

Co
SB
Env
005

IUCN Bibliothèque
CH - 1196 Gland

ENVIRONMENTAL SYNOPSIS

1993

SOLOMON ISLANDS



IUCN
The World Conservation Union

IUCN - THE WORLD CONSERVATION UNION

Founded in 1948, IUCN - The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organisations in a unique world partnership: some 720 members in all, spread across 118 countries.

As a Union, IUCN seeks to serve its members — to represent their views on the world stage and to provide them with the concepts, strategies and technical support they need to achieve their goals. Through its six Commissions, IUCN draws together over 5000 expert volunteers in project teams and action groups. A central secretariat coordinates the IUCN Programme and leads initiatives on the conservation and sustainable use of the world's biological diversity and the management of habitats and natural resources, as well as providing a range of services. The Union has helped many countries to prepare National Conservation Strategies, and demonstrates the application of its knowledge through the field projects it supervises. Operations are increasingly decentralised and are carried forward by an expanding network of regional and country offices, located primarily in developing countries.

IUCN seeks above all to work with its members to achieve development that is sustainable and that provides a lasting improvement in the quality of life for people all over the world.

This Environmental Synopsis was produced in collaboration with the Commission of the European Communities under contract 7-5040/91/28.

Any opinions, findings, conclusions or recommendations expressed in this publication do not necessarily reflect the official policy of the EC. Likewise the designation of geographical entities do not imply the expression of any opinion on the part of participating organisations concerning the legal status of any country, territory or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

THE SOLOMON ISLANDS AT A GLANCE

The Solomon Islands, a British Commonwealth State of a thousand small islands extending over 16,000km, ranks high on the list of threatened ecosystems. But it has only a fledgling protected areas network.

The nation's problems include:

- Deforestation that could exhaust timber resources early in the coming century
- Land tenure disputes that work against conservation
- Piecemeal and poorly enforced environmental legislation
- An economic crisis that encourages unsustainable exploitation of natural resources
- One of the world's fastest growing populations (doubling in 20 years)

Several positive trends can also be noted:

- Grass-roots opposition and growing conservation awareness have prompted the government to draft a new forest policy
- Several proposals have been put forward to defuse the land tenure issue
- Provincial and national authorities are working to improve environmental protection

CONTENTS

	Page
PREFACE	1
FACT SHEET	2
Natural Resources	2
Demography	2
Health and Education	3
Industry and Pollution	3
Economic Indicators	3
KEY ISSUES	4
INSTITUTIONAL CONTEXT	8
Environmental Institutions	8
Environmental Policies and Standards	8
National and International Organisations	9
Legislation Concerning Natural Resources Management and Environmental Protection	10
Environmental Training Institutes and Training Capacity	11
Cultural Aspects of Resource Utilisation	11
STATE OF THE ENVIRONMENT	12
Inventory of Natural Resources	12
Industry	18
Demography and Urbanisation	19
ANALYSIS OF POLLUTION AND DEGRADATION PROCESSES	22
Water Pollution and Water Shortage	22
Soil Erosion and Degradation	22
Deforestation	23
Biodiversity	24
Marine Environment and the Coastal Zone	26
Urban Environment	27
Energy Issues	28
Industry	28
BIBLIOGRAPHY	30
NOTE ON DATA SOURCES	34
ANNEX I	35

PREFACE

This environmental overview of The Solomon Islands was requested by the Commission of the European Communities — specifically the Directorate-General for Development (DG VIII A/1).

It was prepared on the basis of a desk-top study of information to hand as a briefing for CEC officials. Wherever possible the most recent figures and information were employed as sources¹.

After the introductory Fact Sheet and outline of Key Issues, the report is divided into three chapters. The first dealing with institutional infrastructure, especially within the environmental context, together with national and international legislation and training opportunities. The second reviews the country's natural resources. The final chapter evaluates the nation's ecological heritage and considers its past, current and foreseeable environmental problems. Because the information changes so rapidly, no attempt has been made to provide a comprehensive survey of international organisations working in The Solomon Islands. Instead, the reader is advised to contact the organisations themselves for an up-to-date summary of activities.

The IUCN team responsible for the preparation of this Synopsis included: Jeremy Carew-Reid, Peter Sanders, R. David Stone, Peter Hulm, Paul A. Driver, Claire Santer, John Watkin, and Brian Johnston. Additional editorial assistance was provided by Anthony J. Curnow, Adrienne Jackson, Paul E. Ress, Gamini Senevirate and Wendy Lubetkin.

Acknowledgments are due to many people for assistance, especially those within the IUCN Commissions, World Conservation Monitoring Centre (WCMC), library staff at the United Nations (Geneva), and World Health Organization (Geneva). Maps have been provided by WCMC. The cover illustration was designed by Christine Bass. Text design and layout was by Madlen Tschopp. Particular thanks are expressed to David Sheppard and the South Pacific Regional Environmental Programme for comments on an earlier draft of this Synopsis.

¹ A note on the data sources follows the detailed reference list. Within the text, individual sources are indicated by the number of the reference inside brackets, e.g. [24]. Metric weights and measurements are used throughout. A billion refers to 1,000,000,000.

The Solomon Islands

FACT SHEET

Natural Resources

Land area: 28,369km²

Climate: Hot and humid. Mean annual temperature is 27°. Rainfall between November and April, when cyclones also occur. No distinct dry season. South-east trade winds dominate

Rainfall: Mean annual rainfall is 2540mm

Ecological zones: Two ecological zones are represented: Melanesian and Pacific

Languages: English (official) Pidgin and indigenous languages

Main towns: Honiara (capital) 37,451 (1991 estimate)

Measures: Metric system

Currency: Solomon Islands dollar = 100 cents. Average exchange rates (1991): SI\$2.729 = US\$1 and SI\$4.419 = UK£1

Land use: Arable land 570km²; permanent pasture 390km²; woodland 25,600km²; other land 1430km² (1989)

Protected areas: Formal protected areas cover less than 0.2% of the Islands' land. Four categories are recognised: national parks, forest reserves, bird sanctuaries and wildlife sanctuaries

Agriculture: The main food crops are coconuts, sweet potatoes, taro, yams, cassava, garden vegetables and fruit. The main cash crops are copra and palm oil

Livestock: Cattle 13,000; pigs 53,000 (1991)

Fisheries: 57,000 tonnes (1989) [38]; 42,704 tonnes (1991) [6]

Mining: Gold 50kg (1988)

Demography

Population size: 328,695 (1991 estimate)

Population growth rate: 3.5 per annum (1985-1990)

Projected population in 2025: 600,000

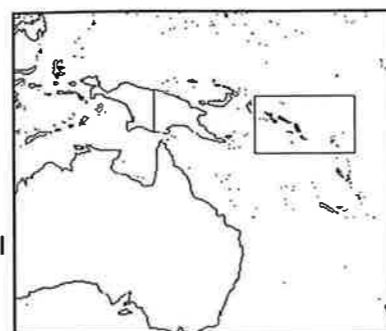
Age distribution: Under 15 years 47%; 15-64 years 49.4%; over 65 years 3.24% (1986 estimate)

Fertility rate: 6.4 (1985-1990)

Gender ratio: Female 48%; male 52% (1986)

Spatial distribution: Urban 10%; rural 90% (1987)

Urbanisation rate: 4.7% of population a year (1980-1985)



Health and Education

Infant mortality (deaths/1000 live births): 43 (1985-1990)

Life expectancy: Females 61.4 years; males 59.9 years (1985-1990)

Access to safe drinking water (% of population): Urban 82%; rural 40% (1990)

Access to sanitation services (% of population): Urban 86%; rural 5% (1984)

Access to health care (% of population): 100% (1991)

Enrolment in education:

Level	Number enrolled	% male	% female
Primary (1988)	52,979	56	44 (1986)
Secondary (1986)	6,025	62	38

Industry and Pollution

Main industries: Fish and food processing; forestry

Energy: Types - timber, charcoal, oil (imported), solar, hydro-electric

Pollution: Pesticides, limited industrial waste, sewage, sedimentation

Economic Indicators

GDP: US\$176 million (1988)

GDP per capita: US\$585 (1988)

GDP growth rate: 5.2% (1990)

Agricultural % of GDP: 36% (1990)

Exports at current market prices: US\$119.4 million (1991)

Imports at current market prices: US\$190 million (1991)

Total official development assistance: US\$49.9 million (1989)

Total external debt: US\$130 million - of which long-term debt amounted to US\$99 million in 1991

Sources: [2, 3, 4, 6, 7, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 38, 39, 41, 42, 43, 44, 45, 46, 47 and 48] unless otherwise indicated

KEY ISSUES

Background

The Solomon Islands are a scattered Melanesian archipelago covering a land area of 28,369km² in the south-western Pacific Ocean, east of Papua New Guinea and north of Vanuatu. It consists of a double chain of six major islands (Fig. 1), some 30 smaller islands and approximately 962 islets, cays and atolls. The island chain extends over 1600km. Its sea area (Exclusive Economic Zone) covers 1.34 million km².

