 likely extinct or near extinction; two large rats and a pteropid bat). There are 8 species of rats, three of which are endangered including Spechts mosaic tailed rat (*Melomys specti*), Poncelet's giant rat (*Solomys ponceleti*) and Emperor rat (*Uromys emperata*). There are 41 species of bats making four percent of the worlds bats of which 19 are endemic and three are critically endangered, including the Montane Monkey-faced bat (*Pteralopex pulchra*), Guadalcanal monkey faced bat (*Pteralopex atrata*) and Bougainville monkey-faced bat (*Pteralopex ansep*).

SI mammal species are particularly concentrated on the island of Isabel and Choiseul. The total known species for both Isabel and Choiseul islands are 36 species of mammals - this represents 56 percent of all SI mammals. Two species of endangered mammals were captured while four species considered vulnerable to extinction were captured. Of the 8 species of giant rats four belong to the genus *Solomys* which is endemic to Solomon Islands. These are amongst the largest rats in the world. Solomon Islands has the highest number of *Pteropus* and *Pteralopex* flying foxes of any country in the world.(Meckeberg et al. 1992).

Endangered species

Three of the mammal species endemic to Solomon Islands are already thought to be extinct such as the Guadalcanal Giant Rat (*Uromys porculus*), Emperor Rat (*Uromys imperator*) and the Santa Cruz Tube-nosed Bat (*Nyctimene santacrucis*). *Hipposideros dinops* found on Poserae on Choiseul Province is one of the World's largest species of insect-eating bat (Leary and Pita, 2000).

3.3.2.3. Reptiles

The most comprehensive data on reptiles so far is Reptiles of the Solomons by McCoy (2006) which is a follow on edition from the first edition published in 1980A. The report presented a comprehensive description of the species distribution, description of species, the morphology including colours and patterns for identification and note their habitats and lifestyles. The 1991 state of environment quoted 76 published references on reptiles. This reference is results of researcher work undertaken in late 1800s and 1900s are the platform in which present studies has been undertaken lately.



FIG 3.4 Common skink species Photo – Dr. Chris Filardi

McCoy (2006) emphasises that whilst a lot of reptiles have been discovered and recorded the interior and mountainous areas of the larger Islands have been poorly collected and new species may still be found.

Endemism and Diversity

Approximately 80 reptiles are now known in Solomon Island which include marine species with over one third endemic and 5 identified as threatened species; herpetofauna includes significant marine turtle breeding populations as well as the endemic prehensile-tailed skink (*Corucia zebrata*), the largest on earth, currently confined to tall lowland and mid-elevation forests in the Solomon Islands. The *Shenomorphus* skink exhibit high endemism with genus has 9 endemic species, while the *Corucia* genus is endemic.

The Prehensile-tailed Skink (*Corucia zebrata*) is reportedly the largest skink in the world and is endemic to the Solomon Islands. The Prehensile-tailed Skink lives in trees, is totally herbivorous, largely nocturnal and the centre of several custom stories. It was recently listed in Appendix two of CITES. The main Threats are human population growth, associated agricultural efforts, habitat loss and the pet trade (Fritz. O. 1998)

Solomon Island is understood to possess 9 endemic species of snake. Some of the snake species found in Solomon Islands includes *Boiga irregularis*, *Candoia carinata*, *Dendrelaphis calligaster* and *Salomonelaps par* (Read, J. Moseby, K. 2001).

There are 27 endemic species of lizard found in Solomon Islands. Some of the lizard found in the Solomon Islands includes *Goannas (Varanus indicus)*, *Geckos Nactus pelagicus* and *Gehyra oceana*, *Lepidodactylus*. (Read, J. Moseby, K. 2001).

Rapid destruction of habitats through deforestation by human activity has been identified as posing the risk of significant impact on some of the species(McCoy 2006).

3.3.2.4. Frogs

Frogs of Solomon Islands by Patrick Pikacha, Clare Morrison and Stephen Richards recently published in May 2008 is the most current and complete collection of information on Solomon Islands frogs. It improves on past research in its systematic survey and illustrations.

Endemism and Diversity

Pikacha, Morrison and Richards (2008) reported a total of 21 frog species for Solomon Islands, representing a clear increase from the 17 last reported in the 1993 State of Environment report. Eighty percent of the Solomon Islands frogs belong to the family *Ceratobatrachidae*, two species from the family *Hylidae* and one from *Ranidae* and one from *Bufo* family. Only two species are endemic to Solomon Islands, *Discodeles malukuna* and *Platymantis* sp nov.

The highest diversity of frog species occurs in the western islands closer to Bougainville and

Papua New Guinea and diversity decreases towards the eastern islands. Most of the species of frogs in Solomon Islands are also found on Bougainville (PNG), which is biogeographically part of Solomon Islands. The limited frog fauna of the Makira group suggests that the south eastern part of the Solomon Island chain has been more isolated (Pikacha, Morrison and Richards 2008).

Table 3.5 A classification Solomon Islands frog species (adapted from Pikacha, Morrison and Richards, 2008)

<i>Genus</i>	<i>Species</i>	<i>status</i>
Family Bufonidae		
<i>Bufo</i>	<i>Bufo marinus</i>	Introduced
Family Ceratobatrachidae		
<i>Batrachylodes</i>	<i>B. elegans</i>	Native
	<i>B. trossulus</i>	Native
	<i>B. vertebralis</i>	Native
	<i>B. wolffi</i>	Native
<i>Ceratobatrachus</i>	<i>C. guentheri</i>	Native
<i>Discodeles</i>	<i>D. bufoniformis</i>	Native
	<i>D. guppyi</i>	Native
	<i>D. malukuna</i>	Endemic
	<i>D. opisthodon</i>	Native
<i>Palmatorrapia</i>	<i>P. solomonis</i>	native
<i>Platymantis</i>	<i>P. acrochorda</i>	Native
	<i>P. aculeodactylus</i>	Native
	<i>P. guppyi</i>	Native
	<i>P. neckeri</i>	Native
	<i>P. solomonis</i>	Native
	<i>P. weberi</i>	Endemic
	<i>Platymantis</i> sp.nov	
Family Hylidae		

<i>Litoria</i>	<i>L. lutea</i> <i>L. thesaurensis</i>	Native native
Family Ranidae		
<i>Rana</i>	<i>R. krefftii</i>	Native

Endangered species

Palmatorappia is a monotypic genus restricted to the Solomon Islands and Bougainville and Buka in Papua New Guinea. A rarely encountered species found in lowland, montane and mid-altitude rainforest. It is always arboreal and calls while perched on tree leaves, unlike *L. thesaurensis* which is regularly found calling on the ground or in low plants. The call is a series of 3-4 “chew-chew” notes. It presumably lays its eggs in moist situations high in the trees. Due to threats to its habitat caused by logging it is currently listed as Vulnerable (VU) by IUCN (2007) (Pikacha, Morrison and Richards, 2008)



**FIG 3.5 *Almatorappia solomonis*, – Isabel
Photo: P.Pikacha**

3.3.2.5. Invertebrates

At least 130 species of butterflies occur in Solomon Islands, of which are 35 endemic. Many belong to the group of large and beautiful “bird-wing butterflies” (Dahl 1986).

There are 25 recognised endemic snail species. Insects are particularly unknown, but

from estimated numbers of Lepidoptera species in the Solomon Islands (Tennent 1998) and the calculation system of Hammond (1992), Jeremy Holloway (1999) estimated that the Solomon Islands has 14,511 described insect species and 46,015 total insect species. This calculation implies that less than one in three species of insects from the Solomon Islands has been described (McClatchy, et al, 2005)

A total of 31 cicada species has been recorded from the Solomon Islands. Thirty species are endemic to the archipelago, and most of them are endemics of one island or a group of islands. *Heteropsaltria jacobii* and *Nggeliana boulard* are now the only cicada genera recorded as endemic to the Solomon Islands.

3.3.2.6. Freshwater species

The freshwater species reported for Solomon Island is a result of two collections made by Gray in 1974 on Guadalcanal and preliminary studies by Gerry Allan in 2004. The results show that Solomon Islands has 60 freshwater species. There is possibility of more as no detailed study has been conducted focusing on fresh water species throughout the country. Newly discovered fresh water species of fish found in watercourses on Tetepare Island include – a goby (*Anguilla marmorata*), Trevally (*Caranx papuensis*), Snapper (*Lutjanus spp*), *Stiphodon semoni* and *Stiphodon rutilaureus* (Pikacha, P. 2006).

3.3.2.7. Introduced fauna

Most of recently introduced are associated with human habitation. The following species are the most common known occurrence: Cane toad (*Bufo marinus*), black twig borer, rhinoceros beetle, fruit flies, crazy ant, little fire ant, tilapia, pig, dog, cat, pacific rat, ship rat, house mouse, red jungle fowl, Indian

myna birds (*Acridotheres tristis*), and the Brown Tree snake (*Boiga irregularis*).

3.4. Marine Environment

3.4.1. Habitats

3.4.1.1. Coral reef and status

Prior to 2000, very little scientific work had been done on the coral reefs of Solomon Islands. A major British Royal Society expedition in 1965 aimed at examining the biogeographical relationships between Solomon Islands and other island systems in the western tropical Pacific. Weber (1973) made the earliest indication that Solomon Islands could have among the highest in terms worldwide reef coral generic diversity. In 1994 a rapid ecological survey of the fringing reefs of Rennell Island and the Indispensable Reefs assessed habitat types, biodiversity, and the abundance and condition of commercially important species.

In 1999 the World Fish Centre (formerly ICLARM) conducted a study to identify any effects of runoff on fringing reefs by comparing abundance, diversity, survival and recruitment of corals adjacent to logged and unlogged catchments on Vangunu Island and Kolombangara Island. In 2000, a scientific team from University of Delaware, USA and James Cook University, Australia conducted surveys in Solomon Islands as part of a Pacific wide study investigating regional and local variation in species richness of coral assemblages across an oceanic biodiversity gradient (Karlson *et al.* 2004). This team collected coral data at the species level and benthic cover from Gizo, Munda and Uepi Island in the Western Province.

A status report on Solomon Islands coral reefs published in 2004 (Lovell et al. 2004) provides data on the Solomon Island reefs updating a

previous report on the status of Solomon Islands coral reef by Sulu (2000).

TNC rapid marine assessment exercise conducted a comprehensive baseline survey of coral reefs concluded that overall reef health in Solomon Islands was good. A general observation from the recent reports conclude that the overall condition of most reefs is good, and reef condition, the diversity of marine life remains mostly intact.

The TNC rapid marine assessment reported that the main cause of reef damage was from crown of thorns starfish (COTS) infestations, the coral eating snail *Drupella*, which when in full outbreak can cause serious damage to reefs seen at most locations. However numbers were always very low and damage very limited. In addition some evidence of damage following bleaching events in 2000-2001 was observed, as well as some minor current bleaching damage. There however exist threats such destructive fishing methods, over harvesting of major target reef species, collection of live coral for lime production, clear felling for oil-palm plantations that could have a serious negative impact on the reef ecosystems of the Solomon Islands in the future.

Coral Diversity

Solomon Islands reefs displays diverse and interesting reef types; from narrow fringing reefs that border high Island shorelines to rare double barrier reefs, patch reefs and atolls (Sulu *et al.* 2000). The Solomon island status of the Solomon Island reef report (Lovell *et al.*, 2004) highlighted some of the most beautiful and largest coral reefs occur in the Western Province where the close proximity of complex lagoon systems, raised coral and volcanic islands serves as an ideal protective barrier and other parts of the country as follows;

- Around the Shortland Islands near Bougainville
- Inside barrier reefs along the northeastern shore of Choiseul
- On either side of Manning Strait between Choiseul and Santa Isabel Islands, and extending along the southwestern shore of Santa Isabel
- In the Ghizo – Vonavona –Roviana lagoon area on New Georgia’s southern shore
- Marovo Lagoon - encircling Vangunu in southeastern New Georgia and along the northeastern coast area past Ramata almost to Lever Harbour
- In the north at Lau Lagoon and west at Langalanga Lagoon in Malaita
- In eastern Guadalcanal (Marau Sound).

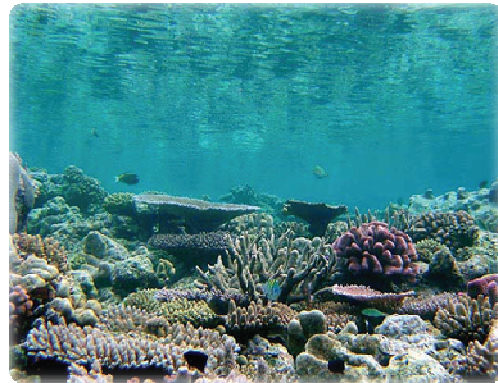


FIG 3.6 Shallow community on reef flat site at Pwaunani Point , Uki Ni Masi Island, Makira – Photo TNC Marine Assessment 2004

There are also several mid ocean reefs, infrequently visited, but covered with coral. These include Roncador and Bradley reefs lying south of Ontong Java, Indispensable Reefs south of Rennell, and several small shoals north of the Santa Cruz Islands.

A major outcome of the TNC rapid Marine assessment report 2004 is the discovery that Solomon Islands has the second highest diversity of coral species in the world after Raja Ampat in Indonesia. Over 494 coral species were found with several new species discovered. No in depth survey of Solomon Islands coral had been done before this assessment.

A total of 485 described species belonging to 76 genera were found during the TNC marine assessment survey and 9 unidentified species belonging to genera *Acropora*, *Anacropora*, *Goniopora*, *Leptoseris*, *Merulina*, *Porites*, *Seriatopora* and *Turbinaria* which brings the total species complement to 494. Many species had variation in growth form or skeletal detail not previously recorded and some well-studied species (*Merulina ampliata* and *Stylocoeniella guentheri*) have variations so different from previous records that they were initially thought to be different species.

3.4.1.2. Sea grass

In the 2004 issue of the Seagrass-Watch (July-2004) the preliminary result of the rapid ecological assessment of the Solomon Islands was published. This is the first detailed survey focusing on seagrass resources for Solomon Islands. The assessment undertaken by McKenzie, Lasi and Campbell found 10 species of seagrass, 80% of the known seagrass species in the Indo-Pacific region. Sites that were surveyed include some very large meadows were surveyed, including one that was more than 1000 ha in size and some deep meadows, down to 37m. Seagrass beds can be observed within lagoons and moats where fine sand and muddy sediments are enclosed by outer coral reefs. Seagrass beds typically lie inshore of coral reefs and play an important role in binding sediments and reducing surface erosion.

The recent TNC marine assessment report on the Solomon complements the report by Len McKenzie of Queensland Department of Primary Industries and Fisheries (QDPI&F), Ferral Lasi (TNC) and Stuart Campbell of Wildlife Conservation Society (WCS). The survey also found 10 species of seagrass from examination of 1,426 sites and identified 486 individual meadows.

The extensive survey also found that 54% of all seagrass meadows (per hectare basis) were found in Malaita Province. All other provinces each included less than 12% of the seagrass meadows. Most Solomon Islands seagrasses were found in water less than 10m deep and meadows were monospecific or consisted of multispecies communities, with up to 6 species present at a single location. The dominant species encountered were *Enhalus acoroides* and *Thalassia hemprichii*.

3.4.1.3. Lagoons

There are a number of lagoons in Solomon Islands which are significant structures in the marine environment. These include lagoons include the Marovo, Roviana, Langalanga, Are'are and Lau lagoons as well as the Maramasike passage.

Marovo Lagoon is the world's largest and best defined double barrier enclosed lagoon system. A result of geo-tectonic, reef building and island arc system processes, the double barrier lagoon is a result of volcanic processes of the Pliocene and later Pleistocene, with volcanic activity continuing at Kavachi.

The lagoon is bounded to the north and east by a string of barrier islands that has formed from elevated reefs 15 to 25 m above sea-level. In the southern end, these islands form a double chain separated by water up to 80 m deep. Comprising sand cay complexes, estuarine complexes and barrier islands as its

major habitats, the result is internationally significant world-class marine biodiversity.



FIG 3.7 Maramasike passage S.Malaita
Photo: Environment and conservation Division

Other examples include the West Are'are Lagoon and Maramasike Passage in South Malaita. These are respectively a long narrow coastal lagoon with many barrier islands and fringing mangroves (Are'are Lagoon), and extensive mangrove forests along a narrow channel (Maramasike Passage) between Malaita and Maramasike islands.

Wetlands of Eastern Choiseul and Rob Roy Island consist of drowned coastline of southeastern Choiseul and Rob Roy Island with many rivers and sheltered lagoons, large areas of swamp forest and extensive mangrove forests, especially on either side of Rob Roy passage between Choiseul and Rob Roy Island.

3.4.2. Marine Fauna & Flora

With a total sea area of approx. 1.6 million square km and a coastline extending over 4,023 km, Solomon Islands possesses relatively abundant ocean space, and associate diversity of potential resources. Marine resources have long been an

important component of the socio-economic livelihood of the people. The marine resource of Solomon Island is also the one of the most extensively researched and studied resources. This because the majority of Solomon Islanders lives in coastal areas and is heavily dependent on marine resources. The countries marine resources are also important commercially forming a significant contribution to the national economy.

3.4.2.1. Marine flora

Algae is a major component of marine flora, one that play a very important role in coral reefs, especially as primary producers, in cementing coral reefs and as shade for coral benthos during sunny weather (Wilkinson and Buddemeier 1994). Setchell (1935) listed nine seaweeds from Malaita, and several taxa from Sikaiana Island and from Bellona. Levring (1960) identified algae collected from Rennell Island. Womersley and Bailey (1969) recorded a total of 233 species of algae from Solomon Islands comprising of 14 Cyanophyta, 121 Rhodophyta, 27 Phaeophyta and 71 Chlorophyta. The most common edible seaweed *Caulerpa racemosa* (Ime-pronounced eeme) can still been seen in fish markets as a popular fresh foodstuff.