The Solomon Islands form part of the Pacific "ring of fire" lying at the boundary of the Australian and Pacific tectonic plates. There is constant seismic action, including volcanoes and earthquakes [16]. Much of the country is mountainous and of volcanic origin. The steep terrain remains under dense tropical rain forest, but extensive tracts of native and introduced grassland cover the northern plains of Guadalcanal. The smaller islands are mainly coralline [2].

The nation is divided into eight Provinces. From west to east they are Choiseul, Western, Isabel, Central, Guadalcanal, Malaita, Makira and Temotu [17]. The national capital, Honiara, is located on Guadalcanal.

Problems affecting the environment include deforestation, land tenure issues, an inadequate legislative and institutional framework, absence of a protected areas system tailored to the Solomon Islands, pollution, over-harvesting of natural resources, economic difficulties, overpopulation and climate change.

Deforestation

Commercial logging takes place on a large number of islands. Deforestation is proceeding much faster than reforestation or regeneration. Forestry policies and enforcement are inadequate. At current rates of use timber resources are expected to last only 15-36 years. A forest inventory (now under way) will provide more reliable information. Although regulations exist to control the size of trees extracted, some logging has taken place on a non-selective basis. The pressures of a rapidly growing population have resulted in a dramatic increase in shifting agriculture. Aerial photographs indicate that the area of land under cultivation is now double that of 1972.

Grass-roots opposition in some communities to the logging and growing awareness of the need for sustainable development have prompted the government to start to formulate a forest policy to provide a sustained yield. Reforestation efforts on government-owned land have been fairly extensive. The government hopes that revenue from the export of plantation-grown trees will replace the earnings from logging once the natural forests have been worked out. A forest planning unit is to be established. Tougher regulations for logging companies — an obligation to replant and to re-process some of the logs locally — are expected. But there is also strong pressure for immediate exploitation. Ways to establish plantations on custom-owned land need to be identified and implemented. Financial backing is necessary in the short term to help communities compete with multinationals if the forests are going to be saved in the long term.

Land tenure

Nearly 90% of the land in the Solomons is owned communally by villages and tribal communities. Government jurisdiction over this customary land is limited. Environmental protection is frequently difficult to negotiate. Many communities have allowed logging to go ahead on land which they own. Where communities have rejected logging, major political tensions have resulted with the government and company involved. Greater cooperation between government and communities is clearly necessary to establish and manage protected areas. Means of establishing timber plantations on custom-owned land need to be identified and put into practice as well.

A Land Tenure Bill was prepared to help resolve disputes but it was defeated in Parliament in 1990. A number of Ministries and the Western Province Government have proposed land registration or certification to combine tenure rights with the best strategy for both development and conservation [4].

Inadequate legislation and institutional framework

Environmental institutions and legislation have tended to evolve piecemeal. The problems are compounded by the generally poor enforcement of existing legislation as a result of very low staffing levels and insufficient environmental training. The Ministry of Natural Resources' Environment and Conservation Division (ECD) — the main body responsible for environmental protection and the conservation of resources — has little legislative backing.

Some provincial governments are attempting to incorporate traditional and customary land-use laws into ordinances as a way of obliging a landowner to protect land of conservation significance. In the central government, draft legislation on environmental protection has been drawn up and is awaiting revision. Until the land tenure issue is resolved, however, comprehensive legislation is unlikely to be effective, even if ratified.

Absence of protected areas system

IUCN has listed oceanic islands and tropical moist forests as two of seven most threatened global ecosystems. The Solomon Islands is high on the list in both categories. Of the 226 islands in the Pacific, Rennell (part of the Solomon Islands group) has been ranked the eight highest in terms of conservation significance, with the other Solomon's territories Guadalcanal and Makira both thirteenth and Malaita thirtieth. Rennell has the third highest number of endemic bird species among Pacific Islands. Of the 163 species of land birds that breed in the Solomons, 72 species (44%), are endemic. One study concluded that no other place in the world, not even the Galápagos, shows so markedly the biological phenomena of speciation and population variation amongst islands [4]. Because of the high degree of endemism in the Solomons, any substantial loss of habitat is likely to lead to extinction of flora and fauna. Among environmentalists in the Solomons, biodiversity loss is of primary concern. Yet the country has virtually no protected areas system.

Recently a number of community associations have been working in conjunction with the government to establish effective protected areas. Three sites covering 60km² have been earmarked so far. But they still need to be established and accepted by the local population.

Recently a number of community associations have been working in conjunction with the government to establish effective protected areas. Three sites covering 60km² have been earmarked so far. But they still need to be established and accepted by the local population.

Economic problems

Since 1985 the Solomon Islands has experienced an ever-widening deficit. The gross national debt rose by 24% in 1990 to an estimated SI\$414 million². The Solomon Islands is heavily dependent on foreign aid — about SI\$88 million³ in 1990, or 25% of GDP [17].

This economic plight is one of the major determinants of government policy. The need to increase export earnings has encouraged the continued exploitation of natural resources, particularly timber. The government has often waived regulations that required logging companies to process 20% of their cut locally and to replant after logging. The demand for tougher ecological safeguards has not been pressed for fear that logging companies would move elsewhere. Similarly, individual communities short of finances have been reluctant to impose conditions on logging interests.

Overpopulation

The Solomon Islands has one of the world's highest population growth rates (3.5%). At this rate the total will triple to nearly one million by 2021. So large a population would place an enormous strain on the land available and ultimately lead to severe soil erosion and degradation. Land disputes would be likely to increase, and a systematic approach to resource management would be difficult to maintain.

Particularly in the vicinity of the main centres, the Solomon Islands environment is becoming increasingly polluted. Services cannot keep pace with population growth, both through the high birth rate and as a result of migration from rural areas.

Climate change

The Solomons would be seriously affected if the sea-level rose due to global warming. Most development, population and resources are located on the coast, even minimal rises in sea-level would deliver a significant blow to the economy and livelihood of the islanders. Fishing resources could be depleted by damage to the seagrass beds and reefs that act as nurseries for a number of fish species. The country would likely face economic collapse.

In addition to the loss of low-lying lands, the freshwater lenses of coral atolls would be threatened. These aquifers, which are important sources of freshwater in the Solomons, commonly "float" on seawater and could be sharply reduced or contaminated by a sea level rise.

² US\$151 million at 1991 exchange rates.

³ US\$32.2 million at 1991 exchange rates.

Environmental awareness

There is a serious lack of environmental awareness at all levels of the community. The resources of the Solomon Islands still seem limitless to most people and widespread environmental problems are yet to be experienced. Environmental awareness and education programmes are therefore major needs [16].

While the Solomon Islands does not have many of the environmental problems of some other island nations, it is currently at a "crossroads": development decisions and resource management actions taken now will determine the natural heritage left for future generations [16].

INSTITUTIONAL CONTEXT

Environmental Institutions

General responsibility for environmental matters is part of the portfolio of the Minister of Natural Resources (MNR). The Ministry's Environment and Conservation Division (ECD) has specific responsibility but it does not have any legislative backing and important environmental issues go unattended because of staff shortages: in 1991 the division had only five employees [1, 4].

The Forestry Division (FD) has separate sections dealing with management, plantation, research and development, timber control (logging and utilisation), and herbarium/extension activities. In 1987 the division had 54 professional staff and a labour force of 595 [1]. Plantation projects account for most FD staff and expenditures [4].

The Conservator of Forests is responsible for implementation of the Forestry and Timber Act (see Legislation) [1].

Marine fauna protection falls under the jurisdiction of the Fisheries Division of the Ministry of Natural Resources.

Environmental Policies and Standards

With the exception of Western Province, no national or provincial government has an environmental policy. A number of sectoral laws have some environmental component, but these are far from adequate [16].

The traditional forest policy was replaced in 1984 by a National Forest and Timber Policy. The Policy called for maximum desirable log processing, minimum wastage and increased investment in forests. These aims were restated in the 1985-1989 National Development Plan, but the objectives have not been achieved, a failure attributed to shortcomings in forest legislation, institutional weakness and a lack of public participation and awareness. A revised forest policy has now been announced. This sets out six imperatives: protection, sustainable use, meeting basic needs, development, citizen participation and distribution. This policy also states that areas should be set aside for environmental, ecological, scientific and heritage reserves, taking into account landowner needs and customary values [1].

After deliberation on provincial priorities and the seminar on a National Environment Management Strategy (NEMS) in 1991, the national task force on "Environment and Sustainable Development" recommended a comprehensive set of priorities for consideration by cabinet for action over 1992-1997. These are detailed in reference [17].

National and International Organisations

The Solomon Islands Development Trust (SIDT) is a rural development organization which emphasises community environmental education. The Trust has had a significant influence in the rain forest logging debate (see Key Issues) [1] and is currently helping develop appropriate sustainable development models in the Solomon Islands.

Other community-based associations have also formed to counter the growing threat of over-exploitation. These include the Fauro People Association and the Vella 2000. Their principal objectives are to promote wise management, use and economic exploitation of resources while maintaining respect for traditional values in their communities. These groups have approached the government for advice on establishment and management of protected areas, with three sites already earmarked (see Key Issues) [1].

Soltrust is a local NGO associated with the Foundation for the Peoples of the South Pacific (FSPSI), a Pacific-wide grass-roots organisation. Soltrust also works closely with the government. Its mandate is to promote village and community development in a way which respects and maintains the natural environment. Activities include programmes aimed at women in the community (sustainable food production, agroforestry, traditional medicine), community eco-forestry (small-scale sawmilling, reforestation, timber technologies, charcoal-making) and village development (sanitation, water supplies, village based fisheries) [4].

Under the 'Australian Volunteer Abroad' scheme SPREP (the South Pacific Regional Environmental Programme) has funded a volunteer within the Environment and Conservation Division who has examined wildlife management issues, with emphasis on species trade, changes in traditional practices and habitat destruction. The project aims to provide guidelines for the sustainable use and management of Solomon Islands fauna. An environmental act is currently proposed which will encompass the establishment of conservation areas, the protection of flora and fauna, regulation of wildlife trade, establishment of a protected areas system including wildlife management areas and the protection of traditional knowledge of resource management.

Legislation Concerning Natural Resource Management and Environmental Protection

The state is party to the Biological Diversity and Climate Change Conventions. It is not yet party to the (World Heritage) Convention concerning the Protection of the World Cultural and Natural Heritage, or the (Ramsar) Convention on Wetlands of International Importance especially as Waterfowl Habitat, and it is not a signatory of the (CITES) Convention on International Trade in Endangered Species of Wild Fauna and Flora.

The (Apia) Convention on the Conservation of Nature in the South Pacific (1976), to which Solomon Islands is a party, is now in force. Coordinated by SPREP it represents the first attempt within the region at cooperation on environmental matters. Among other measures, it encourages the creation of protected areas to preserve indigenous flora and fauna.

The Solomon Islands belongs to SPREP and has ratified (10 August 1989) the 1986 Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (SPREP Convention). Article 14 of the Convention calls on parties to take all appropriate measures to protect rare or fragile ecosystems and threatened or endangered flora and fauna through the establishment of protected areas and the regulation of activities likely to have an adverse effect on the species, ecosystems and biological processes being protected.

Formal protected areas legislation are principally enshrined in two acts, both dating from the colonial era: the Wild Birds Protection Act (1914), Section 14, enables the responsible Minister to declare any island or islands, or any part of any island or district, as a bird sanctuary. The National Parks Act (1954) is considered to be inconsistent with current concepts of sustainable resource use: making inadequate allowance for customary needs and placing no obligation upon the administering agency to manage a national park in accordance with stated objectives.

Some provincial governments have passed ordinances for the establishment of protected areas. They include the governments of Temotu and Isabel provinces. This legislation is subject to the restrictions of the constitution and traditional practices.

The Forestry and Timber Act (1969, amended 1977) has a narrow perspective but provides for controlled forest areas to safeguard water catchments. The Forest Resources and Timber Utilisation (Amendment) Act was approved in 1987. The North New Georgia Timber Corporation Act (1979) provides for the establishment of a corporation for the promotion of timber utilisation in New Georgia. The Corporation can impose conditions on licensed felling and is charged with the duty of encouraging replanting in felled areas [1].

A new Forestry Bill, due to go before Parliament, includes provisions for establishing conservation areas and the protection of forestry reserves as well as of the rights of customary landowners [2]. The Town and Country Planning Act (1979) provides for tree preservation orders for "any tree, groups of trees or woodlands ... in the interests of amenity" [1]. The Lands and Titles Act (1968, amended 1970) enables preservation orders to be applied to land of "historic or religious" value and permits the establishment of nature reserves.

Regulations to protect and preserve the marine environment can be enforced under the Delimitation of Marine Water Act (1978) [1].

In March 1990 the cabinet expressed its commitment to legislation to regulate trade in wildlife and protect the Solomons' animals and plants. Legislation on protected is currently being re-examined. A draft Environmental Management Ordinance has been prepared for Western Province for conservation of marine resources and wildlife, environmental impact reports and customary rights [1,4].

The Fisheries Regulation 1972 sets minimum size limits for turtles, crocodiles, trochus, coconut crabs and lobsters. It also prohibits the taking of, or commerce in, leatherback turtles [4]. Some environmental protection powers also exist under the Clean Waters Act, the Forestry Act and the Mining Act, but they are fairly limited [4].

Although formal environmental legislation is not extensive, a system of resource regulations based upon traditional management knowledge does exist in the communities of the Solomons. While the intent of such practices may not have been to protect the environment, they have largely achieved the same end by maintaining essential ecological processes and genetic diversity. The integration of such knowledge with more recent scientific information can only benefit the development of community resource management strategies [1].

In October 1992 the government endorsed a National Environment Management Strategy, setting out a number of policy directions for management of the environment in Solomon Islands.

Environmental Training Institutes

Very little environmental training takes place in the Solomons. Foresters are educated at the Solomon Islands College of Higher Education, or in Papua New Guinea, Australia and elsewhere [1].

Although there are some environmental training programmes for civil servants, low staff-levels in environmental positions mean that such programmes, however well designed, have minimal impact. There is a fundamental need for environmental education at all levels of society.

Cultural Aspects of Resource Utilisation

Land tenure is constitutionally limited to indigenous Solomon Islanders, and 91% of the land is owned by customary tribal or village groups. These groups are free to use their land and resources as they wish. Sometimes traditional regulations within such groups and communities have had the effect of maintaining ecological processes and genetic diversity. A number of agricultural and forestry projects have been abandoned because they did not win the approval of all land holders [3, 4]. More frequently, resources have been exploited for the sake of short-term benefits that have led to long-term depletion. In 1989 the Solomon Islands Ombudsman compared unrestricted forest access given to logging companies to "the selling of valuable coastal land for shell money and sticks of tobacco" [9].

Customary land disputes have also arisen in recent years as a result of population pressures and development infrastructure requiring different groups to share resources. A Land Tenure Bill was prepared to help resolve disputes, but the bill was defeated in the Parliament in 1990 [4]. Land registration or certification legislation would permit greater protection of the forests and pave the way for the establishment of a protected area system. It might also allow timber plantations on custom-owned land. In the past plantations have been located solely on government-owned land [9].

STATE OF THE ENVIRONMENT

Inventory of Natural Resources

Ecological zones

The Solomon Islands are a near equatorial, extensive double chain of oceanic islands of volcanic origin. They are largely covered with tropical moist lowland rain forest, with the exception of parts of the dryer northern plains of Guadalcanal (where grasslands predominate) and the volcanic areas which have cloud or moss forests. Part of the Pacific volcanic fire rim, the island chains have a number of active volcanoes.

Water

Rivers and streams are numerous on all of the larger islands as well as many of the smaller ones (Fig. 2). In the villages, water quality varies with rainfall and particularly with the natural or man-made disturbance of the catchment areas [17].

Important water sources on many islands are the freshwater "lenses" on coral atolls — aquifers which commonly "float" on seawater [4].

Forest

Despite the wide geographical spread of the islands, the climax vegetation types show remarkable similarity [31]. Twelve very common species make up the upper canopy of primary lowland rain forest. Dominant species include *Calophyllum kajewskii*, *C. vitiense*, *Camptosperma brevipedunculata*, *Dillenia samomonensis*, *Elaeocarpus sphaericus*, *Endospermum medullosum*, *Gmelina moluccana*, *Maranthes corymbosa*, *Parinari salomonensis*, *Pometia pinnata*, *Schizomeria serrata* and *Terminalia calamansanai*. All these species, with the exception of *Dillenia salomonensis* are found throughout the country. Lowland rain forest contains fewer large tree species than, for example, south-eastern Malaysia, and the canopy is mostly irregular. Tree height varies from 30 to 40m. Taller trees are mainly *Terminalia calamansanai*, *Burckella obovata* or giant banyan trees of the genus *Ficus*, which commonly reach 45m [16].

Prior to recent extensive logging, the Solomons supported a rain forest mantle broken only by grassland and heath. Forest cover was estimated to be 24,230km² in 1980 (88% of the land area). A higher figure of 25,260km² was cited by the Ministry of Natural Resources in 1990 (see also Fig. 3). A national forest resource inventory, which began in late 1990, should provide definitive information.