3.4.2.2. Marine fauna

Pelagic fish

Pelagic fisheries in Solomon Islands are primarily focused on tuna species, with skipjack, island bonito, yellow fin, albacore and big eye tuna forming the principal targets. skipjack is the most abundant and economically important species. The richest tuna fishing grounds, the waters of the Main Group Archipelago have been declared as an exclusive reserve for pole-and-line vessels although it is known that other commercial vessels regularly poach in these waters. Tuna

are caught by pole-and-line, purse-seining, and long-lining.

Commercial vessels entering near shore waters to capture baitfish have been blamed for depleting baitfish resources and causing damage to reefs, especially around Marovo and Roviana Lagoons in the Western Province and Thousand ships Bay and Rakata in Isabel.

In the period 2002 – 2007 the annual catch estimates of the Solomon Islands fleet have generally increased. The purse seine fleet's total catches have increased from 6,782 mt in 2002 to 22,313 in 2006, comprising 60% skipjack, 39% yellowfin and 1% bigeye. In 2007, the catches dropped to 17,306 mt due to change in fleet size and operational problems faced by fishing companies. 2006 provisional data show that catches of all major tuna species have increased with around over 13,388mt of skipjack, 8,256mt yellowfin and 669mt of bigeye caught. Data for the Solomon Islands EEZ were based on logsheets data received from the fishing companies. Fishing in the Solomon Islands EEZ was by foreign fleets from China, Fiji, Japan, Korea, New Zealand, Taiwan US and Vanuatu, FSM and US. The fleet size for all these countries have increased rapidly since 2004, based on the number of license issued in 2004 to 2007.

Catch by the pole-and-line fleet has been dominated by skipjack (89%), with a minority of yellowfin (10%) and bigeye (1%). Provisional estimates for the longline fleet in 2004 which was the highest in the last 6 years were 207mt, 294mt and 440mt for albacore, bigeye and yellowfin respectively. The annual catch is expected to be higher if all logsheets were raised and included in this count.

Reef fish

A number of studies and survey has been undertaken at different site of the country that focuses on particular sites at a time and not for the whole country. The first published quantitative report on density and abundance of reef fish in Solomon Islands is from a rapid ecological survey of the fringing reefs of Rennell Island and the Indispensable Reefs. There are other surveys being undertaken that contributing to knowledge of reef fish abundance and diversity of Solomon Islands.

The recent TNC marine assessment report is the first national survey covering most of major Islands of Solomon Island. The survey result shows that Solomon Island has one of the richest concentrations of reef fishes, a total of 1019 reef-dwelling fish species in Solomon waters. The diverse coral reef fish fauna, consist of at least 82 families, 348 genera, and 1019 species, of which 786 (77%) were observed or collected during the survey while the rest found from museum collections.

Forty-seven new distributional records were obtained, including at least one new species of cardinalfish (Apogonidae). A formula for predicting the total reef fish fauna based on the number of species in six key indicator families indicates that at least 1,159 species can be expected to occur at the Solomon Islands. Gobies (Gobiidae), damselfishes (Pomacentridae), and wrasses (Labridae) are the dominant groups at the Solomon Islands in both number of species (120, 100, and 84 respectively) and number of individuals. Species numbers at visually sampled sites during the 2004 survey ranged from 100 to 279, with an average of 184.7. Njari Island, Gizo (site 32) was the leading site for fish diversity. The 279 species count is the fourth highest ever recorded for a single dive, surpassed only by three sites in the Raja Ampat Islands (Indonesia).

3.4.2.3. Echinoderms

Bech-de-mer (sea cucumber)

There are 19 species of sea cucumber recorded for Solomon Islands, the TNC assessment encountered 17 of the species. The low valued species *Holothuria edulis* (pinkfish) and *Pearsonothuria graeffei* (orange fish) were the most common species. The high valued species *Holothuria fuscogilva* (white teatfish) inhabit deep habitat but are not common in the shallow habitat. While some species like the *Thelenota ananas* (prickly redfish), *Actinopyga lecanora* (stonefish), *Stichopus chloronotus* (greenfish), *Holothuria nobilis* (black teatfish) and *Stichopus hermanni* (curryfish) are also present, others like the *Actinopyga mauritiana* (surf redfish), *Holothuria scabra* (sandfish), *Bohadschia similis* (chalkfish), *Stichopus horrens* (peanutfish) and *Holothuria coluber* (snakefish) are uncommon. Few specimens were recorded of the species *Actinopyga miliaris* (blackfish), *Actinopyga crassa* (a species similar to blackfish), *Thelenota rubralineata* (lemonfish) and *Stichopus pseudohorrens*, a species very similar to the peanutfish (*Stichopus horrens*).

The beche-de-mer fishery in the Solomon Islands started as early as 1845 and was well established during the late 1870's and early 1880's with up to 90,000 kg of beche-de-mer being exported to Australia annually (Bennett 1987). The beche-de-mer fishery remains an artisanal activity involving coastal and island communities as fishers as lately as 2004 and was a multi-million dollar industry, and is the second-most valuable marine resource, after tuna, to the national economy (Ramofafia, 2004). It was just recently that a ban was imposed by the Minister of Fisheries as a result of unsustainable harvesting threatening the species.

3.4.2.4. Crustaceans

Crayfish/lobster

The main species that are found in the Solomon Islands are the double-spined ornate lobster (*Panulirus pencillatus*). Other species include (*P. femoristiga*), the painted coral lobster (*P. vericolor*) and the spiny lobster (*P. ornatus*).

Before 1973, some short-lived lobster fishing operations failed because of variable catches and mechanical problems. Several larger operations established in 1995 failed within about a year for the same reasons as the earlier ventures. Almost 23 tonnes of spiny lobsters were exported in 1995, but since this was more than 10 times the estimated sustainable annual catch, the crayfish stocks were probably being over-fished (Skewes 1990). Small-scale operators continue to buy and export lobsters despite a rapidly declining resource. Fisheries regulations prohibit catching, trading or exporting crayfish of the genus *Panulirus* with eggs, whose eggs have been 'scrubbed' or whose carapace length is less than 8cm.

3.4.2.5. Molluscs

Giant clams

There are 6 giant clam species, *Tridacna gigas*, *T. derasa*, *T. squamosa*, *T. crocea*, *T. maxima* and *Hippopus hippopus*, found in the Solomon Islands waters.

Commercial harvesting for the meaty adductor muscle, developed in the 1970s and 1980s, because of the high value and demand for the product. The fishery reached its peak

in 1983 when 10.2 tons of adductor meat were exported, with the rest of the animal usually wasted. As the muscle averages a few hundred grams and comprises about 10% of the live weight of the clam, the export of several tonnes represents harvesting thousands of clams (Sulu et al. 2000)

In 1996 a Honiara-based company, Hai Way International, had a cargo of one tonne of giant clam adductors confiscated at Henderson. Export of clams or clam products is now prohibited under fisheries regulation except clams that come from registered farms or a hatchery.

ICLARM Coastal Aquaculture Centre at Aruligo near Honiara was established to supply farmers with clams for the aquarium trade and restock depleted reefs for about 10 years. (Paruru Aquaculture a locally owned clam hatchery and nursery also designed to supply local farmers with juvenile clams, at Marau Sound. Unfortunately both the ICLARM farm at Aruligo and the initiative at Marau have been compromised by the violence on Guadalcanal, though there are proposals to enlarge ICLARM's smaller field station on the island of Nusatupe near Ghizo now known as World Fish Centre.

Pearl oysters

Blacklip (*Pinctada margaritifera*), goldlip (*P. maxima*) and brownlip (*Pteria penguin*) and are the most commercially important species in the Solomon Islands. The blacklip oyster made up almost 70% of the 1991 export. Blacklip and gold lip oysters, the largest species in the genus, have thick, nacreous, mother-of-pearl, shells used for manufacturing buttons.

Prior to 1990, all pearl shell was exported to Japan for button manufacturing. This period also saw heavy pressure on the resource.

Blacklip because of its restricted nature, shallower and high production is more susceptible to fishing pressure. Goldlip lives deeper and are therefore harder to collect. As a management initiative to conserve pearl oysters, an indefinite ban on exporting pearl oysters was established in 1992.

The World Fish Centre has advocated the farming of pearls as a way to generate new livelihoods for rural communities for sometime. Their findings indicated that shell deemed suitable for aquaculture culture made up only 13% of the pearl shell sighted in the Kia region. Batty and Kile (1990) therefore concluded that pearl culture operation could not stand-alone without assistance from a hatchery.

A joint Solomon Island Fisheries Division and ICLARM project has shown pearl oyster farming to produce pearls and using wild spat is viable. A demonstration farm, producing black pearls from the blacklip oyster, was established at Nusatupe, near Ghizo. Pearls were first harvested from this farm in May 1999, and the shells have been re-implanted to produce a second crop of pearls.

Green snail

The main species of turban shells (*fam. Turbinidae*) harvested in the South Pacific are the green snail (*Turbo marmoratus*); the rough turban (*T. setosus*) and the silver-mouth turban (*T. argyrostomus*). The last two are mainly targeted for food and their shells usually discarded. *T. marmoratus*, the largest species with shells up to 20cm in diameter and weighing 2kg, has a nacreous shell highly prized for inlay work, lacquerware, jewellery and for buttons. The green snail is not an abundant resource in the South Pacific.

Although no quantitative assessment has been done to determine the status of the Solomon Islands greens nail population, based on anecdotal reports and fisheries export data they are clearly much depleted throughout the islands. The Overseas Fishery Co-operation Foundation (OFCF) of Japan in collaboration with Fisheries Division set up the 'Atoll Project' at the Aruligo Coastal Aquaculture Centre to breed them to restock depleted reefs. This project ceased as a result of the last ethnic crises.



FIG 3.8 Trochus processing for button in Honiara - photos: Kinch J. 2004
Trochus

Trochus niloticus is the most important of the trochus-like species in the Solomon Islands (collectively called 'trochus'). Harvested as traditional subsistence food, commercial harvests mainly for buttons, began in the early 20th Century. Shortly after commercial harvesting commenced, it was apparent that trochus was all too easily overfished. The 1993 state of environment report stated that in the 1980s and early 1990s trochus was the most important non-fish resource in Solomon Islands in terms of export earnings (skews 1990). The fishery has declined since that time.

Recent IWP surveys around Mbili Passage and Chea in western province, trochus were found

in relatively low abundance, indicating that this species is heavily exploited (Manioli 2004). The TNC marine assessment also observed that *T. niloticus* was encountered in low numbers and at less number of sites during the survey. In contrast, *T. pyramis* was encountered at twice as many numbers of sites and numbers. Since these two species are known to occupy the same habitat and space on the reef, this would imply a significant reduction in the stocks of *T. niloticus*. Specifically, *T. niloticus* which prefer the exposed habitats compared to the sheltered reefs.

The only current management measure to conserve trochus is a regulation that prohibits taking trochus smaller than 8cm and larger than 12cm when measured across the basal diameter. Currently only one company, ROK and SI Total Event Ltd is operating in purchasing trochus from the rural fisheries centres throughout the country and processed for shell buttons which currently is fashionable on high quality shirts

Other Molluscs

The Status of the coral reef report 2004 outlines several other molluscs important for food or culturally in many parts of Solomon Islands. Langalanga people produce shell money and shell money necklaces from four species of shells – romu (*Chama pacifica*), ke'e (*Beguina semiorbiculata*), kakandu (*Anadara granosa*) and kurila (*Atrina vexillum*). Some are becoming scarce as a result of this practice. Subsistence fishers harvest gastropods like turban shell (*Turbo chrysostomus*), polished nerite (*Nerita polita*), false trochus (*Tectus pyramis*), cowry (*Cypraea tigris*), bivalves such as mangrove oyster (*Crassostrea mordax*), venus shell (*Gafrarium tumidum*) and mangrove mussel (*Modiolus agripetus*); chitons (*Acanthozostera*

gemmcita) and cephalopods for food (squid and octopus) and shell (Nautilus).

There is a small souvenir shell trade where tourists buy a wide variety of shells in some retail outlets in Honiara and at the market. Tourist resorts generally discourage such trade. Some of the rarest species such as the golden cowrie command several hundred dollars each. In Honiara vendors travel door to door selling golden cowrie shells to collectors and entrepreneurs. If the tourist trade was larger, and if cruise ships were still making regular visits, then this shell souvenir industry in Solomon Islands would be much larger.

3.4.2.6. Sharks

There is not a lot known about sharks in the Solomon Islands. It is however known in some areas of the country that it is an important subsistence resource. The major threat is not from subsistence fishing pressure, but rather from the shark fin fishery. Available fisheries export statistics (note no data available for some years) show an interesting trend where the fishery increased markedly in size during the late 1990's. There is suspicion that a large proportion of annual export figures are not being declared or recorded. The fishery remains unregulated with anecdotal evidence of increasing pressure, especially in the Western Province.

3.4.2.7. Turtles

Five species of turtle occur in Solomon Islands: hawksbill (*Eretmochelys imbricata*); green (*Chelonia mydas*); leatherback (*Dermochelys coriaces*); olive or Pacific Ridley (*Lepidochelys olivacea*); and loggerhead (*Caretta caretta*). The first 3 are common and nest in low densities (McKeown 1977; Vaughan, 1981). The other two species

(loggerhead and olive or Pacific Ridley) are rare.

An extensive turtle research study undertaken throughout Solomon Islands by the Solomon Islands Fisheries Division between 1973 and 1982 identified the Arnavon group (including the Waghena area) as the most important hawksbill rookery in the country, supporting more than 600 nests per year (Vaughan, 1981). Vaughan, (1981) also identified Allardyce (Isabel), Hele Pass and Vanguna (Marovo), Bagora (Shortlands), Okaboi (Santa Cruz), Nanunga (Vanikoro) and Tetepari and Baniata (Rendova) as collectively supporting between 100 and 200 nests of hawksbill, green and leatherback turtles each year. Because of the importance of the Arnavon Islands for the nesting of hawksbill and green turtles, the Government declared the area a wildlife sanctuary in 1980.

There is a total ban on exporting turtle shells and a closed harvesting season for all turtle species and turtle eggs from June to August and from November to January during the nesting seasons since 1993. Although subsistence use of turtle continues, there has been no commercial export of turtle shells since these fisheries regulations came into effect. Turtle conservation is one of the most active activity undertaken by major NGOs in the country.

The leatherback turtle in particular is an endangered species recognised worldwide and international efforts are being made to protect its nesting sites. Solomon Islands currently has an tri-lateral agreement with PNG and Indonesia to protect the species.

3.4.2.8. Crocodiles

There is only one species of crocodile in the Solomon Islands the salt water crocodile (*Crocodylus porosus*) (McCoy 2006). The ban

on crocodile in the early nineties has resulted in an explosion of crocodile population throughout the country with increasing reports of crocodile attacks.

3.4.3. Aquaculture

The development of aquaculture industries could potentially relieve pressure on reef resources e.g. ICLARM has demonstrated the viability of long-line pearl oyster farming in Western Province. Aquaculture ventures typically require considerable foreign investment, however, this is unlikely while there remains considerable ethnic disputes.

Seaweed -Villagers have been encouraged since 1987 to cultivate and dry carrageen seaweeds like *Eucheuma* for the phycocolloid industry (Why 1985; South 1993). Grazing by rabbitfish (Siganids) was a major problem until the cultures were shifted to more exposed locations. By 1990 four farms were exporting of 2.5 tonnes (Skewes 1990), but the industry subsequently collapsed due to market collapse.



FIG 3.9 Seaweed farms at Rarumana - Photos: European Union, 2001

In 2001 seaweed was reintroduced in Rarumana as part of the European Union funded Rural Fishing Enterprise Project's (RFEP) diversification initiative. When seaweed was reintroduced in 2001, it slowly

gained momentum until production rose in late 2002. The socio assessment by Wale (2003) record that more people are interested in becoming seaweed farmers and there is the likelihood that when materials become available again, some more people will enlist in the venture.

Prawn - There were two successful prawn farms in Solomon Islands, which exported prawns worth SBD\$1.3 million in 1998. Both farms were closed in 1999 during the ethnic problems with one being destroyed and the other forced to close.

3.4.4. Aquarium Trade

Some 224 coral reef species are exported from Solomon Islands for the aquarium trade. Of these 79% are fish and 17% corals. The remainder are juveniles of giant clams and starfish. Unlike the live fish food trade, these are shipped by air. Most fish are captured in nets or areas of intertidal reef are broken to release fish at low tides. Some resort owners report that anemone fish are obviously depleted

Fish for export in the Solomons are shipped individually inside perforated containers like plastic drink bottles and transported in large buckets to Honiara, where they are graded and air-freighted in plastic bags of oxygenated seawater packed in styrofoam boxes. The growing worldwide demand for high quality ornamental aquarium fish 'captured in an environmentally sustainable way' is leading to industry certification programmes being run by the South Pacific Forum Secretariat and the Marine Aquarium Council (MAC), funded by the Canadian International Development Agency (CIDA) through the Canada-South Pacific Ocean Development (C-SPOD) Program.

Coral species in the Solomon Islands also accounted for 12% of all fish entering the

international market during the period 1997-2002. From 1998-2003, the Solomon Islands also produced 6% of all invertebrates in trade (Wabnitz et al, 2003). Many corals targeted by the live aquarium coral market are large-polyped species, some of which are slow growing. Destructive methods have been noticed when communities collect certain aquarium fish, particularly the breaking of corals to get at blue tangs.

According to the Global Marine Aquarium Database, the Solomon Islands exported 416,212 specimens from 1997-2002, which accounted for 12% of all fish entering the international market. Kinch (2004b) also reported that the Solomon Islands is also a significant source of invertebrates accounting for 6% of the international trade between 1998-2003. Aquarium Arts of Solomon Islands exports about 250 different ornamental fish from 55 species whilst Solomon Islands Marine Exports exports around 70 different coral species and a few assorted invertebrates.