Cyclones are the major influence on floristic differentiation in the Solomon Islands' forests, but human activities have also made a major impact on structure and composition. When populations were distributed further inland, larger areas were cultivated. When these areas were abandoned valuable stands of timber developed.

Several islands had, or still have, interesting variations on the general forest structure. The Santa Cruz islands, for example, had forest dominated by the kauri pine *Agathis macrophylla* but these are now almost completely logged over. On Guadalcanal, around the Solomons'

capital Honiara, rain forest has been replaced by mixed deciduous forest which has been largely degraded to savanna woodland maintained by dry-season fires. Several exotic species have established themselves. The most prominent are *Leucaena leucocephala* and *Broussonetia papyifera*. Small pockets of swamp forest occur mainly along the coast on poorly drained sites. *Terminalia brassii*, an important commercial species, forms pure stands [9].

The extent of commercial timber reserves is uncertain. The uncut, potentially commercially productive forests was estimated at only 1840km² (or 7.6% of the total forested land) in 1978, nearly 70% in Western Province. Since then, logging and clearing for cultivation have been taking place at 60-80km² a year [36].

Forests of commercial value cover about 8% of the land. Most are in the lowland areas, in particular the richer valleys and well-drained alluvial regions. Major timber operations take place on Kolombangara, New Georgia, Santa Cruz and Guadalcanal. The bulk of production is exported as logs but some sawn timber is produced for both export and domestic use. Recently the Government has required 50% of log processing to be carried out in the Solomon Islands.

Concern has been expressed at the rate of forest use. Estimates of remaining accessible timber resources (i.e., feasible to log technically and economically) have all been based on very limited or outdated information [16]. The most optimistic estimate [37] is approximately 36 years if logged at current levels, and 15 years if the maximum allowable cut is taken under timber license agreements. The national forest resource inventory should allow a better estimate to be made [16].

In 1990 the government introduced new legislation designed to protect and sustain forestry reserves as well as the right of customary landowners. This is expected to slow the rate of exploitation of woodland and the consequent environmental damage [2].

The Solomon Islands has extensive mangroves. These were estimated to total 642km² in 1976, but there is no recent information on distribution and condition of stands. The mangroves have not been exploited on an industrial scale but continue to provide rural communities with construction materials, firewood and other community needs [17]. A recent survey of 13 estuaries found mangroves played an insignificant role as nurseries for coral reef species, although they were considered to be important feeding grounds for many other species [27].

In addition to their obvious commercial value, the forests have a number of other benefits: one report [32] has identified 119 native plants that are important food sources and an additional 64 species that are of agricultural value in uses such as crop protection, fencing and animal medicine. In the same study, 313 plants were identified as being important for housing timber, canoe building, fuel and a variety of traditional uses such as fishing materials, carving, dyes, weaving and tools. A further 143 species were identified as having medicinal properties and are used to treat a wide range of ailments.

Agriculture

As a whole, the soils of the Solomon Islands are rich in nitrogen, phosphorous and organic carbon but relatively poor in potassium and magnesium. They are usually deep and well drained. The most agriculturally important soils are recent alluvials, extremely fertile earth found only on the north Guadalcanal plains [17].

Agriculture is the main activity; 90% rely on subsistence crops such as coconuts, sweet potatoes, taro (*Colocasia esulente*, whose tuberous roots are used as food), yams, cassava, garden vegetables and fruit for their livelihood [2]. Smallholders also produce spices such as ginger, turmeric, allspice and cinnamon for export, but in small amounts. In 1986 subsistence agriculture was estimated to account for 16.5% of GDP [4].

Agriculture made up 75% of GDP [3] and 24.5% of export earnings in 1990 [4]. The principal commercial crop is copra (Table 1), which was for many years the islands main export. About 70% of production comes from smallholders and cooperatives, the rest from plantations [3]. A record crop of 42,586 tonnes was produced in 1984 but a severe cyclone in 1986 destroyed most crops on the islands. Production levels climbed again, to 34,300 tonnes in 1990 but accounted for only 6% of total export earnings [2]. All copra is marketed through the Solomon Islands Copra Marketing Board [3].

Rice exports were almost completely curtailed owing to the cyclone of 1986 and closure of the rice research and growing farm in North Guadalcanal in 1987; trade has reportedly resumed to Pacific countries, however, as of 1990 [2,3].

Table 1. Exports of major primary products ('000 tonnes) [39]

Product	1984	1985	1986	1987	1988	1989	1990
Copra	42.0	43.5	32.4	27.9	27.2	35.1	29.5
Palm oil	21.5	18.6	14.5	11.5	13.6	20.7	23.7
Palm kernels	4.0	3.3	4.33	2.8	2.9	2.6	3.9
Rice	9.6	3.4	1.4	--	--	--	--
Cocoa	1.4	1.7	2.0	2.7	2.6	3.3	3.6

Palm oil recovered more quickly from cyclone damage than other crops as a result of attractive prices and the efficient rehabilitation efforts of Solomon Islands Plantations Ltd., which accounts for all output. The company was set up in 1976 as a joint venture between the government and the Commonwealth Development Corporation (CDC), which is also a partner in large-scale palm plantations [3]. Palm oil was the highest export earner among agricultural crops in 1990 and 1991, generating SI\$18 million for each of those years [6].

Cocoa production has expanded considerably since 1986, rising more than 18%, with production in 1990 at 3900 tonnes, half from plantations, half from smallholders. Production is expected to reach 5000 tonnes in the next 2-3 years. No commercial processing of cocoa takes place [4].

1990 saw a rapid expansion of honey production to 24 tonnes, half of which is exported. Production of the local ngali nut (a high-value confectionary nut) for export is becoming important but no production figures are available [2,4].

In addition to periodic cyclones and earthquakes, the agricultural sector suffers from several technological and natural handicaps. Only 30% of the land is cultivable; the rest has poor soils or coastal swamps and steep hills and valleys. Traditional agricultural methods have become a cause of environmental damage. The traditional slash-and-burn system of cultivation, for instance, necessitates long periods of fallow, but land shortage has reduced this duration dramatically with dire consequences for productivity and soil degradation [3].

Improvements in education and training are considered essential to stimulate the agricultural sector and investment. In view of the extremely scattered population (the average population centre groups an estimated 39 people) agricultural extension and support services are both difficult and costly to provide. One way of encouraging smallholder agriculture has been to associate it with or locate it near large estates or plantations; smallholders can then benefit from the advanced techniques and knowledge of the larger farms [2,3].

Livestock

Pig production provides an important part of the local food supply [3]. Cattle production has been declining steadily. The government decided to withdraw recurrent financial support from the Livestock Development Authority in 1988.

Government aid has concentrated on strengthening support for pig and poultry farmers. Plans were developed in 1988 to promote the raising of goats and crocodiles [2]. No action has been reported on this scheme.

Fisheries

During the last 10 years, the fisheries sector has developed strongly. Its potential has been greatly enlarged by the declaration of a 350km Exclusive Economic Zone (EEZ). Fishing is now the largest private-sector employer and in 1991 was the largest earner of export revenues [2, 6].

Two major fishing companies operate out of the Solomon Islands. Solomon Taiyo, a company jointly owned by the government and Japanese interests, has shore bases at Tulaghi and Noro. The Noro cannery and fish meal plant opened in 1989. The second company, National Fisheries Development Ltd., was jointly owned by the government (75%) and Solomon Taiyo (25%) until it was sold to Canadian interests in 1990.

The main commercial catches are skipjack, yellowfin, albacore and other types of tuna suitable for the raw fish market in Japan [3]. The Solomon Islands now has the largest tuna fleet of the Pacific Island countries and has largely closed its waters to foreign fishing vessels [17]. The total catch in 1989 reached about 57,000 tonnes but dropped to the lowest in eight years in 1990, to 29,500 tonnes [4, 38]. This low catch was attributed to poor climatic conditions, small sizes of fish and repair problems with the fishing fleet. In 1991, the catch rose again, to 42,704 tonnes [6].

In the wake of the success of the fishing industry, other maritime enterprises are being encouraged, such as the culture of giant clams, marine prawns and seaweed [2].

Solomon Islanders consume about 34kg/person/year of seafood and are clearly heavily dependent on the subsistence catch, primarily from the reefs and lagoons [17]. Total domestic catch of reef fish (more than 180 species) is not known; about 70 tonnes a year are sold locally.

Protected areas and wildlife

Nominal protected areas are few in number on the Solomon Islands and currently cover some 0.2% of the land. Protected areas include Queen Elizabeth II National Park, Tulagi Bird Sanctuary, Arnavon Wildlife Sanctuary, Oema Island Bird Sanctuary and Simbo Megapode Management Area [16].