Table 3.6 Coral and reef fish export data from 1996- 2003

Year	Coral (including cultured corals)		Fish	
	Piece	Value SI\$	Number	Value SI\$
*1996	-	94672	71621	177509
*1997	61,144	289870	8299	80696
*1998	37,552	422473	58188	174098
*1999	56,522	244645	93886	400264
*2000	51,417	201588	131624	288518
*2001	33,250	126728	70824	214153
#2002	-	260039	-	246574
#2003	-	438093	-	338703

Source: Kinch, (2004b)

3.4.5. Marine Mammals

Cetaceans

Little is known on the distribution and occurrence of cetaceans on the Solomon Island waters as little survey has been undertaken. It is likely that over 30 species of whales and dolphins inhabit the waters under Solomon Islands' national jurisdiction, based on combined sighting information reported for the Solomon Islands, Papua New Guinea, wider Melanesia and eastern Indonesia. This means that more than one third of all known whale and dolphin species worldwide can be found in the Solomon Island Seas, including residential, migratory and endangered cetacean species (IUCN 2003).

Preliminary cetacean species list for the Solomon Island Cetacean REAs observed 11 species belonging to 4 taxonomic groups and 9 genera and includes resident and migratory species; several rare, vulnerable and/or endangered whale species - including blue, Bryde's sperm, and beaked whales; as well as numerous coastal and oceanic dolphin species (*Fam. Balaenopteridae*, *Physeteridae*, *Kogiidae*, *Ziphiidae* and *Delphinidae*).

Dolphins- There are reported 9 species of Dolphin in the Solomon Islands water and include the Spinner Dolphin (*Stenella longirostris*), Pantropical spotted dolphin (*Stenella attenuata*), Common bottlenose dolphin (*Tursiops truncatus*), and single sightings for the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Risso's dolphin (*Grampus griseus*), Rough-toothed dolphin (*Steno bredanensis*) and Bottlenose Dolphin (*Tursiops truncatus*) (Leary and Pita, 2000).

Many coastal communities, such as the Shortlands and Savo Island, have important spinner dolphin resting areas at their local reef lagoons (Leary and Pita, 2000).



**FIG 3.10 Dolphins in Solomon Island waters
– Photo: TNC Marine Assessment report**

Traditional dolphin hunting

The Solomon Islands Marine Assessment visited two traditional dolphin hunting villages, Fanalei on SE Malaita with hunting grounds in the coastal and open waters adjoining the western Pacific and Bitá'ama on NW Malaita. The assessment showed the communities on Bitá'ama are no longer engaged in dolphin hunting, but that the SE Malaita community of Fanalei is still very much active in the activity of trading dolphin teeth for traditional ornamentation and money. The practices and cultural heritage of the dolphin hunters of Malaita are relatively well documented in the scientific literature and other more anecdotal reports.

International dolphin trade

In 2003 the Solomon Island government licensed live-capture trade of catching and exporting bottlenose dolphins (*T. aduncus*) in SI waters for local and international cetacean displays and 'swim-with the dolphins' tourism ventures. This resulted in an export in 2003 to Mexico which received widespread attention from international regulatory bodies such as CITES as well as dolphin activists and the scientific community. Another export quota

of 30 dolphins was exported to Qatar during 2004.

After considerable international pressure, the government of the Solomon Islands announced a complete ban on further exports of dolphins early 2005. However the ban was recently lifted in 2007 allowing for an export quota of 100 dolphins a year.

Dugongs - The dugong (*Dugong dugong*) is the only herbivorous mammal that is strictly marine, and is the only extant species in the family Dugongidae. It is listed as vulnerable to extinction at a global scale by The World Conservation Union (IUCN). Currently there is no information available on dugong abundance and distribution, habitat loss and degradation, fishing pressure, indigenous use and hunting and research. Plans are currently in place to undertake a survey of dugongs in the country.

Whales - There are 8 species of whale found in the Solomon waters. The 8 species include Bride's Whale (*Balaenoptera edeni*) which has been recognized as a distinct dwarf stock endemic to the waters surrounding Solomon Islands, the Short-finned Pilot whale (*Globicephala macrorhynchus*), Melon-headed Whales (*Peponocephala electra*), Orca or killer whale (*Orcinus orca*), Mesoplodon beaked whale (*Mesoplodon sp.*), Rorqual baleen whale (*Balaenoptera sp.* – either the common Bryde's or Sei whale; *B. brydei* or *B. borealis*), Sperm whales (*Physeter macrocephalus*) and Humpback whales (*Megaptera novaeangliae*) (Leary and Pita, 2000).

3.5. Sites of special significance

The word Kastom in the Solomon Islands context denotes culture and tradition as

distinct from the 'whiteman way' or introduced and modern way of doing things. It is often conceptualised so as to include matters relating to social and cultural relationships based on the fundamental constructs of land and bloodlines (including kinship, clan, line), residence and language (wantok). The extended family (kinship unit) is an important relationship based on culturally recognized connections between parents and children, extending to siblings and through parents to more distant relatives.

Land is central in traditional cultural life, being a parallel fabric to the population of human life itself, and forming the most valued heritage of the whole community – saturated with spiritual, historical and political significance. It provides links with ancestors and spirits and source of power (economic and political). It is common throughout the country that absolute ownership of land resides with an apical ancestor whose rights have been inherited by a given clan or tribe. The big-man mode of leadership characteristic to many parts of Solomon Islands occurs whereby a leader commands following through the accumulation and distribution of wealth, and via the creation of a network of allegiances and obligations that can extend far beyond the village or island.

3.5.1. Natural Heritage sites

East Rennell World Heritage site –The Government of Solomon Islands became a party to the World Heritage Convention on June 10, 1992. Solomon Islands was the first country in Oceania to have a site inscribed onto the World Heritage List, although the UK territory, Henderson Island, was listed in 1988. In 1998, East Rennell was inscribed as a natural site on the World Heritage List under criteria (ix) – “outstanding examples representing significant on-going ecological processes in the evolution and development

of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.” East Rennell has recently completed its Management Plan



FIG 3.11 Bird Island – East Rennell world heritage site – Photo :Greg T

Other Potential Natural Tentative World Heritage sites - There have been ongoing discussions underway with communities in the Marovo Lagoon and their partners about the possibility of nominating this area as a World Heritage Site. However due to the considerable destruction due to logging in the area, it is believed the World Heritage criterion of “intactness” may no longer be met by this area.

However, the political tensions of the coming years resulted in a breakdown of these efforts as government became incapacitated and many supporting agencies left the country. There is also discussion that to have Solomon Islands submit a tentative list for mixed natural and cultural site and a working document has been developed by UNESCO Solomon Islands office, potential sites include;

- Marovo-Tetepare Complex (Marovo Lagoon, Tetepare I., Hele Is, S W Rendova & Mborokua Island) – a mixed natural and cultural site

- Arnavon Region (Arnavon I, part of South Choiseul & Santa Isabel) – also a mixed natural and cultural site
- Bauro Highlands & Three Sisters Complex (Makira) and/or Mt Maetambe, Choiseul – serial submission for natural site

3.5.2. Cultural Heritage sites

Solomon Islands also have the potential to submit tentative list of cultural sites that might be considered in the context of WH values. Potential OUV cultural values include **WWII sites such as Iron Bottom Sound, Tulagi, Munda** and others, as well as **Tikopia and Anuta Islands**, and an expansion of the current World Heritage Site in East Rennell (East Rennell is currently inscribed on the World Heritage list as a natural site). There may also be cultural values in the above natural areas listed within the above table that are best assessed by cultural experts.

4.0 ENVIRONMENTAL CHANGE: CAUSES AND CONSEQUENCES

4.1. Society, economy and environment

In Solomon Islands, there is strong inter-relationship between society, economy and environment. The people's livelihoods and national economy are directly dependent on resources and processes within the environment. As a society heavily reliant on natural materials extraction for local consumption or export, and dependent on environmental processes for livelihoods, the environment is both critical to growth and development, and directly impacted by the effects of the same.

In the process of exploiting resources, reductions in stock levels and degradation in habitat integrity and carrying capacity are experienced. This is driven both by scale of activity and the methods utilised for these activities. As the population grows, the need for greater use of resources grows and in turn the more pressure is put on the resource base. It is therefore fundamentally important for governments and civil society to understand the relationship between the economy and the environment, how people and the economy have changed over time, and how they may change in the future in relation to the environment.

In discussing the country's environment change, its causes and consequences, an overview of the country's socio-economic situation is provided to illustrate the inter-relationship between society, economy and environment.

4.1.1 Dual economy

Solomon Islands has a dual economy, the formal or cash economy and informal or subsistence economy. The vast majority (85%) of the people are dependent on the subsistence economy. They derive their livelihoods from subsistence agriculture, fishery and forestry and small-scale income generating activities; particularly export cash-cropping and fresh produce marketing. The formal or cash economy is also almost dependent on extraction of the same natural resources within the country's environment. The situation is that the country's natural resources directly support both the livelihood of the village communities and the country's formal economy. The dependence on subsistence economy by 85% of the country's population makes environment particularly important to the well-being of Solomon Islanders.

Table 4.1 Solomon Islands production by major commodity 1997-2007 (metric tonnes except logs)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Copra	28679	26971	23242	19004	1701	305	12898	21831	26182	21213	27903
Coconut	5399	8339	10345	8553	117	--	--	12	28	59	741
Oil											
Palm Oil	28863	29077	12877	--	--	--	--	--	--	5427	17151
Palm	7005	6821	3182	--	--	--	--	--	--	1236	4829
Kernel											
Cocoa	3907	844	2395	2316	2038	2907	4587	4181	4928	3835	4470
Fish *	40654	49390	47961	21163	17699	18508	28955	27249	23853	29597	21196
Logs ('000 m ³)	650**	593	628	541	293	550	714	1043	1118	1130	1446

Source: CBSI Annual Report 1994-2007 -- = data unavailable or unreliable;

Notes: * Fish catches are those of Solomon Taiyo Ltd. and National Fisheries Development only.

** Since 1997, there are no log production data so log exports are used as a proxy.

The cash economy is becoming an important part of people's livelihood, and land, along with resources such as fisheries and forests often provides the only means to have access to cash. These resources (land, forest and fisheries) are therefore important both as sources of food at subsistence level and income. Traditional and subsistence societies are being transformed into the cash economy and this transition is exerting great pressure on the environment.

4.1.2 Natural Resource Extraction

The country's post-World War II economic development focused heavily on agriculture, especially the development of large-scale plantation cash cropping in specific geographic locations where arable fertile lands are found, notably the northern Guadalcanal Plains. This narrow economic focus has generated a situation of uneven development, which has been compounded by the difficulty of both colonial and post-colonial governments to effectively provide services to the majority of people living in the 'non-economic' parts of the country.

Subsequently, post-Independence economy has also been characterised by the increased extraction of the forestry and fisheries stocks, such that these two sectors have provided significant export revenues since the 1980s and still remain the country's two major export earners. Whilst some land and reef owners have received royalty incomes from these industries, corruption and mismanagement, coupled with the inability of successive governments to redistribute economic

benefits through the provision of services to rural people, means that the majority of people have received little if any benefit.

The extractive industries that currently form the formal or cash economy includes commercial forestry and fisheries, and large scale agribusiness and mining. Domestic food production for cash income is also becoming important activity. Over one third of the GDP is contributed by the Agriculture sector through export of copra, cocoa and recently palm oil. Unsustainable logging of natural forests, fish, particularly tuna are the driving

force behind the recent economic growth (The World Bank, 2007). The country's production by major commodity is provided in table 4.1.

It is uncertain, *or at least not seen visibly or tangibly*, whether Solomon Islands has received fair return from its natural resources exploited in the last 30 years of its independence. It is, therefore, essential to develop a critical understanding of the national balance sheet, in order to determine how much of the country's resource stocks have been harvested, how much has been received and retained in return and how much the carrying capacity or natural stocks of the environment or the ecosystem service has been lost. From both a subsistence point of view as well as a cash-economy perspective, the environment is recognised as a resource base, either as a provider of materials or products, but also as a provider of services, such as fertility, detoxification or resilience. Economic considerations of the environment need to emphasise the need for a broader recognition of the resource importance of environment, particularly in terms of the services which it provides to people and the economy.

4.1.3 Subsistence Food Production

The gap between cash and subsistence economies is however huge. Surveys of rural livelihoods over the past 15 years have consistently showed the importance of subsistence food production from land and fisheries as safety net for rural households. Communal land ownership enables customary land owning groups to access resources for subsistence and income earning purposes. Most food consumed by rural villagers is grown by them in nearby food gardens. Other important sources of food are coconuts, fishing, other marine including shell fish and

mangroves, and fruit and nut trees in the forest or in villages. Subsistence food production sustained the population during the displacements and fighting associated with the ethnic tension in 1999 to 2003. It underwrites the economy and is a major strength of the nation.

Table 4.2 Estimated productions of staple food crops in Solomon Islands, 2004¹

<i>Crop</i>	<i>Estimated production (tonne per year)</i>	<i>Proportion of production (per cent)</i>
weet potato	280,000	65
Cassava	51,000	12
Banana	34,000	8
Taro and kongkong taro	32,000	7
Coconut²	26,000	6
Pana and yam	7,000	2
Other³	2,000	0

Source: Bourke *et al.*, 2006

Sweet potato is by far the most important source of food energy in the Solomon Islands. It contributes an estimated 65 % by weight of the locally grown staple foods (Table 5. 2). Other important food crops are cassava, banana, kongkong taro, island taro, coconut, pana and yam. The production of these staple food crops is estimated to be about 430,000 tonnes per year.

With the exception of some limited donor-funded assistance to smallholder copra, cocoa and livestock production, the subsistence food production has **never** been a development priority for colonial and post-colonial governments nor donor agencies. As a result, subsistence food production has not been adapted successfully over time to adequately and sustainably meet the growing

food requirement of the country's increasing population. Shortage of suitable arable lowlands due to a combination of increased population, land tenure issues, and the introduction of tree cash crops, has increased pressure on marginal and sloping lands that are now being cultivated for subsistence food production. Cultivation of marginal sloping lands is unsustainable and is responsible for accelerated soil erosion, loss of soil fertility, increase in pest and diseases, decline in crop yield, and widespread land degradation.

The situation can be understood as one of declining natural heritage, where forests are disappearing, land is degrading, streams are becoming increasingly polluted and reefs stocks are depleting. This dis-integration of natural systems and habitats are driven by indiscriminate land use and uncontrolled conversion of country's natural resources into cash with benefit only a small sector of the society. Substantial resource stocks have been exploited with little benefit to the country and the people who via traditional tenure own 90% of the resources. Natural resources are also of social and cultural importance for rural households. It is evident in certain areas that traditional approaches and practices cannot cope with the stresses on the natural resource base. As a large part of the national population will continue to be rurally based and depend on subsistence activities, pressures on natural resources and the environment will continue unless successful actions are commenced as soon as possible. Maintaining the sustainability of the natural resource base, protecting sensitive habitats and increasing the resilience of land resources is therefore important for providing a sound platform for economic development.

Apart from stress placed on country's resources through both subsistence and cash economy Solomon Islands continue to face enormous development challenges.

Populations are highly dispersed across a vast double archipelago of islands. Inter-island transport and communication services are inadequate and the road networks on most islands are very limited. The mountainous terrain of the larger islands creates pockets of highly isolated communities. Most of the country is continuously wet and in many places excessive rainfall is a constraint to agricultural production and infrastructure development.

These biophysical and spatial conditions pose fundamental challenges to any model of economic development or national planning for the country. This has heretofore gone unrecognised in any serious manner in national policy.

4.2. Causes of Environmental Change

The causes of current environment change are presented and the state produced by these causes is discussed in this section.

4.2.1 Population pressures – subsistence use intensification

There has been considerable intensification of land use in the country over the past three decades. This is caused by the rapidly increasing population. The population estimate for Solomon Islands is around half a million with average annual population growth rate of 2.8%. This implies that the population will double every 25 years (Bourke et al., 2006). The average population density for the country is around 14.6 persons per square km.¹ This figure is however misleading

¹ This is based on a total land area of 28,000 km² as opposed to the 30,400 km² which is cited in the census. This also has a bearing on the population

because most of the population lives on the less than 10% of the country which consists of flat coastal plains, lagoon islands and atolls. Very few people reside in the rugged mountainous interiors of the islands. Population densities vary widely between the provinces, ranging from four persons/square km in Rennell-Bellona Province, to 35 persons/square km in Central Province.

The subsistence cultivation system is based on fallowing land to restore soil fertility. In the past and in areas of low population density, shifting cultivation maintains soil fertility by means of long fallow 15-25 years long, but in many locations, they are typically 5-9 years and as short as 1-4 years in some places where high population densities are in excess of 10 person per square km (Mackay, 1988). The reduced fallow periods, and often extended cropping periods, have produced food for the growing population, but this is also resulting in a reduction of soil fertility, with consequent reduction in crop yields. This is now becoming a major problem in some locations, particularly on north Malaita and many small islands. These islands include Bellona; the small islands in the Roviana, Vonavona and Marovo lagoons, Simbo Island, the Gilbertese settlements in Gizo and the Shortland Islands of Western Province; Wagina island of Choiseul Province; Santa Anna and Santa Catalina islands in Makira Province; and a number of small islands in the Russell Island group of Central Province, in particular on Loun Island and Maruloan Island (Bourke *et al.*, 2006).

Along with declining soil fertility and yields of food crops in some locations, a number of

density figures provided in the 1999 census. The land areas of Choiseul and Western province which are used in the census are thought to be inaccurate (by around 50% in the case of Western Province) and have been adjusted for the purposes of calculating population densities.

other significant issues also pose threat to subsistence food production. The first is increasing pest and disease problems, again often associated with more intensive land use. Widespread and destructive logging has also reduced potential food garden areas in some locations, and third, lack of labour due to young population migrating to urban areas.

The pressure to farm cash crops, has driven the introduction of harmful farming practices such as extensive land clearing, intensification of land use and inappropriate soil cultivation. The occupation of most flat arable lands by cash cropping is also pushing subsistence cropping onto marginal areas especially steep lands. About 63% of the total land area (28,000 square km) in Solomon Islands comprise steep lands (> 20% slope) which are used for shifting cultivation by smallholders. Intensified and constant cultivation of marginal sloping lands is unsustainable and is responsible for soil erosion, loss of soil fertility, increase in pest and diseases, decline in crop yield, and widespread land degradation (Cheatle, 1987). There are few if any widespread and quantitative data on soil erosion rate, extent and severity of land degradation decline in soil fertility and sustainability of current cropping systems in Solomon Islands.

4.2.2 Commercial Plantations

The agricultural sector exports are primarily palm oil, palm kernels, copra and cocoa and are key measured contributors to the country's Gross Domestic Product (GDP). Like most of its South Pacific island countries, the agricultural sector account on average for about 30 % of GDP.

Copra and cocoa production are dominated by smallholder production with average farm size ranging from 0.1 to around 10 ha. Some commercial agriculture plantations, including

the Russell Islands Plantation Limited (RIPEL) are located in specific geographical areas with fertile arable lands throughout the country. For example, the RIPEL2 has coconut and cocoa stands in the Russell Islands, Lunnga on Guadalcanal Plains, and Gozururu in Isabel Province. The size of these commercial agriculture plantations are around few hundred ha. The actual total area under coconut and cocoa is not available but they occupy large tracts of coastal flat lands on almost all Islands in the country.

In 1976, the CDC established an oil palm plantation on the Guadalcanal Plains and in 1978, crude palm oil export by Solomon Islands Plantation Limited (SIPL) was estimated at SB\$6m almost equal to that of copra export and later exceeded both cocoa and copra. Prior to the national civil unrest 1998-2003, the company's total production in 1998 was 29,077 tonnes of crude palm oil and 6,821 tonnes of palm kernel together valued at SB\$98m, all from a total area of 6,000 ha. The SIPL ceased production in 2000 due to the ethnic tension on Guadalcanal but palm oil production resumed in 2005 under a new company, the Guadalcanal Plains Palm Oil Limited (GPPOL), and in 2007, it exported 17,000 tonnes of crude palm oil and 650 tonnes of kernel oil. GPPOL's production target for 2008 is 24,000 tonnes of crude palm oil and 2,500 tonnes of kernel oil, and it plans significant production increases over the next nine years, with the establishment of 1,000 hectare each year to bring the estate area to 15,000 ha.

Agricultural policy remains focused on the premise of cash cropping despite little progress in this regard particularly for coconut and cocoa and a worsening world climate for this approach.

² The RIPEL remain however in-operational since 2004 due to management problems.

Apart from plantation cash cropping, plantation forestry is also expanding. In the 1970's and 80's large scale, "industrial" plantations were established by Government on alienated land at Alu in the Shortland Islands, Gizo, Kolombangara, New Georgia, Isabel and on Nendo in Temotu Province. The total plantation area as reported in 2003 was 35,000 ha (SIG-URS, 2003), however large areas have failed or have been harvested and the current commercial area is estimated to be 22,200 ha.



FIG 4.1 Local teak planters Malaita – photo: Ministry of Forestry

Since 2003, villagers have continued to establish significant areas of their own plantations with Government support. A joint FD-SIFMP II database indicates over 9,000 individual plantings have occurred to date. It is estimated that village plantations will begin to contribute to the national wood flow in the early 2020's.

In 2007 plantation logs accounted for 7 % of total log export or around 1.45 million cubic metres, mostly from the two forest plantation companies namely Kolombangara Forest

Plantation Limited (KFPL) and Eagon Pacific Plantation Company Limited (EPPCL). Both

companies also increased the total planted area to about 1,620 ha in 2007.

Conversion of large tracts of land, mostly fertile coastal lands into commercial plantations is a significant threat to biodiversity; adds pressure on land resources by displacing domestic food gardening and if not managed properly will pollute river systems and coastal marine ecosystems due

incurred on the subsistence sector, by logging. These costs are not recovered by the subsistence fails without any adequate substitute.

subsistence sector, and in no adequate way reinvested so as to provide alternative livelihoods for the people whose subsistence base is eroded. No matter what the rate of extraction, if this continues, the economy will struggle to grow as

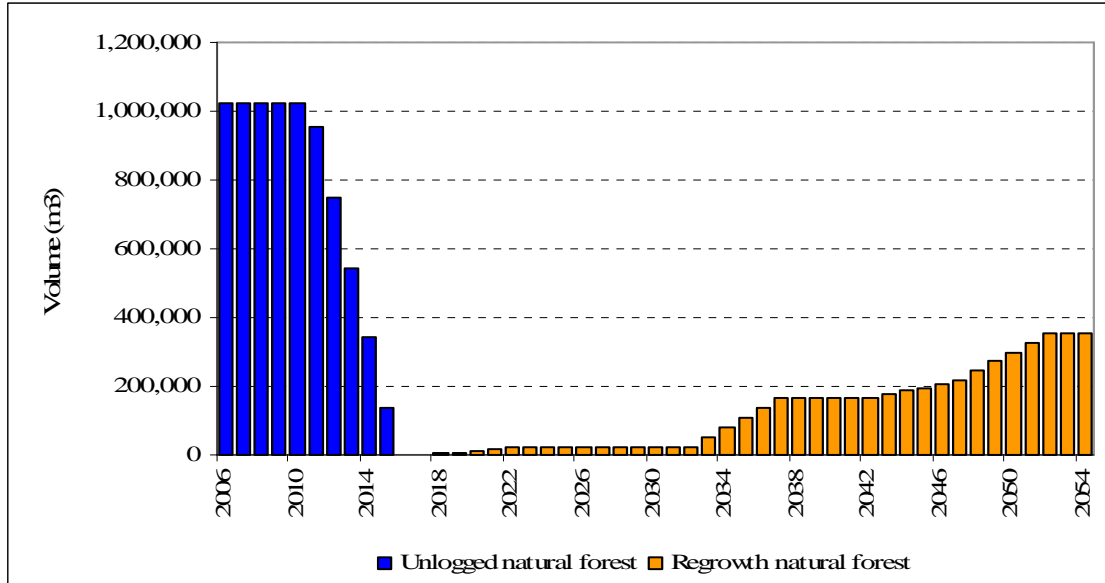


Fig 4.2 Projected national wood flow from natural forests: 2006 – 2055 (adopted from national forest assessment 2006)

to excessive runoff and siltation during heavy rains. If not managed, these all have considerable potential to impact the country’s rapidly growing population.

4.2.3 Logging

There are several resources within the environment that are being exploited at unsustainable rates, but the most pressing is the country’s forest resource. A critical situation exists with the forests.

Firstly, industrial logging destroys the subsistence utility of the land without creating alternative livelihood options. In other words, there are huge economic costs

Secondly, the rate at which this is occurring means that only approximately a decade of extraction is left before the resource is exhausted. Following this exhaustion, cash flow from wood production will collapse.

Overuse of the resource is destroying it, in such a way as to ensure that the hardest impacts are the poorest and largest part of the population. The collapse of this industry will also eliminate it as an income source to the government. This is especially significant

given that it is the single largest revenue source for the government. Overuse of the forest through logging is a disaster that has already begun.

Should prevailing international food prices continue, the impacts of past logging on reduced subsistence utility on land will begin arriving in the next few years in the form of hunger, unrest and increased competition, possibly leading to conflict.

It is estimated that the total forest area is around two million ha, of which only 598,000 is harvestable and 288,200 ha have already been logged. In 2007, log production increased by 28% to 1,444,003 cubic meters (CBSI Annual Report, 2007). The

Solomon Islands could support a sustainable yield of 320,000 m³ per annum. However, with the current rate have already been logged. In 2007, log production increased by 28% to 1,444,003 cubic meters (CBSI Annual Report, 2007).

A National Forest Inventory Project (SOLFRIP) carried out between 1993 to 1995 found that the natural forests of extraction (1,444,003m³ in 2007), the country will lose all its commercial forests soon. A recent study on forest resources in the country predicted that the natural forests export decline will begin to occur in 2011 and will decrease further until 2014 and it is expected that total commercial forest exhaustion will occur by the end of 2015 (SIG-URS, 2006).

Table 4.3 Summary of current forest areas (ha) - Source: URS 2006						
Province	NCF	UF	LF	CA	PL	Total area
Guadalcanal	460,600	40,200	37,600	0	300	538,700
Western	359,500	49,500	120,700	0	21,800	551,500
Isabel	297,000	56,700	68,800	0	300	422,800
Malaita	373,200	28,900	18,600	0	1,300	422,000
Choiseul	228,300	82,900	18,600	0	400	330,200
Makira	295,400	17,400	9,000	0	100	321,900
Temotu	63,100	19,900	1,500	0	3,200	87,700
Rennell	41,900	24,000	0	0	0	65,900
Central	55,100	5,700	3,600	0	100	64,500
Total (ha)	2,174,00	325,200	278,400	0	27,600	2,805,200
Total (%)	77%	12%	10%	0%	1%	100%
<i>NCF – non-commercial forest and cleared land</i>			<i>CA – commercial areas</i>		<i>LF – logged forest</i>	
<i>UF – unlogged commercial natural forest</i>			<i>TA – total area</i>		<i>PL – plantations</i>	

4.2.4 Urbanization

Urbanization is recognized as one of the principal causes of environmental change. With regard to the distribution of the urban population, Honiara, with a 1999 population of 49,107, accounts for more than three quarters of the total urban population of 63,732. If the adjoining urban areas of Guadalcanal are included, 'greater Honiara' represents 82% of the urban population of the Solomon Islands. The other urban centres are miniscule in comparison to Honiara. These are, in order of percentage of total urban population: Noro (5%), Gizo (5%), Auki (3%), Tulagi (2%), Kirakira (2%), Taro (1%), Buala (1%) and Lata (1%).

The urban population (Figure 4.3) grew rapidly with an Average Annual Growth Rate (AAGR) of 3.8%. The Ministry of National Planning (MNP), assuming that these AAGRs will continue, estimates a national population

of 716,000 by 2019 with Honiara reaching 105,000, more than double that of 1999. From 1970-1986, Honiara (Table 5.2) grew by 6.0% annually, with the recent decline in AAGR reflecting to some extent the temporary movement of people out of Honiara in 1999 due to civil unrest. With the improvements in law and order on Guadalcanal, Honiara's growth could again increase more rapidly than the projections suggest.

The total population increase and the urban increase (particularly in Honiara where fuelwood is becoming increasingly scarce) and utilities companies like SIWA and SIEA are struggling to maintain regular supply has great impact on the urban environment.

4.2.5 Mining

Open pit mining has been limited to date to the Gold Ridge Mine on Guadalcanal.

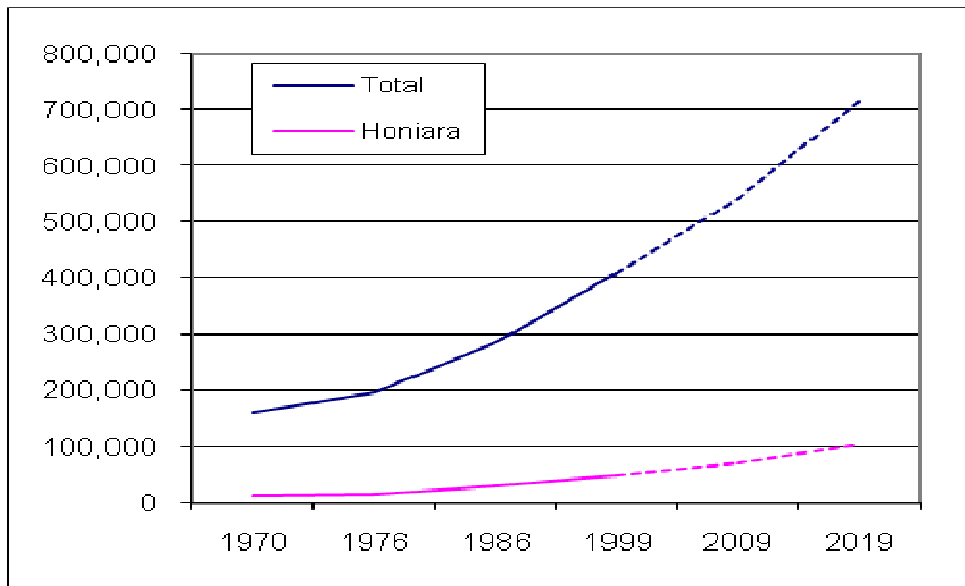


Figure 4.3: Population 1970-1999 & Projections to 2014

Source: Data from Ministry of National Planning (Jan. 2004)

Note that the intervals shown between years are not constant.

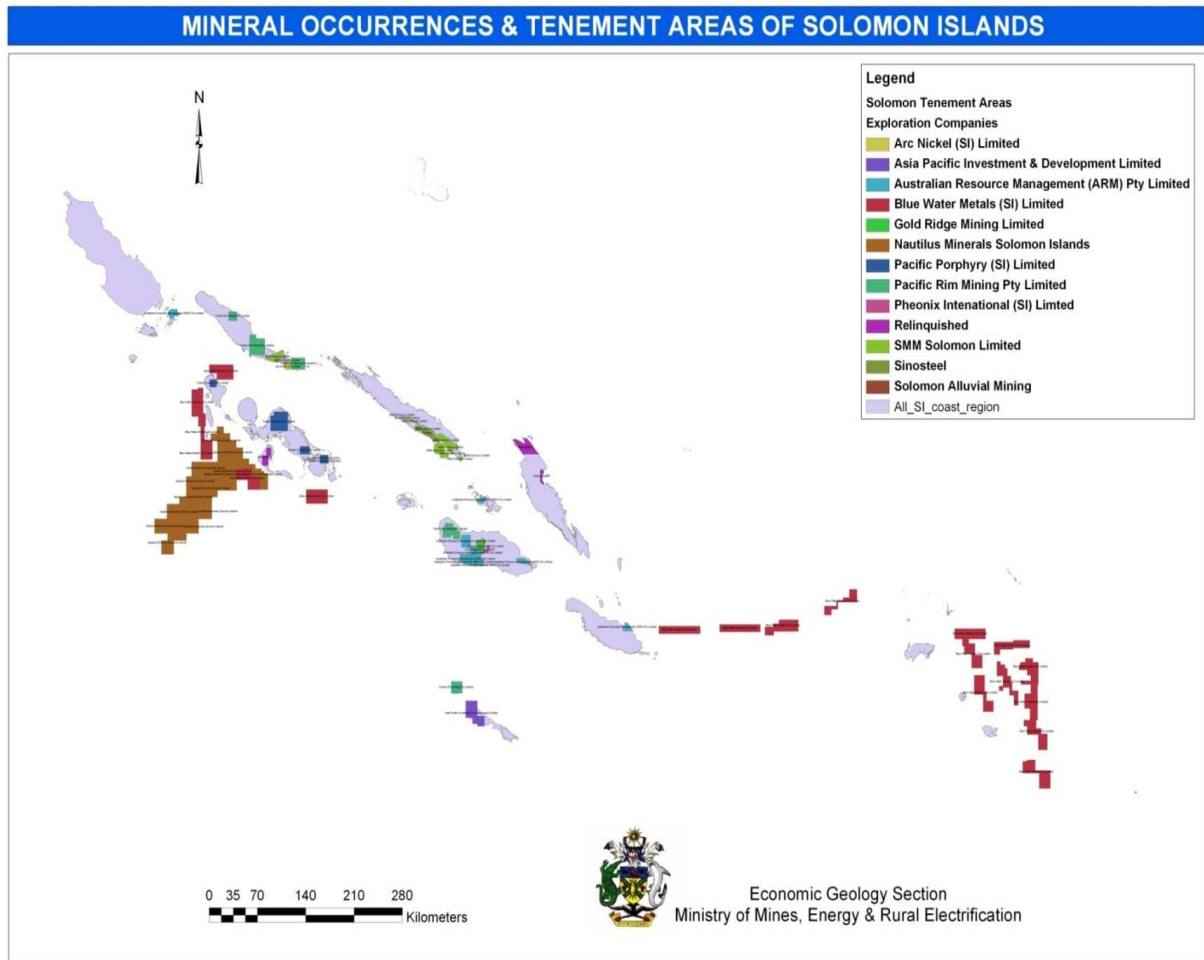


FIG 4.4 Mineral occurrence and Tenement areas in Solomon Islands

The environmental impacts of this mode of minerals exploitation are to the immediate environs of the mine site due to deforestation and earth removal for the pit and ancillary earthworks; and to the riverine drainage systems in the area which are the potential end points for any chemicals escaping the mine itself. To date the Gold there has been no evidence of the latter, although there are persistent concerns about the stability and integrity of the mine water dam downslope from the mine pit itself. As mining impacts accelerate in the country, these concerns will

become increasingly widespread and important.

4.2.6 Fishing and marine exports

Fisheries resources, especially tuna export have also been a major contributor to foreign exchange earnings for the country. Apart from domestic fishing companies, license is also issued to foreign companies who fish in the country's Exclusive Economic Zone (EEZ). There is substantial fish resource in the country's EEZ and the biologically sustainable annual catch level (120,000 tons) has never been attained. Fish export in 2007 from local

catch dropped by 28% to 21 195 tons from 29 597 tons in 2006 with significant increase in cannery production (CBSI Annual Report, 2007). To ensure sustainable catch, the Solomon Islands Fisheries Act 1998 and the National Tuna Management and Development Plan ("Tuna 2000") govern tuna fishing. The Main Group Archipelago (MGA), the richest tuna area is designated to pole and line fishing preserve. Pole and line is locally based and labour intensive, thus generating and sustaining employment (United Nations, 2002). Policing these high sea areas is difficult, so there has been increasing illegal fishing by overseas vessels occurring.