The inadequacy of this protected area system has several causes. State-owned land covers only 257km² (9% of total land, of which 240km² is committed to forestry plantation or operation. At present there is also little opportunity to develop conservation areas on uncommitted government land. The protected areas system is thus very weak. None of the formally gazetted areas has management or field staff, and they have very little conservation significance or official recognition.

Customary land owners are frequently willing to grant temporary access rights for timber felling but are reluctant to be alienated permanently from their land to create protected areas. Arnavon Wildlife Sanctuary, for example, was gazetted without consulting parties claiming rights under customary law. This led to serious management implementation problems and a failure to protect the site [1].

Of the 31 identified terrestrial and marine habitats, only three are included with even nominal protected areas, namely some lowland rain forest types, mixed species montane rain forest and grassland. Habitats which at present receive no protection include various lowland rain forest formations; *Neonauclea/Sloanea* montane rain forest; cloud, riverine, swamp, mangrove and atoll/beach forests; *Casuarina* woodland and scrub; serpentine vegetation and dwarf-shrub heath; various freshwater habitats; sea turtle nesting areas; algal and seagrass beds with associated fauna; various reef formation, rocky coast, lagoons estuaries and offshore environments [1].

In conservation importance, Rennell Island is ranked eight in the entire Oceanian Realm and is the second most important raised coral island after Guam. Critically important sites, none of which are protected at present, include Rennell, the Arnavon islands and the kauri pine (*Agathis macrophylla*) stands on Santa Cruz. Coastal, mangrove and montane forests are all critically unprotected [1].

The best conservation at present is that carried out by some of the customary land-owning groups, although these efforts have thus far escaped recognition and lack the support of formal legislation. This will be rectified when there is formal government recognition of these community-based protected areas.

One proposal for a protected system based on the distribution of birds suggested declaring three large high-priority protected areas, three smaller high-priority ones and eight medium-priority protected zones. Mammal, insect and plant species would also benefit from such a plan as their distribution patterns are probably similar. In addition various reefs, lagoons, mangrove and small botanical reserves would be included [1].

Tourism in the Islands is currently at a very low level, with some 11,000 visitors annually. Proposals exist to develop "conservation tourism", centred on Rennell's freshwater Te Nggano Lake and emphasising the natural attraction of the area. This would encourage the development of a protected areas system [1]. There have been some recent developments with the Komorindi protected area proposal.

Non-renewable resources

Mining has not been extensive in the Solomon Islands. But recent changes to the mining and petroleum laws, hitherto a barrier to potential developers, are expected to encourage exploitation. Heavy mineralised areas at Betilonga and in the Sutakiki valley, on Guadalcanal, have been investigated for gold, silver and copper. There have been surveys of phosphate deposits, estimated at ten million tonnes, on Bellona Island, of deposits of asbestos at Kumboro, on Choiseul, and of high grade bauxite on Rennell and Vaghena Islands [2,3]. Deposits of lead, zinc and cobalt have also been discovered.

Nickel deposits of 24 million tonnes of ore on San George and Isabel islands are likely to be exploited in the early 1990s.

Gold and silver production is carried on by 60-70 alluvial panners who sell gold to dealers for export to Australia. Both the volume and value of gold declined significantly in 1987 and 1988, but it still constituted 2% of export earnings (SI\$1.6 million). Cyprus Mining, a US company, is interested in a small open-cut mine at Gold Ridge on Guadalcanal with reserves estimated to be three million ounces. The project is currently under independent review; negotiations with affected landowners are taking place and land acquisition procedures have begun [2, 3, 4].

Environmental concerns have been expressed regarding inadequate rehabilitation of prospecting sites and negligent prospecting. A major concern is the lack of institutional capacity in the government to screen development proposals adequately and undertake environmental impact assessments (EIAs) of mining proposals. This capacity is expected to be increased in the near future.

Although on-shore oil exploration began in Central Guadalcanal in early 1960, no commercial fields have been identified. Off-shore, seismic exploration of about 25,000km² of sea bed has indicated that five areas have good potential, but further work is required before a full evaluation can be made [17].

Industry

Main industrial sectors

Manufacturing on the islands is not well-developed. The main enterprises are the fish freezing, canning and smoking factories from the fish industry. The only factory of any size is the fish processing plant at Noro, run as a joint venture by the government and a Japanese company [3]. Six sawmills were in operation in 1988, and a flour and rice mill also began operations in that year [3].

Other manufacturing, all on a small scale, includes wickerwork furniture, fibreglass articles, clothing, boat building, batteries, spices, tobacco and soft drinks. Investment in plants for fruit juice canning and milk reconstitution are being considered. Various handicraft items are exported.

In 1989 the government announced that it planned to encourage the development of tourism for the first time. The 10-year plan aimed to increase the number of hotels in Honiara from 3 to 10 and the number of resorts in rural areas from 20 to about 100. In spite of tourist investment of SI\$62 million, it is thought that growth is likely to take some time. In 1989 there were only 290 hotel and resort rooms, two-thirds in Honiara. In 1990 only 30% of the estimated 11,000 people who visited the islands were classified as tourists [2, 3].

Net tourist earnings at present are similar to those from shell exports, but could grow to rival fisheries and forest products. Great efforts will be needed to upgrade infrastructure and domestic services. Proposals for tourism expansion are being made on the basis of financial assistance from the European Development Fund (EDF) of the CEC, within the framework of the Pacific Regional Tourism Development Programme [1].

Location of industry

Industries are mainly located in Honiara, apart from the Noro fish-processing plant. Small sawmill operations are associated with individual communities. In general the small cottage industries are decentralised, indicating the self-reliance of outlying areas.

Energy sources and consumption

The most common domestic energy sources in the Solomons are fuelwood and charcoal. A number of industries use oil, although consumption figures are unavailable. Oil imports amounted to nearly 10% of total imports costs in 1989 [2, 3].

Electricity is available in several urban areas from six generating stations. In 1986 total consumption was 26GWh, 90% in Honiara [3]. Plans to establish new hydro projects in other urban areas are under way.

Solar power installations are spreading to rural areas but wider use is hampered by an import duty of 35% on materials [4].

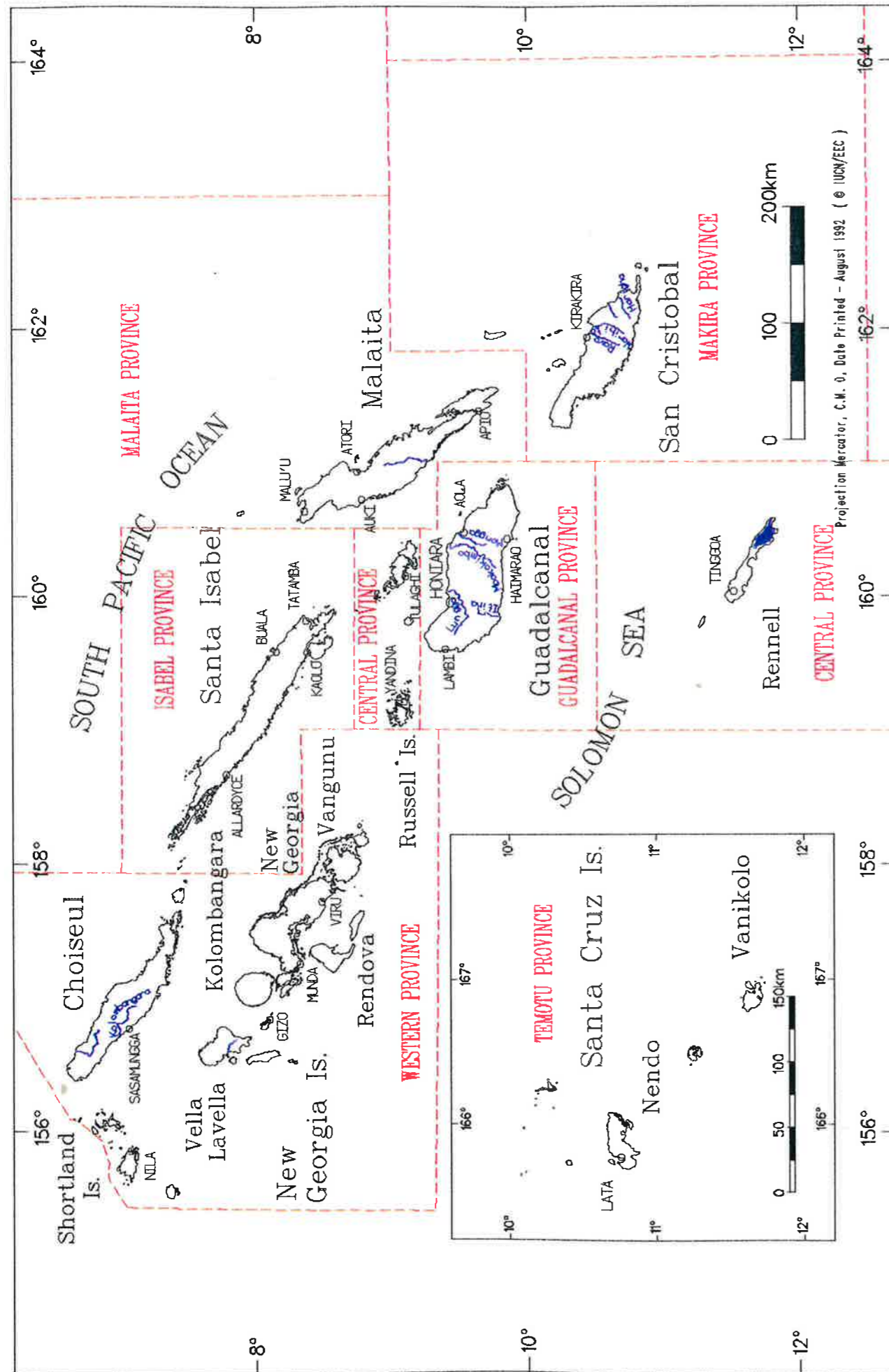


Figure 1. Administrative Boundaries, Rivers and major towns of The Solomon Islands.