Associated with this is the issue of under-benefit. Although there appears to be no evidence for tuna stock depletion, the degree of national, provincial and local benefit from the fishery is very limited. Apart from illegal fishing, a key complication in enhancing benefits from the tuna fishery is the need to market the product internationally, and of the need for effective surveillance, monitoring and negotiating capacity at a national level.

Fisheries resources are also an important component of the subsistence sector. The average capita fish consumption of 27.5 kg per year was recorded in 1983 and in 1988 it increased to 34.4 kg (22.4kg of fish and 12 kg of shellfish) (United Nations, 2002). Most marine ecosystems such as mangroves, lagoons and reefs are also being over-exploited in many areas. While population growth is responsible for additional pressure on these ecosystems almost everywhere, commercial extraction is worsening these effects in many cases. Beche-de-mer, trochus, crab and reef fish gathering activities are all contributing to ecosystem decline to different degrees throughout the country. This pattern of overuse limits the productivity of inshore fisheries to provide much needed protein in the population's diet, as well as

preventing ongoing, reliable income generation from marine product exports.

4.2.7 Pollution

Pollution is discussed here in relation to fresh water resources. Many households in the country do not have access to water supply systems and still rely on stream and rivers to obtain water for drinking and household use. Women and in most cases children perform household work and this involved extra workload and responsibility especially when streams and rivers are polluted. Indiscriminate land clearing through subsistence food production, for plantation and commercial logging is resulting in drying up and sedimentation of river and streams systems. Even if water supply systems are built high sedimentation in river systems clog the pipes making the water dirty and unsuitable for drinking and household use. Most coastal villages and those on atoll islands ground water from wells are saline. This problem is becoming common and poses risk to the villages who rely on the water from the wells for their household use. Pollution problems in river catchments are also increasing with rapid population growth is also poses threat to the coastal marine resources.

Pollution to the coastal and marine environment emanates from two main sources: (a) Land-based sources and through rivers and streams and (b) Sea-based sources. Pollution from agricultural and logging activities such as soil erosion, siltation, land use and run-offs, at the moment still does not pose major threats to the marine environment except in particular locales such as urban areas of sites of intense land clearing and plantation agriculture. In Honiara alone, at least 75% of sewage flow through a piped collection system directly into the sea without treatment. Discharges from ships in the form

of garbage, bilge water and other pollutants are a major source of sea-based pollution. An increase in these forms of pollution is already a concern as more ships are coming into and using the country's harbours and waters. Local ships are also contributing to these forms of pollution.

4.2.8 Energy Production and Use

The majority of energy use is biomass, for cooking and for drying copra and cocoa for export. However, the accessible fuelwood are increasingly scarce in some areas. For some parts of the country, the major fuel woods for copra drying is mangrove forest, and its overuse is now a major contributing factor to coastal erosion. Fuelwood is used (Table 5.4) by 89% of the population as their main fuel, increasing to 95% if Honiara is ignored and provides more than 61% of gross national energy production. A commercialised fuel wood market is gradually developing in Honiara. It began in the early 1990s but was stopped during the height of the ethnic tension in 1999 and started again in 2001. Currently fuel wood prices ranges from SI\$15-30.00 per bundle depending on size (about 15-25kg respectively). Supplies come mainly from secondary forest and logged over areas of Tenaru and Queen Elizabeth Park (Mt Austen), about 10 km from Honiara.

4.2.9 Climate Change

Already extreme weather events in the country in recent years serve as a forewarning of the impacts on the environment that are likely to occur due to climate change. Some examples included the serious drought that affected the country in 2004, causing food shortages in Temotu province and category 5 cyclone that hit Tikopia Island in the same year. Climate change also poses risks to natural ecosystems such as the coastal and marine environments, fisheries, agriculture,

water resources, health, biodiversity, infrastructure and industry.

4.3. Environmental Consequences

4.3.1 Fresh Water Stress

The fresh water resource is currently under stress as indicated through the following:

- Erosion and sedimentation of stream and river systems from logging operations, subsistence cultivation on sloping lands and



Fig 4.5 Salt water intrusions on Ontong Java atoll. Photo: NDMO

- land clearing for plantations affect water quality and thus degrades reefs, mangrove areas and coastal fisheries. There is poor understanding amongst loggers and communities of effects of land clearing, logging, erosion and downstream effects on reefs and fisheries.
- Indiscriminate land clearing through subsistence food production, for plantation and commercial logging is resulting in catchment drying. Recently, the Honiara water supply

source has seen a 50% drop in water availability in the catchment (50%).

- Pollution problems in river catchments are also increasing with rapid population growth, reflecting inadequate planning to control development in catchments and conflicting regulatory decisions such as the granting of development rights and logging licenses in catchment or conservation areas.
- Increasing salinisation of ground water in most coastal villages and those on atoll islands due to ingression of seawater during extreme weather events or as an ongoing trend.

4.3.2 Soil Stress and Degradation

Serious soil stress is experienced through low crop yield and high incidence of pest and diseases. This stress resulted from diverse pressures such as: high population growth and/or density, uncontrolled large scale forestry, large intensive agriculture developments, displacement of traditional land and resource management systems, land tenure issues, introduced agricultural systems, mining and changes to customary farming practices. A lack of quality spatial information means that the full extent of soil stress and land degradation cannot yet be ascertained. While the extent of the problem is not known, soil stress and land degradation are recognized as major problems confronting the Solomon Islands (GoSI National Assessment Report to the WSSD, May 2002).

There is considerable scope for vicious circles driving worsening degradation. As land is degraded it becomes a haven for invasive species, because of a diminished ability of the ecosystem to control them. Invasive species

in turn affect the soil-nutrient moisture regimes of catchments, leading to poor soil structures and further fertility decline. Most of the accessible soils have fertility and/or micronutrient deficiencies and increased exposure results in soil leaching and erosion with great impact on soil quality and subsequently low crop yield.

4.3.3 Forest Depletion

With depletion of forest resource, communities are finding it increasingly difficult to access forest products and materials for housing, food, and good quality water which are important for village livelihood. Much of the deforestation over large tracts of land occurs on very steep land. Serious erosion, siltation, soil structure decline and loss of soil fertility threatens terrestrial and marine biodiversity, and the ecological service and functions of local water and coastal systems as well as the production potential of the land.

4.3.4 Loss of Biodiversity

Land based activities including Agriculture, forestry and mining exerted pressure on the terrestrial environment which led to loss of biodiversity, invasive alien species, land degradation, impact inland aquatic. Inappropriate land use, deforestation activities and over harvesting of marine resources is resulting in loss of biodiversity but no data is available on rate of biodiversity loss. Although Solomon Islands comprises some of the most diverse ecosystems in the world (The World Bank, 2007), little attention is given to biodiversity and environmental conservation except for a few initiatives. Solomon Islands animal and plant life possess international importance. It is reported that there is a great diversity of land animals than in any other pacific island nation – 223 birds, 52 native mammals, 61 land reptiles, and 17

different frogs. Many of these animals are endemic (Office of the United Nations Resident Coordinator 2002). Henderson and Hancock (1988) also identified a total of 3, 210 vascular plants.

4.3.5 Fish Stock Depletion and Coral Reef Degradation

While population growth is responsible for additional pressure on these ecosystems almost everywhere, commercial extraction is worsening these effects in many cases. Over-exploitation for both subsistence and commercial use has resulted in severe depletion of several important food and commercial species. These include greensnails, blacklip and goldlip shells, coconut crabs, giant clam and sandfish (sea cucumber).

Other species such as trochus, crayfish/lobster and turtles though are under some form of protection (regulation) are also threatened. Two commercial companies are currently engaged in coral export but there is no monitoring system in place to check on their activities. These activities are all contributing to ecosystem decline to different degrees throughout the country. This pattern of overuse and non-existent or inadequate regulation limits the productivity of inshore fisheries to provide much needed protein in the population's diet, as well as preventing ongoing, reliable income generation from marine product exports.

Natural disaster such as cyclones, earthquakes, volcanic eruptions and tidal waves, impact greatly on coastal environments and can have destruction effect not only physically but by the alteration of the ecosystem. Such phenomena have not been seriously considered before but have the

capacity of destroying endangered species and the coral reefs.

4.4. Social, Cultural and Economic Consequences

4.4.1. Urban Drift

Although over time there has been a gradual shift of households into the cash economy, for the most part this has not meant a shift away from subsistence. This has been in part because of the very limited opportunities in villages to earn cash to meet basic needs. Prices are low for major commodities such as copra and cocoa and there is a lack of reliable and affordable transport to markets. There is no information on alternative sources of income for villagers and few marketing arrangements for selling the produce they grow. Given this reality, the best option for many households is for men to go to urban centres such as Honiara seeking casual paid work, while others resort to destructive resource-extraction activities such as logging or the over-harvesting of coastal marine resources. Neither represents a sustainable solution but are nonetheless seen as "better than nothing".

4.4.2 Diet Shift, malnutrition and Diseases

In some communities income-generating activities such as cash cropping, logging, fishing, marketing of garden produce and small business enterprises are having some beneficial results. They bring cash income to rural villages, employment, slow migration to towns and enable people to meet basic needs such as paying for kerosene, soap and school fees. The increase in income, while welcome is not invested and so is consumed in its

entirety. This is due to the insufficiency of the cash stream as well as possibly the lack of accessible financial services. Instead, cash incomes have often changed consumption patterns in such a way as to surface novel social problems or exacerbate existing ones. These include: 1) increased consumption of imported processed food of low nutritional value (rice, noodles, tinned fish/meat, tea and flour-based items); 2) consumption of alcohol and tobacco; 3) gambling (kura); and 4) the introduction of entertainment equipment such as videos and modern dance music.

All these are leading to a growth in non-communicable diseases (diabetes and infant malnutrition) and introducing new routes for community social dysfunction to occur, particularly when youth culture and generational gaps are considered.

4.4.3 Community Conflict over Resources

Substantial resource stocks have been exploited with little benefit to the country and the people who via traditional tenure own 80-90% of the resources. Instead these activities have fuelled conflict and antagonism amongst the people and sometimes with the state through state, company and individual exploitation or manipulation of resource owners. The seminal example is the logging industry. At times conflict within and amongst family members has arisen because of unequal distributions of those minor timber royalty cashflows which do tickle down to the resource owners.

4.4.4 Shifting Cultivation Intensification

In areas where fallow periods reduce to 1-4 years, the shifting cultivation system breaks down and lands become degraded. Continuous cultivation of the land not only

impacts soil quality but also effectively mines the soil of nutrients to a state where it is almost non-functional. With loss of soil quality, it is incapable of performing its function as a medium for biomass production and as an environment regulator. To restore the soil into its functional state will require substantial technical input and investment which is beyond the scope and capacity of the resource owners.

5.0 INSTITUTION, LEGAL, POLICY FRAMEWORKS AND PROGRAMMES

This section provides an overview of institutions responsible for environment management and protection as well as national policies related to environment management. Assessment of approaches, progress, limitations of current programmes is also presented.

5.1. Institutions

The national institution charged with environmental management and monitoring is the ECD in the Ministry of Environment, Conservation and Meteorology. This is a new ministry created by the Sikua led Government (CNURA) in 2008. The division has since increased its established staffing from only two officers in 2007 to a total of ten in 2008, demonstrating the government's intention to strengthen capacity for environmental management and monitoring while at the same time mainstream environment considerations across all sectors in its development plans. Severe shortages in human resources capacity have prevented the division in the past from operating effectively in carrying out its responsibilities in the areas

of development, setting environment standards and monitoring through implementation of the Environment Act 1998.

Various other government agencies are also responsible for environment related management work and legislation. They include the following Ministries: Ministry of Forestry, Ministry of Agriculture and Livestock, Ministry of Fisheries and Marine Resources, Ministry of Mines and Energy, Ministry of Health (Environment Health), Ministry of Lands and Survey, Ministry of Planning and Aid Coordination, National Disaster Management office, Visitors Bureau and National Museum. At the Provincial level Town and Country Planning Boards are formed to undertake planning, regulatory and resource management functions. Apart from this, the Provincial Governments are not in a position to take on environment management and monitoring responsibilities since they have been empower to do so and thus a disconnect exist between national and provincial governments in terms of implementing action plans formulated at national level. The communities or resource owners are also not connected to the provincial and national institutions and most cases they are making uninformed decisions which often results in their manipulation by the state, companies and individuals and direct resource exploitation and environmental damage.

There is therefore a serious institutional weakness in environmental and natural resources management at the national, provincial and community level.

5.2. Legal, Policy and Strategy Framework

Environmental governance suffers due to inconsistencies in law, institutions and administrative processes. For example vertical

linkage between the national and provincial level of governments and community are not defined and often non-existent. At the same time there is no associated fiscal system to equitably distribute revenue. Decisions also suffer from lack of sound and integrated national policy. In addition to this, there is inadequate support both human and financial to natural resource use and management state agencies, in particular the Environment Division of the Ministry of Environment, Conservation and Meteorology and the Planning Section of the Ministry of Agriculture and Livestock. Both Ministries still suffer from lack of capacity and the same situation holds for other state institutions charged with environment management. Thus, attempts made in the past to introduce systems for sustainable resource management practices have been met with lukewarm reception over the last decade, resulting in a patchwork of institutional networks, legislative platforms, policy and plans, at the national and provincial levels.

5.2.1. Legal Framework

There is no consistent legal or policy framework in place for the integration of environment and development planning, or to address specific environmental Management objectives: biodiversity, conservation of natural resources, land degradation, coastal management and marine resources. The National Environmental Management Strategy (NEMS) of 1993 remains the only relevant policy document; however this was developed with little community participation. It does however provide useful information that is still relevant.

The Environment Act of 1998 (made in 2003) has been a positive move, however recent reviews have noted inconsistencies within the law and how it relates to other legislative platforms (ADB, 2005). The country suffers

from a lack of capacity to implement the Environment Act, as there are shortcomings in instituted decision making and enforcement systems.

In terms of policies and legal framework, the Department of Mines & Energy has drafted a mineral policy, but this has not yet been put into effect. Important concern in the mining development is its impact to the environment. The Mines and Minerals Act has provision for Environmental Impact Assessment (EIA) which complements well with the requirement of the Environment Act 1998.

5.2.1.1. The Environment Act 1998

The text of the Environment Act 1998 states it is "An Act to make provision for the protection and Conservation of the environment; the establishment of the Environment and Conservation Division and the Environment Advisory Committee and for matters connected therewith or incidental thereto."

The Act provides for an integrated system of development control, environmental impact assessment (EIA) and pollution control, including;

- Prevention, control and monitoring of pollution, including regulating discharge of pollutants to air, water or land and reducing risks to human health, and prevention of degradation of the environment;
- Regulating the transport, collection, treatment, storage and disposal of waste and promoting recycling, re-use and recovery of materials in an economically viable manner; and

- Complying with, and giving effect to, regional and international conventions and obligations relating to the environment.

The Environment Act has considerable power by virtue of article 4 (1) which states that in the event of conflict between the Environment Act and other legislation, the provisions of the Environment Act shall prevail.

Regulations under the Act are currently being drafted and will cover detailed requirements for EIA. The existing *Solomon Islands EIA Guidelines for Planners and Developers* (May 1996) pre-date the Environment Act and are not legally binding. In the Second Schedule, the Act lists prescribed developments for which consent, accompanied by an EIA, are required. All prescribed projects require a simple assessment through a "screening" or "scoping", to see what form of additional assessment is required. Most prescribed projects require a *public environmental report* (PER), while many major projects such as logging, large agricultural developments, mining, large scale tourism developments, and infrastructure projects will also need a second stage of appraisal (in an *environmental impact assessment*) which includes technical, economic, environmental and social investigations, and these are presented in *environmental impact statement* (EIS).

5.2.1.2. Wild life Protection and Management Act 1998

The preamble to The Wildlife Protection and Management Act 1998 frames the legislation in terms of the international CITES agreement:

"An act to provide for the protection conservation and management of wildlife in Solomon Islands by

regulating the export and import of certain animals and plants; to comply with the obligations imposed upon Solomon Islands under the Convention on International Trade in Endangered Species of Wild Fauna and Flora and for other matters connected therewith or incidental thereto".

The object of the Act is to regulate the international trade in the country's wildlife resources including birds, reptiles, amphibians, mammals, insects, plants and marine organisms. In order for anyone to be involved in the wildlife trade that individual or organization needs to have an "approved management programme" and have its name entered into a specific "register". A special "permit" equivalent to CITES permit, to be issued by ECD, must accompany a particular consignment of wildlife intended for export. An application with information on the wildlife to be exported including the export value of the consignment must be submitted in a specified form for approval by ECD. Solomon Islands recently became a member of CITES June 2007, therefore the current development of regulations will now include all CITES requirements.

5.2.1.3. The Town and Country Planning Act 1979

The Town and country planning Act has potential to provide for the consideration of environment sector for conservation of cultural and biodiversity areas. The objective of the Act is to ensure that land is developed and used in accordance with proper policies and a high consideration to the peoples welfare.

An important limitation of the Act however is that it affects only non-customary land, the

physical planning office responsible for enforcing the Act can only advise when it comes customary land but are not required to follow the mechanism of the Act.

5.2.1.4 Provincial Government Act 1979

Power for making ordinances over wildlife and marine resources is also devolved under the Provincial Government Act 1997.

The IWP Report 2006 states that:

"Provincial legislative authority derives from a combination of the Provincial Government Act 1997 (PGA) and the accompanying devolution orders (PGAs33). Regulatory or executive powers derive from valid provincial ordinances or may be delegated to the province under national statutes, devolution orders, or by negotiation between the province and responsible national authority (s31(1)). The Devolution Orders made in respect of each province give them legislative competence over a range of matters of direct relevance to natural resource management."