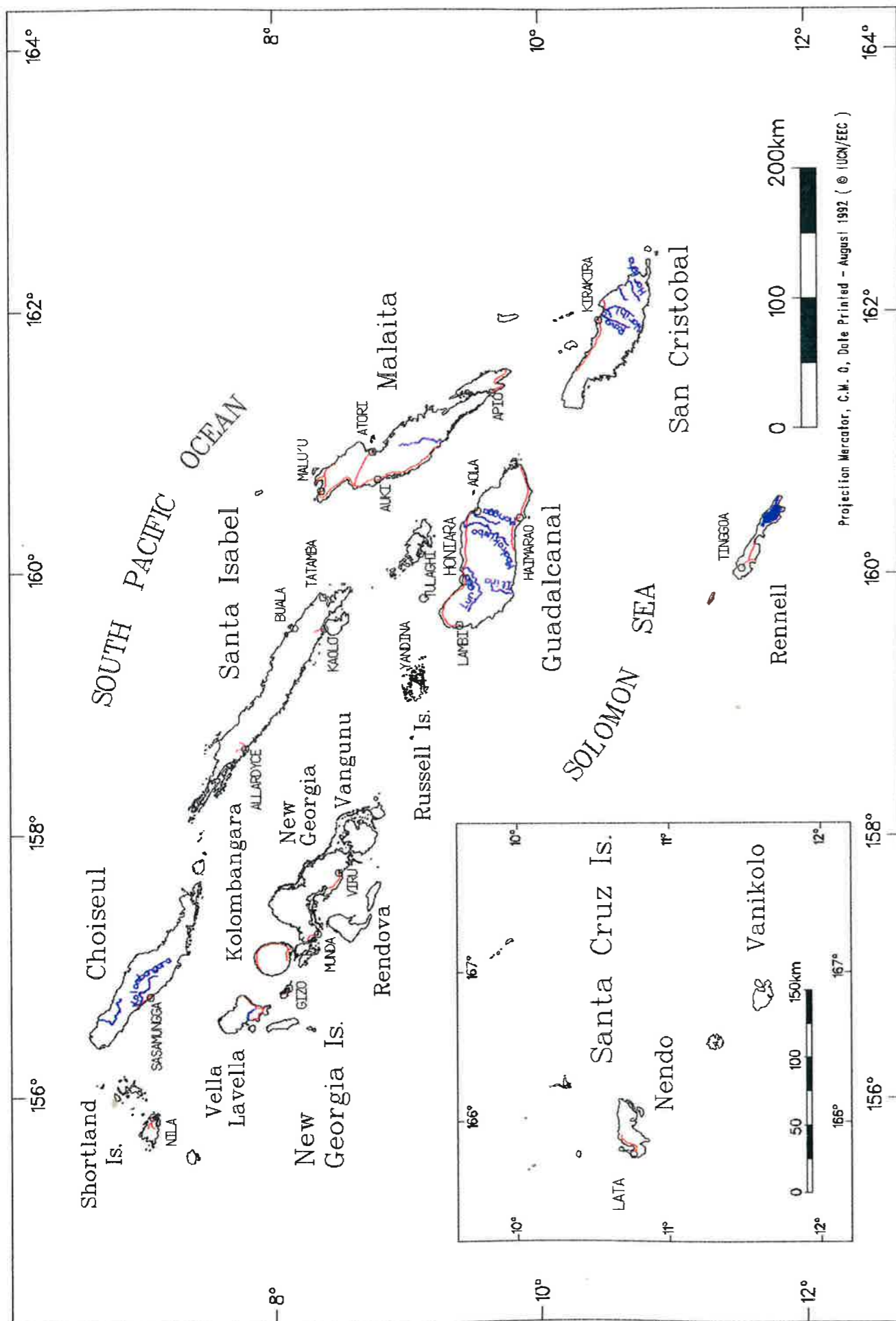


Figure 2. Major communication routes in The Solomon Islands:

Demography and Urbanisation

Demographic pattern

At the latest national census in 1986 the recorded population totalled 285,796. In 1991 it was officially estimated at 328,695.

Malaita and Guadalcanal are the most heavily populated of the six large islands and many smaller ones that make up the Solomon Islands (see Table 2). The average population density for the islands is 11.6 people/km². Most people live in rural areas in small settlements and villages along the coastal fringe, average village size being about 44 people [17]. Above-average densities are found in Central, Malaita and Temotu Provinces. Such averages can be misleading because they are not expressed as a percentage of the available arable land; they also mask some critical areas of high population density on small islands, notably Reef Island with 177 per km² and Tikopia which has 1166 people living on 4km² (equivalent to 292 per km²) (see Table 3). It is on such islands in particular that the pressures on limited land resources are more likely to cause severe environmental problems [17].

Table 2. Estimated population distribution in 1991 [in 17]

Province	Estimated population	% distribution	Density/km ²
Western	64,716	20	7.0
Isabel	16,564	5	4.0
Central	20,997	6	16.3
Guadalcanal (excluding Honiara)	60,746	19	11.4
Honiara	37,451	11	1702.3
Malaita	86,491	26	20.5
Makira	25,235	8	7.9
Temotu	16,495	5	19.0
Total	328,695	100	average 11.6

About 94% of the population are Melanesian, 4% Polynesian, 1% Micronesian, with some Europeans and Chinese. About 80 dialects and languages are spoken, but Pidgin English (in Pijin, much of the vocabulary is derived from standard English but used in a Melanesian grammatical form and with different intonations) is the lingua franca and widely understood. Standard English is the official language [2].

About half of the population are under 14. Less than 5% are over 60 years of age. Life expectancy, averaging 60.5 years varies only slightly between males and females [4].

Christianity is the dominant religion. The Church of Melanesia claims 30% of the population, the Roman Catholic Church 20%, the South Seas Evangelical Church 18%, the United

The Solomon Islands

Church (11%) and the Seventh Day Adventists make up 10%. Only 2.1% profess adherence to customary beliefs and 0.5% profess no religion [4].

Table 3. Islands with higher than average population densities (from 1986 census) [16]

Island	Area (km ²)	Population (1986)	Density/km ²
Vella Lavella	868	15,385	17.7
Russells	231	4,727	20.5
Ngella	354	10,161	28.7
Savo	30	1,826	60.2
Ulawa	63	2,049	32.5
Reef	29	5,118	176.5
Santa Cruz	586	7,166	12.2
Tikopia	4	1,166	291.5
Anuta	3	207	69.0

Population growth

The population rose from approximately 161,000 in 1970 to 197,000 in 1976. During 1976-1986 the annual rate of increase was 3.5%, one of the highest in the world [4]. It is exceeded in the Pacific, for example, only by Wallis and Futuna with 5% and the Republic of the Marshall Islands with 4.2% [17]. The fertility rate is over six children, the highest rate for all the island nations of the Pacific [4].

Population growth projections vary. Assuming constant fertility and mortality levels over the next 35 years, the population is projected to reach 470,000 by 2001 and nearly one million by 2021. If, however, mortality levels are assumed to be declining at a rate equal to that during the past census period and fertility drops faster than the current decline to the provisional target set by the Solomon Islands Population Committee, population levels will reach just over 400,000 in 2001 and 566,000 in 2021 [4].

Internal and external migration

Migration between the individual islands of the Solomons is fairly common. Over 20% of those aged 15 or over make a lifetime migration between provinces. Guadalcanal and Honiara are the most popular destinations in inter-island migration, although recently completed port facilities at Noro have led to a high level of immigration into Orviana [4]. In 1986 all provinces except Guadalcanal and Central showed net emigration, with Malaita having the highest rate [4].