The Provincial Government Act 1997 Schedule 3 provides a list of activities for which the provinces have responsibility and have the power to pass ordinances:

- *Trade and Industry* - Local licensing of professions, trades and businesses, local marketing.
- *Cultural and Environment Matters* - Protection of wild creatures, coastal and lagoon shipping,
- *Agriculture and Fishing* - Protection, improvement and

maintenance of fresh-water and reef fisheries.

- *Land and Land Use* - Codification and amendment of existing customary law about land. Registration of customary rights in respect of land including customary fishing rights. Physical planning except within a local planning area
- *Local Matters* - Waste disposal
- *Rivers and Water* - Control and use of river waters, pollution of water,
- *Corporate or Statutory Bodies* - Establishment of corporate or statutory bodies for provincial services including economic activity. (Provincial services include "Conservation of the Environment" and "Fishing").

5.2.1.5 Other relevant Legislation

Other legislation has environmental implications for resource development and management, as indicated in Table below:

Table 5.1 Relevant Resource Management Legislation

<i>Act</i>	<i>Date</i>	<i>Main Objectives</i>
River Waters	1973	Control of river waters for equitable and beneficial use; establishes activities for which permits are required.
National Parks	1978	Establishes national parks and prohibits fishing and hunting in same without permit; establishes restrictions on activities undertaken within national parks; provides for appointment of park rangers.
Wild Birds	1978	Lists scheduled birds (incl. eggs and nests) for protection from

Protection		being killed, wounded, taken or sold (including skin or plumage); establishes several bird sanctuaries; establishes strict hunting seasons for certain birds.
Town and Country Planning	1979	Applies to urban areas (capital city and provincial towns); covers the management of land incl. crown land; specifies urban and rural management and planning functions and incl. controlling development.
Agriculture and Livestock	1982	Provides for protection and advancement of agriculture and livestock industries; defines noxious weeds and provides for control of same.
Lands and Titles	1988	Covers the management of land, defines "customary" land, and sets out procedures for land acquisition. This Act is being reviewed and a new draft bill is being circulated for consultation.
Forest Resource and Timber Utilization	1991	Governs licensing of felling of trees and sawmills, and timber agreements on customary land; deals with forest declared as State Forest and Forest Reserves and establishes restrictions in same. Forestry Bill 2004 seeks to replace the Act and various amendments. The Bill provides for conservation of forests and improved forest management including establishment of national forests.
Mines and Minerals	1996	Establishes system for mining applications and licensing; establishes Minerals Board; regulates and controls mining activities; includes alluvial mining
Wildlife Management and Protection	1998	Provides for the protection, conservation and management of wildlife by regulating the export and import of certain animals and plants; and to comply with obligations under the Convention on International Trade in Endangered Species (CITES).
Fisheries	1998	Framework for fisheries

	management and development incl. licensing of fishing vessels and processing plants, listing prohibited fishing methods; provides for establishment of Marine Protected Areas (MPAs) and coastal management plans.
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Source: (SIG, 2007)

5.2.1.6 Provincial Ordinances

There are a number of provincial ordinances that are significant in terms of environment management in the country, most focus on natural resource management. These provincial ordinances could be reviewed and further strengthened to include and consider adaptation to climate change as part of natural resources management. The provincial ordinances includes;

- Temotu Province Environmental Protection Ordinance 1994 (TPEPO)
- Malaita Province Wildlife Management and Licensing Ordinance 1995
- Malaita Province Management Area Ordinance 1990 (MalPWMLO)
- Isabel Province Conservation Areas Ordinance 1993 (IPCAO)
- Isabel Province Wildlife Sanctuary Ordinance 1995 (IPWSO)
- Isabel Province Marine and Freshwater Areas Ordinance 1993 (IPMFAO)
- Guadalcanal (sic: Guadalcanal) Province Wildlife Management Area Ordinance 1990(GPWMAO)
- Makira Province Preservation of Culture and Wildlife Ordinance 1984 (Mapco)

5.2.2 Policy & Strategic Frameworks

5.2.2.1 Coalition for National Unity and Rural Advancement Policy (CNURA)

CNURA policy platforms state clear in intent regarding environment issues and climate change. This forms part of its wider ambit to strengthen development through a “bottom-up” approach which encompasses the empowerment of the people through rural advancement strategies, the pursuit of the Millennium Development Goals, and the devolution of powers and functions and decision-making authority to the periphery.

The CNURA government after coming into power established a Ministry of Environment, Conservation and Meteorology, separating it from the Department of Forestry and marking a significant step in terms of institutional recognition of the environment. It also established within the new Ministry a new Climate Change Division to coordinate all climate change issue related activities in the country. One of its major policy objectives is to ensure the sustainable utilization and conservation of the natural resources and environment and successful adaptation to climate change. It is to be hoped that this initial progress in policy direction can be consolidated.

5.2.2.2 Environmental Policy

Solomon Island is yet to develop a national environment policy to guide environment related activities in the country. There are other policy documents such as the former national development plan (NERRDP) which have lapsed but still hold relevance in terms of the approaches to improve the environment and economic sector. . The primary document for environment is remains the National Environment Management 1993 (NEMS). The government however has not

taken any initiative to implement the NEMS and given the time that has lapsed, it needs to be reviewed.

The National Biodiversity Strategic Action Plan (NBSAP) has not been completed. This is now a current priority of ECD and has the support of WWF, TNC and the NCSA Project.

5.2.2.3. Ministry of Environment, Conservation and Meteorology Corporate Plan 2008-2010

The Ministry of Environment, Conservation and Meteorology Corporate Plan includes the translation of the CNURA policy statements and articulation of the priority focus areas for Environment and Conservation Division and Climate Change Division. This Corporate Plan has become the initial document providing for the establishment of the climate change division and its stated objectives over the next two years.

Some of the priorities areas that the Environment and Conservation will undertake under the Corporate plan include:

- the development of a national waste management strategy for the country,
- the undertaking the state of environment report,
- the completion of the national biodiversity strategic action plan,
- development of a national protected areas system of the country and the monitoring of prescribed development in the country.

The mainstreaming of the impact and vulnerability to the climate changes will also be important considerations in this work program.

5.2.2.4 National Forest Policy

The National Forest Policy, endorsed by Cabinet in 2002 has five focal areas, the focus of which is the sustainability of the forest sector in the country. There are opportunities for consideration of good environment practice and also climate change impacts in the policy. The five focal areas are;

1. Adopt a long term view of the forestry sector – Strategies to protect ecological function by excluding high-impact uses and enforcing ecologically based standards. Manage harvest towards sustainable levels, support a reinvigorated program of tree planting and put in place appropriate legislation
2. Protect future economic forestry options - Strategies to apply ecologically based standards to commercial logging operations and forbid further increases in level of log harvesting.
3. Promote greater provincial and local-level participation in forest planning and administration - Strategies to devolve some responsibilities to provinces and establish extension function within Forestry Division and provide a legislative framework for eco-forestry.
4. Provide strong support for environment and ecological sustainability – Strategies for the support of an ecological protection approach which is also consistent SI's international commitments.
5. Leave commercial-scale plantations and sawn timber production investment decisions to the private sector - Strategy to remove the requirement in current logging licenses for a portion of the volume harvested to be domestically processed.

5.2.2.5 Code of logging Practice

The code of logging practice came into force in 2005 in an attempt to address the severe environment impact of logging. The Code is “aimed at ensuring that where selection logging takes place, the ecological and cultural functions of the forest, and its productivity in terms of wood and water production, are protected”, (COLP May 2002). The code has 13 standards which logging operations must adhere to with guidelines on how to undertake the requirement of the code. The Code was conceived as a core part of the legal regulatory framework for the forestry sector. There are a lot of opportunities to include adaptation activities within the code and make more encompassing in the consideration of climate change.

5.2.2.6 Fisheries Policy

The National Fisheries and Marine Resources Policy stated the responsibility of developing and managing, in cooperation with provincial authorities, the exploitation of all fisheries and marine resources found within the Fishery Limits in such a manner as to secure optimum social and economic benefits for the people of Solomon Islands. Its major objectives are to;

1. To achieve and maintain self-sufficiency in supply of fish to the domestic market;
2. To improve cash income throughout the fisheries sector by way of assisting Solomon Islanders in developing their resources through self-employment;
3. To maximize participation of SI nationals in commercial fishing and associated activities;
4. To improve the foreign exchange position of SI by encouragement of local processing fisheries resources into value-added products; and

5. Encourage farming of aquatic resources.

5.2.2.7 Agriculture and Rural Development Strategy (ARDS)

ARDS has been developed as a result of the demand for progress in rural development where 84 percent of Solomon Islanders live. It is also driven by the need for development through a bottom-up and holistic approach which encompasses the empowerment of the people through rural advancement strategies, the pursuit of the MDGs, the revitalization of the economy, improved law and order, effective service delivery and the devolution of powers and functions and decision making authority at rural level. It also adopts a longer-term perspective to ensure that rural development resources are used efficiently and lead to better, more sustainable rural livelihoods outcomes.

ARDS has three overarching focal priorities for rural growth and employment generation;

- (i) a greater focus on local development and greater participation of rural communities in economic development, including through strengthening provincial governments;
- (ii) Supporting the rural economy with a focus on agriculture, infrastructure and rural finance services; and
- (iii) Improving the management of the country’s rich natural resources for greater and more sustainable local benefits.

ARDS is implemented by the Ministry of Planning of Planning and Aid Coordination under the rural development program.

5.3 Multi-lateral Environment Agreements

Solomon Islands is a party to a number of International and regional Multi-lateral environment agreements. These MEAs has been instrumental in development of national environment management strategies to address major environment issues. The country is currently developing major national strategies under the Rio Conventions. The national Biodiversity Strategic Action Plan (NBSAP), the National Adaptation Plan of Action (NAPA) and National Action Plan to address land degradation (NAP). The table in Annex 3 shows the MEAs which Solomon Island is a party to.

5.4 Environment related Projects

5.4.1 National Capacity Self Assessment Project

The National Capacity Self-Assessment (NCSA) was an initiative by the Secretariats of the CBD, UNFCCC and UNCCD to identify and overcome the capacity constraints hindering Parties to effectively implement the three international environmental agreements. In Solomon Islands the NCSA attempts to achieve two broad objectives. One is to carry out an assessment of local capacity to address global and national environmental issues and concerns. The second is to develop a plan for the implementation of key activities to address the capacity building needs determined through the assessment exercise, especially as they relate to the CBD, UNFCCC and UNCCD. It is anticipated that, with key issues identified, resources can be mobilized to implement the plan.

The life span of the project is 18 months beginning from May 2005 and ending in November 2006 but has since been extended to June 2008. Funded by the Global Environmental Facility (GEF), the NCSA is implemented through the UNDP in collaboration with ECD, being the executing agency. The project is currently housed within the office of ECD at the Ministry of Environment Conservation and Meteorology headquarters, with the Director of ECD as its Project Manager in collaboration with the National Coordinator.

5.4.2 National Biodiversity Strategic Action Plan (NBSAP)

The National Biodiversity Strategy and Action Plan (NBSAP) is a vital document that will guide the Government's policy in relation to the country's Biodiversity and Environment. This will form basis as strategies and actions for the protection and conservation of the country's biodiversity in accordance with Article 6 of the CBD. The NBSAP process was initiated in 1996; however, due to difficulties faced by the National Government in facilitating its progress soon after its initiation, implementation was halted. UNEP, which administers funding for the NBSAP withdrew its financial support in late 2006 due to the delay of the process. The government through ECD still see the importance of NBSAP and is working closely with conservation NGOs to revive the work again.

As a party to CBD, Solomon Islands is required and obliged to develop the NBSAP document. Solomon Islands commitment to the CBD will be a key instrument in serving the promotion and guidance of actions for biodiversity conservation and sustainable use of biological resources.

5.4.3 UNDP Program of work on protected areas (PowPA) system

The protected areas system project will undertake a stock take assessment of national strategies and plans relating to developing a protected area system for Solomon Islands. This includes stakeholder analysis, systemic and institutional assessment for the development of protected areas in the country. Consultations with relevant stakeholders in the development of appropriate legislation and strategies for protected areas will be undertaken to identify possible priority areas to be designated as protected areas for each of the provinces. A prioritization exercise supported by the project will be conducted, which will inform the development of a national matrix work plan for the program of work on Protected Areas. This initiative is anticipated to contribute to regional and international efforts in biodiversity conservation into the long term. Solomon Islands completed the first phase of the project and has applied for the second phase of the program. An initial gap analysis has identified potential sites to be developed as protected areas for Solomon Islands (Annex 4).

5.4.4 Solomon Islands Biosafety Project

This project originated from the CBD in 2002. The main purpose of the National Biosafety Framework (NBF) is to assist Solomon Islands government meet its obligation under the Cartagena Protocol, a mechanism established under the CBD to regulate transboundary movement of living modified organisms (LMOs) and maximize the benefits of biotechnology while minimizing its possible adverse effects human health and the environment.

In Solomon Islands the NBF was implemented through the UNEP (IA) and executed by ECD (EA). It was funded by the GEF and aims to carry develop a framework of policy and supporting analysis for the country to meet its obligations under the Cartagena Protocol. The project started in 2002 but was suspended after the ethnic tension and has not received further funding from GEF. Despite this, the bulk of analytic and consultative work has been completed, and the Framework is close to readiness for final policy consideration.

5.4.5 National Adaptation Program of Action (NAPA)

The objective of the NAPA project for Solomon Islands is to develop a country-wide program of adaptation activities to address adverse effects of climate change and climate variability, including extreme events. It will provide a framework to guide the coordination and implementation of adaptation initiatives in the country, through a participatory approach that builds synergies with other relevant environmental and national development programs. The final outcomes of this project will be a National Adaptation Plan of Action on climate change and associated resource mobilization strategy for Solomon Islands, and greater political commitment to and public awareness of the need for adaptation activities.

The project is currently implemented by the Ministry of Environment, Conservation and Meteorology.

5.4.6 Sustainable Land Management Project (SLM)

The overarching objective of SLM is to strengthen human, institutional and systemic

capacity for Sustainable Land Management. Major expected outcomes include;

- Increased knowledge and awareness of land degradation and the importance of sustainable land management,
- Systemic capacity building and mainstreaming of SLM principles and objectives,
- Enhanced technical, individual and institutional capacities for SLM,
- Enhanced technical support at the local, provincial and national levels to assist with mainstreaming and integrated decision-making.

The project will be implemented by the Ministry of Agriculture and Livestock.

5.4.7 Solomon Islands Biodiversity and Natural Resource Management (Isabel Province)

This project will develop a mechanism for community-led resource management for biodiversity conservation in Solomon Islands. It aims to fill the gap in natural resource governance created by the decline in, or erosion of, traditional resource management systems. Working with customary land-owning communities, it will help enhance and update traditional systems to suit current population pressures and economic imperatives. A policy and legal framework that supports the stewardship of natural resources by traditional owners will be formulated.

6.0 MAJOR ENVIRONMENT PROGRAMS

6.1. Environment Management and Pollution Control

6.1.1 Environment Impact Assessment and Monitoring

A major mandate of the Environment and Conservation Division (ECD) is the EIA Review and Monitoring of all major development activities as required by the Environment Act 1998. Pollution control is also an integral part of the monitoring activities undertaken by ECD as required under the Environment Act 1998. In the past and up until early 2007, insufficient human resources prevented ECD from mounting an effective monitoring program. With additional establishment posts in its structure, it is planned to improve this function going forward.

6.1.2 Waste Management

Waste management (of both solid and liquid waste) has been a major unaddressed issue in the past, but initial work is now underway to remedy this. The dumping of waste inappropriately on land, sea and other environmentally sensitive areas has been a major concern, but Solomon Islands still lacks a national policy or strategy on waste management. This has been reflected in the lack of a systematic approach to the management of waste in Honiara city and most provincial centres. In an attempt to develop a national strategy the ECD in April 2008 undertook a national stakeholder's waste management workshop with support from SPREP and JICA. The strategy is expected to be completed by end of June 2008.

Most communities use their back yard to dump household waste and most provincial centres practice open dumping. Non-degradable materials such as plastic are a major threat to the environment.

6.1.3 Gold ridge mining Tailings Dam Monitoring

Monitoring of the Gold Ridge tailings dam is being undertaken by ECD on an ongoing basis. With the increasing number of prospecting companies in the country, developing effective environment management system for Gold ridge as the first mining operation in the country should set a significant precedent for the mining industry and for people’s expectations regarding the relationship between mining and the environment.



FIG 6.1 Gold Ridge tailings dam Lake – Photo: Ministry of Mines and Energy

After the closure of the mine during the height of the ethnic tension, the Gold Ridge tailings dam filled with water to its maximum capacity. The recommencing of mining operations therefore depends on how this dam will be de-watered. Consultations with landowners on the best approach to the de-watering process resulted in the government seeking an independent study by the Commonwealth Secretariat. The

recommendations from this study are currently being discussed with land owners and the company has indicated willingness to implement the recommendations.

6.2 Species Management and Protection

6.2.1 Wildlife Trade

Trade in wildlife is regulated by the Wildlife Protection and Management Act 1998. The ECD is also responsible for the issuing of wildlife export permit for both terrestrial and marine species export. Solomon Islands did not become a member of CITES until June 2007, but has been exporting wildlife under the Wildlife Protection and Management Act 1998. In August 2006, the Government suspended the trade in the country’s wildlife. The suspension was necessary to give time to develop necessary regulations for both the Environment Act 1998 and the Wildlife Protection and Management Act 1998. The order applies to all wildlife including birds, reptiles, insects or butterflies and marine organisms including plants. Since the suspension order has been in place the ECD has not processed any new permits for export but has revalidated expired permits to allow any existing stock possessed by the exporters to be cleared.

6.2.2 Turtle Conservation and Monitoring

This is a continuing program, which involves the monitoring of turtles mostly in the Arnavon Islands but also in other parts of the country. The monitoring normally is carried out during the peak seasons from May – July and November – January with a focus on the hawksbill and leatherback. The project is implemented in conjunction with Fisheries Division, with funding support from South

Pacific Regional Environment Programme (SPREP).

6.2.3 BSSE Leatherback turtle conservation

An international partnership on the conservation and management of Western Pacific Leatherback turtles is ongoing. This partnership has been established through a Memorandum of Understanding between the governments of the Republic of Indonesia, Papua New Guinea and Solomon Islands, and focuses on the conservation and management of Western Pacific Leatherback Turtles at nesting sites, feeding areas and along migratory routes throughout the three countries. The objectives are:

- To promote the conservation of Western Pacific Leatherback Turtles through the systematic exchange of information and data on research, population and migratory routes,
- To monitor and manage, nesting sites and feeding areas for Western Pacific Leatherback Turtles,
- To enhance public awareness of the importance of conserving Western Pacific Leatherback Turtles and their critical habitats,
- To harmonize marine turtle and marine conservation activities, sustainable use principles where ecologically viable and appropriate and incentives for turtle conservation across the Bismarck Solomon Seas Eco-region.
- To promote tri-national dialogue and partnership involving active participation by a range of stakeholders including national, state and local governments, site management agencies and owners, technical institutions, development agencies, industrial and private

sector, non-government organizations, community groups and local people who share a responsibility in conserving Western Pacific Leatherback Turtles.

6.3 Terrestrial and Marine Conservation/Protected areas

6.3.1 Arnavon Marine Conservation Area

The Arnavon Islands Marine Conservation Area (AMCA) is a well-established marine conservation area manned by two Wildlife Assistants paid by the Solomon Islands Government. The officers are non-established personnel of ECD and mainly based in the islands to ensure that poachers are kept away from harvesting the marine resources within the protected area and carry out monitoring of hawksbill nesting site. Jointly funded by the government and The Nature Conservancy (TNC) the AMCA is currently overseen by a management committee, which meets every quarter. Members of the committee are drawn from relevant government agencies and the communities of Kia (Isabel) and Posarae (Choiseul).

6.3.2 Tetepare Conservation Area

With an area of 120 square km Tetepare is the largest uninhabited tropical Island in the South Pacific Ocean. About 97% of Islands rainforest still remain intact or undisturbed while the remaining 3% is taken up by coconut, planted in the early 1900's. The islands vegetation has high diversity of canopy and under storey trees along the raised coral platforms and coastlines. Tetepare's relatively undisturbed nature provides habitat for a wide range of terrestrial species. Preliminary

research so far has showed 73 bird species, 24 reptile species, four frog species and 23 mammal species (18 bat species). Aquatic fauna of river communities include large numbers of freshwater snappers (*Lutjanus fuscesens*), and estuarine groupers (*Epinephalus* sp.) as well as silver & trapiroid grunters (*Mesopristes argenteus* & *M. cancellatus*). There is also evidence of high diversity and abundance of gobioid and eel fauna, crabs (*Varuna* sp.), prawns (*Macrobrachium* spp, Snails (*Neritidae* sp.), estuarine crocodiles (*Crocodylus porosus*) and estuarine sting rays . Recent survey of four rivers, estuaries and two lakes discovered three new *Stiphodon* gobioid species, with one new genus and one further at family level.

The site is managed by the Tetepare descendants Association (TDA) with the support of WWF, CUSO, Government Agencies (Ministry of Fisheries and Marine Resource and Ministry of Forestry, Environment and Conservation, Ministry of Education and Human Resources Development), Solomon Islands Locally Managed Marine Areas Network (SILMMA), Conservation International, Australian Biologists and TDA Patrons, SIVB and WPTA.

6.3.3 Marine Protected Areas

The 2006 Locally-Managed Marine Area (LMMA) Network annual reported a total 25 Marine Protected Areas (MPAs) for Solomon Islands with 21 locally managed covering a total of 507 square kilometers. These MPAs scattered throughout the provinces have been established by communities in Marau Sound, Ngella, Marovo Lagoon, Tetepare, Roviana Lagoon, Choiseul and Gizo. Other areas include the Shortland Islands, Russell Islands, Three Sisters Islands, Leli Island, Lau Lagoon, Suafa Bay, Langalanga Lagoon, Are'Are Lagoon and small Malaita, Northern

Isabel and Northern Choiseul. A number of NGOs and government agencies such as the ECD and Ministry of Fisheries and Marine Resources support the community involved in MPAs through SILMMA, this include TNC, WWF, FSPI, Live and Learn and World Fish Centre.

7.0 ENVIRONMENTAL ISSUES AND DEVELOPMENT

Even given the limitations of information coverage and quality, it is clear that Solomon Islands faces grave environmental issues. It is also clear that these issues are inseparable from core “development issues”, such as poverty, income and livelihoods and energy. This inseparability increases both the importance of successful action as well as the difficulty of any such action.

Priority issues emerging from our analysis in this report can be understood as forming three classes:

- Conceptual concerns – understandings that underlie the environmental and policy issues that are critical to the natural environment and human population of Solomon Islands.
- Environmental issues – those issues regarding the continued sustainability of the environment in terms of its systemic integrity and in terms of its ability to support the life and aspirations of Solomon Islands’ people.
- Policy issues – those issues regarding the ability of human actions, organisation and institutions to respond successfully to the foregoing environmental issues.

7.1 Conceptual issues

7.1.1 The environment is core to SI survival and development

Just as the majority of the population is rural, so is the largest part of the economy. This reality remains unrecognised in official statistics and policy. More than 80% of the people of Solomon Islands produce their own food, housing and even much of their own medicine. At most, the cash economy **supplements** this economy, permitting access to cash bought goods such as soap and petrol/kerosene and cash bought services such as school fees.

With practically no irrigation or mechanisation, natural soil fertility and watersheds support the staple food gardens which feed the rural majority as well as a sizable portion of the peri-urban community, particularly around Honiara.

These services together with the forests provision of construction materials and non-timber forest products represent ecosystem services which feed and house more than 80% of the country's population. In 30 years of independence, national and donor policies have not been able to provide sustained economic development progress able to substitute for, or reduce the people's direct dependence on the environment. Because of poor government service delivery, tax-funded public services derived from the cash economy still have a limited impact on this majority.

As a result they remain as heavily reliant on ecosystem services as in the past. A productive natural environment remains the main thing keeping Solomon Islanders alive and out of worsening poverty.

Development activities, policies and projects have not replaced the environment as the main provider for Solomon Islands, but instead have had the next effect of worsening its ability to provide for the majority and the poor.

7.1.2 Environmental issues are economic issues

It is crucial to dispel the myth of economy vs. environment in Solomon Islands. With only small manufacturing and services sectors, there are really three major economic sectors in the country;

The subsistence sector feeds and houses more than 80% of Solomon Islanders and cushions them from the shocks of political instability (1998-2003) or world markets (2007-8. Extremely conservative calculations (see Annex 5) place **the size of the subsistence economy at more than 200% of the total exports of all copra, cocoa, palm oil, tuna and logs.**

This huge economic activity is subsidised by the environment and functional ecosystems. In the absence of irrigation, mechanisation or chemical fertiliser, most of the food needs of the country are supported directly by the ecosystem services of forest water retention and soil fertility. Timber and non-timber forest products form the mainstay of national shelter and provide the resilience necessary for disaster recovery. Reef and mangrove productivity, provide for a substantial, perhaps majority of animal protein in the diet of the national population.

Table 7.1 Solomon Island 2008 Income estimates

Subsistence activity	Export Agriculture	Extractive industries
2008	2007 exports	2007

estimates Forest uses – \$2.6 billion Root crops - \$1.1 billion	Copra cocoa, palm oil – \$212 million	exports Logs, tuna, gold – \$996 million
Source: PHCG policy discussion paper 1	Source: CBSI (2007) Annual Report	

While official statistics have consistently omitted subsistence production in the past, current soaring rice prices should draw attention to the fact that feeding the Solomons is the largest and most expensive economic activity, and that the subsistence sector has dominated this sector of the economy throughout SI history.

Therefore the most food, most building and most livelihoods in the country are supported directly by environmental services. Any activity that irreversibly degrades the environment is in effect reducing the capital stock of the country and cannot be considered growth or development in practical terms. However, the current policy emphasis on logging and palm oil promotes this exact degradation.

7.1.3 The national context is key

Past national policy positions on logging, palm oil, cash crops and land use have contributed to land, forest and reef degradation throughout the country. While these policies have been set at national level, they are also in response to forces that operate outside of Solomon Islands. These include international markets that demand tropical timber and now, palm oil. These also include international policy actors which emphasise the cash economy and a focus on export production for development.

These influences have operated over the past 30 years to convince policy makers of the insignificance of the environment and the subsistence economy, and have led the nation into a worsening dependence on environmentally destructive extraction that returns limited financial benefit while at the same increasing poverty for the majority of Solomon islanders.

New forces of global change are and will be of increasing influence in the coming period. The most important of these global drivers is the climate change consensus and the movement to reduce oil reliance of the world economy. These changes will visit new thinking and pressures on Solomon Islands and its policymakers, some of which are already being felt.

- Due to high oil prices and urgency on climate change, international markets now favour the production of oilseeds. This combined with the old policy emphasis on cash cropping, has meant a shift towards the rapid expansion of palm oil plantations.
- The possibility of an international carbon offset regime which recognises the carbon balance benefits of preserving natural forests is driving a new interest in carbon credits and deferral of deforestation.
- The expansion of emerging economies has led to a prolonged mineral boom, which together with new technology has meant that undersea deposits in the country are now being sought by mining concerns.

It is imperative that the environmental and economic effects of proposals emerging from these globally processes are considered critically with a clear understanding of the Solomon Islands situation. While Solomon

Islands is not a major power, there is now (and has been in the past) considerable policy space for the modification of international pressures to suit the national reality and the development needs of the Solomon people.

Such opportunities have in the past been missed due to a lack of a skill base in information and analysis. This is no longer the limiting factor – organisational capacity is.

7.2 Environmental issues

7.2.1 Deforestation through logging

Logging is presently the most pressing issue both environmental and economic, facing the country.

As this report has made very clear, the environmental, economic and social consequences of continued logging at current rates will be disastrous. The collapse of the export industry will be accompanied by further decline in the ability for village people to eat, drink and build houses. When government duty revenue collapses, this additional hardship will be visited on the whole country, not just the poorest rural people who are now already bearing the burden.

Both the methods used and the scale of logging are destroying the viability of the SI environment, its biodiversity and its ability to support our people. It is likely that history will show logging to be a worse disaster than all the cyclones, earthquakes and ethnic tension in our first 30 years as a country.

Reducing logging licenses and enforcing the existing rules would be the single most powerful “bottom up” or “rural development” policy that any government could deliver.

7.2.2 Forest and soils degradation

The parallel pressures to locate cooking fuel and grow food are being driven by a steadily increasing population, and a systemic inability to adapt agricultural, cooking and settlement practices to meet the restrictions of higher population density.

Simply put, forests and soils are “running out”, not only in terms of their ability to support people, but also in terms of their ability to support themselves. The poor grasslands surrounding Honiara and the flood silt filling its coastlines following heavy rain are signs that beyond a certain amount of pressure, neither the forests nor the soil can remain.

Mitigating this degradation will require widescale and comprehensive changes in living practice as well as structural and policy changes to make these changes feasible.

7.2.3 Biodiversity loss

The extraordinary biodiversity of Solomon Islands is highly dependent on intact habitats and a low degree of disturbance. It is therefore vulnerable to loss as a result of a wide range of activities that destroy habitats, such logging, the expansion of gardens and denuding of forest, the expansion of settlements and the establishment of large plantations.

It is also being lost through more targeted and selective activities such as fishing and wildlife collection for export. Additional to these, there is a constant risk of ecosystem invasion by alien species that are either already established in urban communities, or newly introduced from outside the country.

This loss of biodiversity is partly unrecognised because there is so little knowledge about the full range of biodiversity in Solomon Islands. Because of this however, the consequences and risks of this loss are also poorly understood. Without realising the existence of or roles of certain key species or assemblages, ecosystem collapse or degradation may occur with little predictability and with few options for effective response.

Adequately responding to this issue will require a total reorientation in terms of policy emphasis on research, knowledge and data gathering. The degree to which biodiversity is unknown is of cross-cutting significance to all the other environmental issues.

7.2.4 Degradation of coasts, seas and reefs

The other habitats under direct and sometimes severe pressure are the coasts, lagoons, seas and reefs. The expansion of coastal settlements is often accompanied by deforestation particularly of mangroves and other coastal vegetation. Along with logging and plantation establishment, these settlements increase the risk of siltation of surrounding reef systems. Siltation kills coral organisms and is capable of altering the community structure of reefs. Other anthropogenic pollution such as human waste (sewage) and non-biodegradable materials such as plastics are also contributing to coastal degradation.

7.2.5 Ecosystem shifts due to geo-climatic change

The recent experience of the 2007 Gizo earthquake and its effect on coastal environments and reefs in the Western Province are a reminder of the natural world's contributions to environmental change. In

addition to tectonic and geological activity, climate change may already be contributing to habitat and ecosystem changes in Solomon Islands. Global climate change will likely take the form of altered rainfall patterns, increased severity of cyclones and the possibility of sea level rises with associated changes in coastal ecosystems and landforms.

Such geological and climatic changes may not be prevented or averted, but much can be done to mitigate severity of impacts on ecosystem integrity and functionality and on the effects on the productivity of those ecosystems for human use.

As with biodiversity, this will require an altogether new emphasis on information, research and knowledge integration.

7.3 Policy issues

7.3.1 Political will – the beginning and end

Addressing the foregoing identified environmental issues depends fundamentally on political will. To date this has not been present or sustained. A clear example has been seen in attempts to regulate the logging industry. Despite the emergency situation with the national forests, and the disastrous consequences of *status quo* activities, several policy initiatives to reform logging over the past decade have been successfully blocked by the logging industry. Clearly without high level commitment to change, the fundamental trend of environmental destruction will continue unabated until widespread collapse is experienced, or even past that point.

There are a number of key areas of incapacity which act in two ways to prevent positive change:

- they act to prevent emergence of political will, and
- make implementation of policy difficult in those cases where there is political will

These areas of incapacity are the focus of the policy issues identified below. While these issues are in a sense subsidiary to the lack of political will, action on them presents opportunity for the emergence of political will, and of real action as and when it emerges.

7.3.2 Lack of policy recognition for the environment

A central problem remains a systemic lack of recognition of the importance of the environment amongst policymakers and leaders. Without this recognition, the difficulties of poor political will are compounded by ignorance. Decision makers lack understanding about the role and value of the environment as well as about the urgency and seriousness with which it must be considered.

There are two major aspects to this profile of the environment in policy circles:

- **Underestimation** - The environment is seen as minor relative to the normally dominant concerns of development and economy. Because little is known about its past and current economic dominance, it is seen as an “extra” and often inconvenient to “business as usual” approaches to development policy. This view is often reinforced by external actors’ ignorance of the subsistence economy, and a presumption that growth can and will pay for environmental protection.

- **Compartmentalisation** – The bureaucratic system’s emphasis on distinct mandates for government departments leads to a fragmented, compartmentalised approach. When applied to environmental issues, this runs counter to the reality that environmental issues need to be integrated into economic planning, agriculture, fisheries, education and even health. Understanding about environmental issues cross-cutting nature is therefore often limited to staff in the core agencies such as ECD.

An attitudinal change regarding the environment is needed in both political and bureaucratic settings, so that both importance and relevance is clearly visible at key points of the policy process.

Particularly key in this is an explicit accounting system that relates ecosystem services to economic output and growth. Priority sites for this linkage would be via national accounts (CBSI Annual Reports), poverty measures (Ministry of Planning and Aid Coordination) and human development indices (MDGs and HDI).

7.3.3 Weak integrative capacity

Related to misconceptions and poor understanding of the role and nature of environment in national development, is a weak capacity by the lead agencies, to act integratively. Acting integratively involves identifying and responding to the environmental issues contained in or implicated in policy proposals across the full breadth of government:

- from agriculture (for instance decisions on appropriate land use and the support of sustainable agriculture)

- through tourism (for instance positions on the appropriateness of the siting of tourism developments)
- to trade and economic development (for instance including ecosystem degradation in cost-benefit analyses of new industries such as palm oil).

The necessity of doing so is especially clear for meeting such cross-cutting issues as biodiversity loss and invasives. For instance, biodiversity loss (a key environmental issue) is occurring as a result of many different activities ranging from urban sprawl to large scale land clearing. These are areas of policy mandated to several different Ministries and Departments.

Adequate integrative capacity will require a high degree of competence in both policy analysis and strategic environmental analysis. These functions are currently not catered for in the Division or Ministry but need to be urgently developed. Such capacity should be able to address the following questions on an ongoing basis:

- What are the key environmental issues for Solomon Islands and how do they relate to other prevailing key issues such as food security, energy, peacebuilding and development?
- What are the environmental impacts of any given policy proposal or policy platform?

Both the current Environment Act as well as prevailing corporate planning of the Ministry for Environment, Conservation and Meteorology, Environment emphasise impact assessment across the full range of development activities and projects. The capacity to deliver this service to the government and people of Solomon Islands will rest on the integrative capacity of the Division and Ministry.

The benefits of an effective impact assessment function in the ECD will extend to all sectors which rely on environmental integrity for production and sustainability. These benefits will result from averted damage, mitigated effects and ecologically “efficient” development measures. The magnitude of benefit arising from such measures will be very considerable.

In a country such as Solomon Islands, almost all sectors fall into this category, meaning that even very significant costs for impact assessment will be more than offset by the benefits to people and institutions reliant on the environments.