Nevertheless, the larger towns (Honiara, Gizo, Auki) have high emigration rates as previous immigrants (or their offspring) return to their "home" island. In the case of Gizo and Auki this has resulted in a net population loss. Over 40% of the adult population of the smaller, remote and densely populated out-islands such as Sikaiana, Tikopia, Bellona, Reef and Duff Islands and Rennell have moved away.

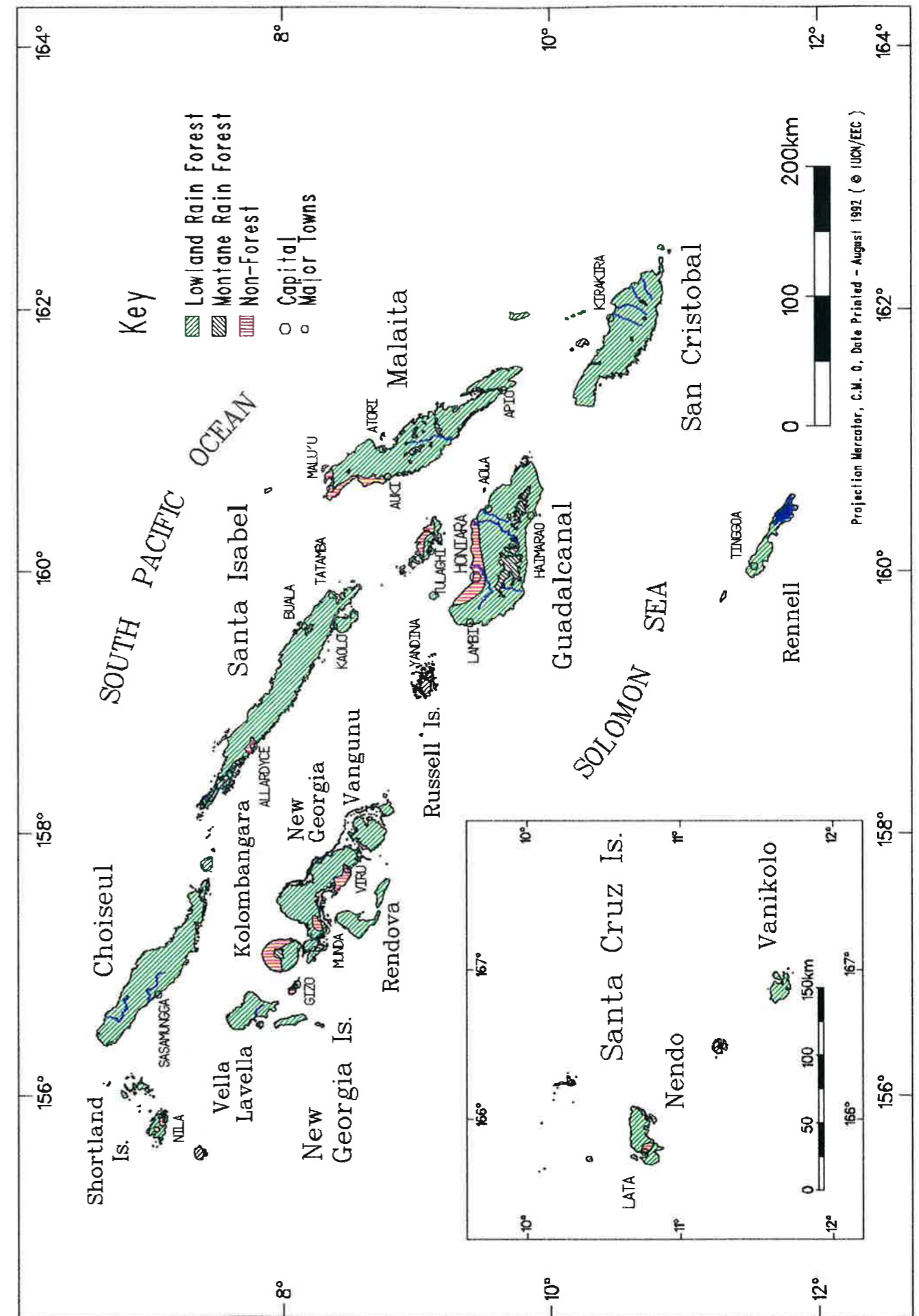


Figure 3. Vegetation pattern of The Solomon Islands.

See text and Annex I for further details.

International migration over the past ten years has been negligible [4].

Extent, density and distribution of urbanisation

Honiara is the only sizeable urban centre, with an estimated 37,500 inhabitants. Migration of wage earners and their dependents to Honiara and North Guadalcanal has given those places growth rates twice the national average [3].

Due in part to the poor infrastructure, the government is emphasising decentralised rural development to prevent a further population drift to the capital. In several five-year development plans, almost half of public capital expenditure went to infrastructural projects, and strong focus was placed on education and general rural development [2]. Honiara still is experiencing a high growth rate and rural schemes will need to be continued.

Main towns on other islands include Kirakira, on San Cristobal, Auki, on Malaita, and Seghe, on New Georgia.

Health issues

Malaria is the most serious health problem in the Solomons. Cases of the disease are growing rapidly, with 86,820, or 20% of Solomon Islanders, recorded as developing the disease in 1990. This estimate shows a 33% increase on the 1989 figure. The Malaria Research Institute claimed that more than 80% of Honiara's population were suffering from malaria in 1990. Although reservations have been expressed about the claims, evidence shows a major problem exists. The Malarial Eradication Programme has been intensified in recent years, with frequent DDT sprayings to eliminate mosquitos from dwellings [3,7].

The other main (but considerably less serious) diseases are tuberculosis and leprosy, the incidence of which are apparently decreasing due to vaccination and better detection techniques [7]. A combined tuberculosis/leprosy programme has been devised in order to bring about better control of individual patients in a domestic situation [15]. A WHO report in early 1993 stated that no AIDS cases had been reported [40].

Diarrhoeal diseases are relatively common in some areas and are often related to other infections such as malaria or respiratory disease.

Mild to moderate malnutrition is seen in some areas but the true incidence and geographic distribution are unknown.

There are six government hospitals and two others that are run by missions, together with 124 clinics of various types. In total they provide 713 hospital beds and 685 clinic beds. The country has 38 doctors and 420 nurses. In 1976 there were 6250 persons per doctor but by 1983 this figure had risen to 7105 [3].

At the 1986 census, 52% of the population had had no education, 40% had received primary education, 7% secondary education and only 1% higher education. Western Province has a dramatically lower level of persons with no education (9%) and a very high level (80%) of primary school education. Education qualifications are lowest in Malaita [4].

ANALYSIS OF POLLUTION AND DEGRADATION PROCESSES

Water Pollution and Water Shortage

Only 25% of the rural population has a safe water supply and only about 20% has proper sanitation [3]. This problem was exacerbated by the damage to existing water supplies by the cyclones in early 1987 and 1988. The government's objective in its second five-year plan was to supply all rural communities with drinkable water by 1991 [3].

The greatest threat to water supplies are contamination from domestic wastes and waterborne disease-carrying insects. Larger settlements such as Honiara are thought to be particularly vulnerable. The available supply of water tapped from surface and groundwater aquifers is now inadequate in the capital city to meet urban domestic demand and the water needs of proposed new industries such as a brewery [17]. Although surface and ground water resources are abundant in Honiara, these need to be more fully developed and existing leakages minimised.

Chemicals such as DDT for anti-malaria spraying have been widely used in the past, with little assessment of environmental impact. DDT is still used in many rural areas for these purposes and it is likely that there are residual levels of the pesticide in the environment [17]. The use of biocides and chemical fertilizers has been widespread on Guadalcanal and in the Russells, mainly on the large-scale commercial plantations of coconut and oil palm. Seepage of hazardous materials and leachates may result in contamination of ground waters and marine pollution [17]. Little education is offered regarding the safe use and handling of dangerous chemicals.

Siltation of watercourses has resulted from poorly constructed and maintained roads on Guadalcanal (built mainly for logging). Many complaints of the declines in the quality of drinking water have followed logging [4].

Mining as yet is not extensive, but as development increases in the next decade, disposal of mine wastes and tailings will be a threat to nearby rivers.

Soil Erosion and Degradation

Soil degradation has been identified by the Ministry for Agriculture and Lands as the main environmental issue for agricultural development in the rural areas. Rapidly expanding village populations has put a high demand on arable land for subsistence gardening, particularly in areas such as central Malaita, Ontong Java and the hinterland of Honiara. This, in turn, has meant a reduction in fallow periods to replenish soil nutrients. Fallow periods have fallen from as much as 15 years to less than six months. Garden yields have been reduced, placing further demand on available agricultural soils. Expansion of garden areas to more mountainous terrain has also increased soil erosion, land slips and susceptibility to cyclone damage [4].