7.3.4 Poor environmental information

Policy makers have very poor access to all the different sorts of environmental information:

- location specific primary monitoring data
- sector or activity-specific information
- gross integrated national-level data sets

Without ready access to this information, neither analysis for design nor integration for implementation of policy can happen. It is of key importance that environment stakeholders (in government and outside) can access the best available information on the environment and just as importantly, assess how valid and accurate it is. At present this function does not exist within the ECD.

Fortunately the SI environment enjoys a relatively high degree of attention from international NGOs and academia. Considerable primary and secondary data exists, representing an excellent opportunity for the rapid development of an interim

information management system, which collates current and past information and permits the submission of additional reports as and when they are produced.

While there are feasible immediate responses such as this, again a basic reorientation is needed in SIG environmental agencies. Information, data and the processes producing them need to be prioritised within ECD together with systems for managing them. This very report represents an accessible opportunity for beginning this shift. It represents a starting point in terms of an information base that can feed into an ongoing process of information development and analysis.

7.4 Recommendations

If some new progress in slowing environmental destruction is not made in the next few years, there is potential for the overall effects of this destruction to dwarf the suffering caused by the civil conflict known as the tensions from 1998 to 2003. For this reason, it is imperative to consider realistic incremental measures that are feasible in the immediate policy environment. Some key ones are outlined here.

7.4.1 Environment policy mainstreaming

Environmental policy should be mainstreamed into national accounts, Millenium Development Goal reporting and Human Development Indices and other development agendas and reporting tools. National rural development platforms should place environmental health and ecosystem productivity at the front and centre. Environmental issues and policies should frame international and regional positions, reform considerations within the provincial

government area and negotiations with principal aid donors.

This is obviously a very significant undertaking and the following recommended actions have been identified as providing impetus towards realising this, as well as contributing directly to better environmental policy.

7.4.2 National Environment Summit

A National Environment Summit should be convened in 2009 to consolidate the momentum developed in by the current administration in 2008 and establish a platform for further progress. Several policy challenges can be effectively met through this single action;

- Low policy recognition of environment would be constructively addressed by a high level, high visibility event capable of attracting national and international actors and focusing on the key needs and opportunities faced by the country.
- Improvement of integrative capacity in the ECD would be kickstarted through the coordination of agendas and collation of materials leading up to this summit. With a single event providing a synopsis of the environment-economy and environment-development nexus, there will be ample opportunity for the ECD to gain analysis and information which is directly relevant to its ability to integrate environment across policy areas.
- The gathering of top-level analysts and organisations at one event will offer the opportunity for the collation of a single body of up to date material and information on national, global and linking environmental issues.

This Summit would also serve as a logical and practical follow up outcome emerging directly from this current SOE process.

7.4.3 Environmental Information Base

An interim Environmental Information Base (infobase) should be established which acts as a single annotated electronic directory to all available hard and soft copy information on the SI environment, its status and its pressures and uses. This directory would be accompanied by an e-library of all soft copy information, and also comprise a catalog of hard copies held at the ECD. The directory should be online and possess a functionality for new materials to be submitted electronically by third parties, with full listing on the directory dependent on ECD approval of the materials.

Such an Environmental infobase would be achievable with 4 weeks of technical input, assuming availability of materials and cooperation by information sources. Once completed it would form the basis for the development of an information management system for ECD, and a springboard for the further development of ECD's information gathering and management function in subsequent years.

The bibliography of this current report may serve as an initial starting point.

7.4.4 Annual SOE updates

The ECD should carry out or commission annual SOE updates which are limited to presentation only of information which has substantially changed or been updated since the previous year. This will increase ECD institutional familiarity with data collection

and sources and reduce the requirements for the triannual SOE reports. The first such SOE update would be a feasible exercise in 2009 as a follow up to all the data presented in the Summit.

7.4.5 Scope options for implementation of existing arrangements

A scoping study should be conducted involving the ECD, office of the Legal Draftsman, Ministry of Provincial Government and Ministry of Finance to develop a framework for the implementation of existing EIA provisions under the Environment Act. Of particular emphasis should be the identification of options for mechanisms by which EIA costs would be recovered under existing legislation and how this income stream could be channelled into the funding of an environmental monitoring unit.

8.0 CONCLUSION

Solomon Islands has witnessed major environmental changes since Independence as a result of its ongoing reliance on extractive industries, rapid population growth and underlying political difficulties. Unfortunately the impacts of such environmental change are not widely recognized, nor are the options and priorities for response. In order to make rational management conservation and environmental management decisions to guide government policy, it is critical for policymakers to access reliable information and analysis on the environmental changes that have taken place, the drivers of these changes and ongoing trends that influence them.

This SOE report aims to make available relevant information and analysis on the environmental changes that have taken place,

the drivers of these changes and the ongoing trends that influence them. It further suggests broad options for institutional and policy response to address the causes and consequences of these.

It is hoped that this will be useful to policymakers, managers and Solomon Island citizens alike as well as assist SIG especially its environment managers in monitoring of environmental changes and help adopt appropriate interventions that will improve environmental sustainability.

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10.0 ANNEX 1

MAJOR VEGETATION TYPES OF SOLOMON ISLANDS

<i>Vegetation type</i>	<i>Components</i>	<i>Major species</i>	<i>Locations</i>
1. Coastal strand vegetation (mangroves)	Tall forest dominated by Rhizophora sp.& Brugueria sp	Rhizophora sp.& Brugueria sp. dominated Impoea, Spinifex, Canavalia, Thuarea, Cyperus, Scaevola, Hibiscus, Pandanus, Tournefortia, Cerbera, Calophyllum, Barringtonia, Terminalian and Casuarina	Isabel, New Georgia, Malaita, Makira, eastern Guadalcanal
	Low forest dominated by Rhizophora apiculata	<i>Rhizophora apiculata</i> dominated Impoea, Spinifex, Canavalia, Thuarea, Cyperus, Scaevola, Hibiscus, Pandanus, Tournefortia, Cerbera, Calophyllum, Barringtonia, Terminalian and Casuarina	Isabel, New Georgia, Malaita, Makira, eastern Guadalcanal
1. Freshwater swamp/Riverine forest	Camphosperma brevipetiolata dominated	<i>Camphosperma brevipetiolata</i> , <i>Inocarpus fagiferus</i> , <i>Eugenia tierneyana</i> , Barringtonia spp., <i>Calophyllum vexans</i> , <i>Pterocarpus indicus</i>	Widespread on most islands, New Georgia
	Closed canopy Terminalia brassi dominated	<i>Terminalia brassi</i> , <i>Inocarpus fagiferus</i> , Eugenia	Widespread on most islands, New Georgia
	Low open canopied - pandanus	<i>Eugenia tierneyana</i> , <i>Inocarpus fagiferus</i> , <i>Erythrina orientalis</i> and Pandanus	Widespread on most islands, New Georgia
	Mixed swamp forest	<i>Inocarpus fagifer</i> ,	Widespread on

2. Lowland forest		<i>Syzygium tierneyana</i> , <i>Intsia bijuga</i> , <i>Barrington racemosa</i> , <i>Callophyllum vexans</i> , <i>Pterocarpus indicus</i> , <i>Camptosperma brevipetiolata</i> , <i>Terminalia brassi</i>	most islands, New Georgia
	Lowland beach forest	<i>Ipomoea pescaprae</i> , <i>Canavalia rosea</i> , <i>Virna marina</i> , <i>Wollastonia biflora</i> , <i>Barringtonia asiatica</i> , <i>Callophyllum inophyllum</i> , <i>Cerbera manghas</i> , <i>Heritiera littoralis</i> , <i>Intsia bijuga</i> , <i>Terminalia catappa</i> , <i>Casuarina equisetifolia</i>	Widespread
	Lowland forest - mixed sp.	<i>Calophyllum kajewski</i> , <i>Callophyllum vitiense</i> , <i>Eleocarpus sphaericus</i> , <i>Endospermum meddullossum</i> , <i>Gmelina molucana</i> , <i>Maranthes cor ymbosa</i> , <i>Parinari solomnensis</i> , <i>Pometia pinnata</i> , <i>Dillenia salmononensis</i> , <i>Schizomeria serrata</i> , <i>Terminalia calamansanai</i>	Widespread
	Camptosperma dominated lowland forest	<i>Camptosperma Breviopetiolatum</i>	Widespread
	Hill forest	<i>Pometia pinnata</i> , <i>Callophyllum kajewski</i> , <i>Endospermum medullosum</i> , <i>Gmelina mollucana</i> , <i>Canarium spp.</i> , <i>Parinari salomonensis</i> , <i>Vitex cofassus</i>	Lower slopes of Mt. Maetambe (Choiseul)
	Low diversity forests	Ultramafic soils, <i>Casuarina papuana</i> , <i>Dillenia crenata</i> ,	South tip of Choiseul and Isabel, San Jorge

		<p><i>Gulubia hombronii</i>, <i>Xanthostemon</i>, <i>Myrtella</i> <i>beccarii</i>, <i>Pandanus lamprocephalus</i></p>	
<p>3. Montane</p>	<p>Upper montane</p>	<p><i>Syzygium</i> (<i>Eugenia</i>) sp, <i>Metrosideros</i> sp., <i>Ardisia</i> sp., <i>Ficus</i>, <i>Rhododendron</i>, <i>Dacrydium</i> spp, <i>Podocarpus pilgeri</i></p>	<p>Kolombangara, Popomanaseu (Guadalcanal)</p>
<p>4. Seasonal dry forest and grasslands</p>		<p><i>Pometia pinnata</i>, <i>Vitex cofassus</i>, <i>Kleinhovia hospita</i>, <i>Themata</i> sp., <i>Imperata cylindrica</i> <i>Pterocarpus indicus</i>, <i>Antiasis toxicaria</i>, <i>Ficus</i> spp. and <i>Sterculia</i> spp</p>	<p>Northern Guadalcanal, Florida Islands</p>

11.0 ANNEX 2

MULTI-LATERAL AGREEMENTS SOLOMON ISLANDS IS A PARTY TO.

Convention/instruments	Status	Purpose/Aim	Agency Responsible & related Projects
Regional MEAs			
i) Waigani Convention	Ratified 7/10/1998	Ban the importation of into Forum Island Countries of hazardous and radioactive wastes and to control the transboundary movement and management of hazardous wastes within the South Pacific region.	ECD
ii) Pollution Protocol for Dumping	Ratified 10/9/1989	Prevention of pollution of the South Pacific region by dumping.	Marine Div/ECD
iii) Pollution Protocol for Emergencies	Ratified 10/9/1989	Cooperation in combating pollution emergencies in the South Pacific region.	Marine Div/ECD Project: National Pollution Prevention Plan
iv) Natural Resources and Environment of South Pacific (SPREP Convention)	Ratified 10/9/1989	Protection of natural resources and environment of the South Pacific Region in terms of management and development of the marine and coastal environment in the South Pacific region.	ECD
Chemicals, Wastes and Marine Pollution			
i) Liability for Oil Pollution Damage	Ratified	Strict liability of a ship owner for pollution damage to a coastal state within a certain amount.	Marine Div
ii) Marine Pollution Convention (London)	Ratified	Prevention of marine pollution by dumping of wastes and other matter.	ECD/Foreign Affairs
iii) POPs Convention (Stockholm)	Acceded 28/7/2004	Protection of human health and environment from persistent organic pollutants.	ECD/Environmental Health Div Project: National Implementation Plan (NIP)
Biodiversity			

i) Desertification (UNCCD)	Acceded 16/4/1999	Agreement to combat desertification and mitigate the effects of drought in countries experiencing drought or desertification.	Agriculture Div/ECD Project: National Action Plan on Land Degradation and Drought; National Capacity Self Assessment (NCSA)
ii) Cartagena Protocol on Biosafety	Acceded 26/10/2004	Protection of human health and the environment from possible adverse effects of the products of modern biotechnology, especially the living modified organisms (LMO) while maximizing its benefit.	ECD Project: National Biosafety Biosafety Framework
iii) Convention on Biological Diversity (UNCBD)	Ratified 3/10/1995	Conserve biological diversity through the sustainable use of its components and the fair and equitable sharing of the benefits arising out of utilizing genetic resources.	ECD Project: National Capacity Self Assessment (NCSA); National Biodiversity Strategy and Action Plan (NBSAP); International Waters Programme (IWP); 3 rd National Report.
iv) CITES	Instrument of ratification being prepared	Regulation and restriction of trade in specimens of wild animals and plants through a certification system for imports and exports.	ECD
v) World Heritage Convention	Acceded 10/6/1992	The protection of sites of Outstanding Universal Value. Solomon Islands currently has East Rennelle as World Heritage site.	Museum/ECD Project:
Climate			
i) Kyoto Protocol	Ratified 13/3/2003	Reduce greenhouse gases especially carbon dioxide for the 39 industrial/developed by an average of 5.2 % by 2012.	Meteorology Div
ii) Climate Change (UNFCCC)	Ratified 28/12/1994	Sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change.	Meteorology Div/ECD Project: National Adaptation Plan of Action (NAPA); Second National Communication on Climate Change;

			National Capacity Self Assessment (NCSA)
iii) Montreal Protocol	Acceded 17/6/1993	Allows phase out of substances that deplete the ozone layer according a fixed schedule.	ECD/Energy Div
iv) Ozone Layer Convention (Vienna)	Acceded 17/6/1993	Protection of the ozone layer through intergovernmental cooperation on research, systematic observation of the ozone layer and monitoring of chlorofluorocarbons(CFC) production	ECD/Energy

12.0 ANNEX 3

Calorific extrapolation from Bourke (2004)

- This model calculates the value of all root crops (kumara, cassava, taro etc) which are produced and consumed by subsistence gardeners in SI. We do this by answering three questions:
 1. How many tonnes of root crops are eaten by SI people every year.
 2. How much rice would be needed to replace that food **if it were not grown** by SI gardeners.
 3. How much would it cost the economy **if SI people had to buy** the amount of rice needed to replace root crops?
- This is an update of calculations presented by Bourke et al. (2004). The reasoning and assumptions is as follows (partially adapted from Bourke 2004):
 - This calculation is only for root crop production – no calculations are included for the value of subsistence fishing, chickens, eggs and pigs. Protein is considerably more expensive than carbohydrate, so a similar calculation for subsistence protein would yield significant numbers.
 - There are no undernourished people in Solomon Islands – everyone is eating enough calories³ on a daily basis
 - The mean daily food energy intake from staple foods is 2665 calories/person/day. This estimate is based on PNG data, an assumption about the proportion of energy derived from staple food crops, and is approximate.
 - Multiplying the estimated population in 2004 by the food energy intake and the number of days per year (365) gives the SI population's estimated annual food energy requirement, which is 457×10^9 calories per year. This figure is given in red type in the first column.
 - Supplying this energy would require 124,800 t of rice.
 - The annual increase in population determined in the 1999 National Census (2.8%) has been used to calculate the annual increase in this tonnage, as well as the increase in the tonnage of imported rice.
 - The difference between the energy requirement of SI (measured in t of rice), and energy supplied by imported rice (in t of rice), equals the energy equivalent of local root crops (in t of rice)
 - The amount of rice (in t) needed to replace those crops is given in column 4.
 - The amount of rice needed in terms of 20 kg bags is given in column 5.
 - Multiplying column 5 by the Honiara price for 0kg rice bag gives us column 7. This is the estimated cost of feeding rice to the SI population if no root crops were grown.
- 2004 figures in red from Bourke et al. 2004
- 2.8% growth pa assumed for all volume and population figures
- Honiara prices for 20kg units of rice
- 2008 prices assumed to be the average of Q1 price and Q2 price weighted 25:75
- Farm gate prices are assumed because most root crops are consumed at location
- **NB** This calculation is a gross underestimate of the economic value of subsistence root crops. We have assumed that all rural Solomon Islander would pay the Honiara price for 20kg rice units. However, the cost for all non-Honiara residents would be much higher than we have assumed. Using the real province or village cost for rice would lead to a larger final figure.

³ Note this is different from malnourishment – the quality of the diet is being ignored here. There is significant malnourishment caused by protein and vitamin deficiency in some areas of SI, but no evidence of under-nourishment.

1	2	3	4	5	6	7
National calorific Requirement (cal)	national rice equivalent (t)	import volume (rice plus flour equivalent)	shortfall in rice equivalent (t)	national rice equivalent (20kg units)	20kg unit price	farm gate equivalent of rice (SBD m)
4.57E+11	124800	28000	96800	4840000	75	363
4.70E+11	128294	28784	99510.4	4975520	80	398
4.83E+11	131887	29590	102296.7	5114835	100	511
4.96E+11	135579	30418	105161	5258050	140	736
5.10E+11	139376	31270	108105.5	5405275	220	1189

At current rice costs, subsistence kumara, cassava and other root crops are contributing **at very least 1.189 billion dollars** to the SI economy.

Integrated forest use extrapolation from Cassells 1992

Extrapolation from Cassells 1992

- 7 person family
- Kuku village case study – NW Choiseul
- Substitute valuations measured for garden land, sago palm, fuel-wood, firewood etc. (no water costs, recreation or spiritual)
- Valuation was that a 7 person household derived SBD 10,512.15 per annum in benefit from forest and bush resources (not counting mangrove, reef or river water)
- Cassells, 1991/2 study
- **Assuming that all rural dwellers still derive the same value per annum from their respective bush environments.** This may not be the case in overcrowded or environmentally degraded regions/locations.

There are **473,000** villagers in 2008 (assume 80% of 557 thousand population)
473,000 population)
67571.43 This is equivalent to **67571** 7-person households in current population
***SBD 10,512.15** per annum benefit for each 7 person household (1991/2 dollars)
Total current benefit in 91/2 dollars, multiplied across the estimated 67571 households
SBD710.32m
3.69 Inflation multiplier from 1992-2008
SBD 2621.1m or adjusting for CPI inflation = multiply by factor of 3.69 (source CBSI Annual Report 2007)
2.62 billion

In 2008, forest utilisation

- by the entire current rural population
 - at a similar level to that in 1991 in NW Choiseul
- represents good and services worth more than \$2.6 billion.**