Most land degradation complaints such as soil erosion, soil compaction, loss of nutrient cycling, and loss of soil fertility, occur during and after logging [16]. Timber roading and snigging (hauling logs from a forest using chains) on Gizo and Kolombangara have resulted in severe soil damage to an estimated 15% of the land traversed by heavy machinery. Many areas note an increase in soil compaction from heavy equipment, loss of the nutrient-recycling ability of the forest, and sheet and gully erosion. The result is topsoil removal and eventual silting of rivers and lagoons [5].

Deforestation

Before the 1970s the forests on the Solomon Islands were largely pristine. Since then, widespread logging by foreign enterprises has resulted in the loss of primary forest on several islands, especially Gizo and Kolombangara, with consequent loss of wildlife habitat, soil compaction and erosion.

In 1990 there were 15 licensed logging companies (only ten of which were operating) and 17 licensed sawmills. All provinces, with the exception of Central Province, have been or are subject to logging. The largest volume in 1990 came from New Georgia and Rendova (Table 4), where three companies operate. Sawn timber in 1990 amounted to 21,831m³.

Table 4. Log export production by island in 1990 [16]

Island	No. of companies	Log volume (m ³)	% total log export production
New Georgia and Rendova	3	187,034	49
Choiseul	1	55,952	15
Guadalcanal	2	45,277	12
Shortlands	1	39,107	10
Makira	1	31,291	8
Malaita	2	26,465	6
Total	10	385,126	100

Despite the closure of Lever's Pacific Timbers Company in 1986, forestry remains an important source of export revenue. In 1990 it was the largest currency earner, accounting for 34% of export revenues [2]. About 95% of log exports go to Japan. Sawn timber is sold to Australia, New Zealand and the UK [3]. The 1990 level of production is expected to be short-lived.

To expand monitoring of logging practices and adherence to licensing terms, the government has recently undertaken an AIDAB-funded Timber Control Project. The project aims first to expand the government's monitoring capacity. This will ensure that environmental damage and wastage is minimised; timber agreements adhered to; information on use is regularly and reliable updated; and that information on production, revenue and invoicing is correct. The

second objective is to train and assist customary landowners to negotiate logging contracts on a more informed base; make them more aware of the environmental dangers of logging; and enable them to monitor logging on their land [16].

Areas of natural forest close to villages have been seriously degraded by commercial logging on many islands including Kolombangara, New Georgia, Gizo and Guadalcanal. Under 1986 regulations logging, companies can fell only trees with a diameter in excess of 60cm; this regulation is likely to reduce damage to forests and enhance natural regeneration [1]. But at the moment the losses can be expected to seriously jeopardise the long-term viability and quality of village life. In addition, previously inaccessible areas adjacent to logging roads will become open to slash-and-burn farming. While this is still limited in the Solomons, pressures of population indicate it is likely to become more common.

There has been a dramatic increase in shifting agriculture, which has also caused extensive deforestation. Aerial photographs in 1991 indicated that the land under cultivation is double that of 1972 [4,9], roughly equivalent to the increase in population. Coastal forests are under particular pressure, usually for conversion to coconut plantations or to provide firewood and building materials.

A major concern is the disparity between exploitation and replacement, plus the growth in logging of the remnant forest. There is little information on the rate of natural regeneration in the Solomon Islands. Research is needed. Sustainable management procedures should also be developed.

Among reforestation efforts timber plantations are being created at the rate of 15km² annually, with 240km² established as of the end of 1989. These are all located on government-owned land. Common species planted include teak, mahogany and gmelina. It is hoped they will become a major source of export revenue to gradually replace earnings from the natural forests as the level of commercial timber is exhausted [9]. Extensive plantations are also planned for Kolombangara in a joint venture between the government and the Commonwealth Development Corporation [1].

The mangrove forest has never been heavily exploited and the canopy is typically 24m tall. Mangroves around Marovo Lagoon have been felled in the mistaken belief that they inhibit production of coconut plantation. In rural areas there is some exploitation for firewood and construction timber.

Biodiversity

Biologically, the main chain of islands that stretches from the Shortlands to Malaita (including Choiseul, Isabel and Guadalcanal) share many species, while the western chain that ranges from Vella Lavella through Kolombangara and New Georgia to Gatukai, shares other distinctive species. Makira and the Santa Cruz group of islands also have distinctive faunas.

The flora of the Solomon Islands has its strongest affinities with that of Malesia (the area including Papua New Guinea, Malaysia, Indonesia and the Philippines), but has fewer

families, genera and species because it is geologically recent and has never been linked by land to another continent [31]. There is no overall estimate for the level of species endemism, but specific examples of endemism for certain Families and Genera may be found in reference [16].

A total of 3210 species of vascular plants have been listed for the islands [32], but as many as 4500 species are believed to occur. Almost 400 fern species, 230 species of orchids and 1750 flowering plants have been recorded.

There has been no assessment of rare or endangered plant species, nor of the impact of introduced plants, many of which appear to have spread following disturbance of natural forest [16].

Of the native fauna, birds have been the most closely studied. The Solomons have the most diverse avifauna of all the Pacific Ocean islands [16]. An estimated 173 species of land birds breed in the islands [33], while an additional 50 species of sea birds or migrants have also been recorded. The islands are also known for their high level of endemism: even at the species level 44% of the birds are endemic. Eighteen of these species are considered threatened [34], although the precise conservation status of most species is not well known.

With the exception of frogs, mammals are the most poorly studied group of vertebrates [16]. There are 52 species of native mammal, predominantly flying fox (26 species), insectivorous bats (18) and rats (8). Fifty percent of the species are endemic and represent one of the one of the worlds richest areas of diversity for pteropid flying foxes and giant rats. Three species of giant rats, 13 species of flying foxes and four species of insectivorous bat are considered vulnerable or endangered because their limited distribution and the habitat alterations that are taking place on many of the islands [16, 17]. The dugong (*Dugong dugon*) is considered vulnerable.

Among the 130 species of butterfly, 35 are endemic and 54 are shared with Papua New Guinea. Rare species include the sword-tail butterflies *Graphium meeki* (found only on Choiseul, Santa Isabel and Bougainville), *Graphium mendana* and a swallow-tail butterfly *Papilio toboroi* [8, 17].

Among other invertebrates there is a high generic endemism of land snails including 15 species of *Papuina* (Camaenidae) and eight species of Partulidae. Seventy-two species of reptiles and amphibians have been recorded, including eight endemic species and one endemic genus. One species of skink *Corucia zebrata* is found only in the Solomon Islands and Bougainville while another, *Sphenomorphus bignelli*, is exclusive to Guadalcanal, Kolombangara, Ngela and the Russell Islands [8].

Rennell Island has the highest level of faunal endemism in the Solomons [4]. Five endemic bird species occur there: Rennell shrikebill (*Clytorhynchus hamlini*), Rennell fantail (*Rhipidura rennelliana*), Rennell Island white-eye (*Zosterops rennelliana*), Woodford's white-eye (*Woodfordia superciliosa*) and the Rennell starling (*Aplonis insularis*) [10]. Ten species

of bat and a subspecies of *Rattus exulans* as well as 17 species of reptile also occur on the island [10].

A recent survey (1989) found that the saltwater crocodile (*Crocodylus porosus*) was nearly locally extinct as a result of over-exploitation for the skin trade [28]. The Solomon Islands Government is considering a number of restrictive measures to protect the species.

Green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) nest in small numbers on many beaches throughout Solomon Islands. Green turtles are important resources for food and culture for many coastal people and there is a small local trade in meat. Hawksbill turtle populations are believed to have declined significantly since 1980, most likely as a result of turtle shell export (3.9 tonnes in 1989) [29]. While the nests of leatherback turtles (*Dermochelys coriacea*) continue to be harvested for their eggs (despite legal prohibitions), numbers appear to be recovering, and an increase in nesting turtles has been recorded in Western and Isabel Provinces [30]. The loggerhead turtle (*Caretta caretta*) and olive ridley turtle (*Lepidochelys olivacea*) are also found in Solomon waters, but are very rare [17].

Japan, the only importer of turtle shell (bekko) has announced that it will cease to import it in 1993 and the market will therefore be closed [16]. The Fisheries Division is currently working on an amendment to ban the export of unworked bekko.

Major threats to biological diversity come from deforestation, soil erosion and siltation of rivers, mangroves and coastal marine ecosystems. Due to the high degree of endemism in the Solomons, any substantial loss of habitat is likely to lead to the extinction of species of plant and animal. Trade in wildlife is also a major problem. At least 19 species of reptiles and four species of frogs have been exported for the live pet trade. A total of 14,137 and 13,538 reptiles and amphibians were exported in 1989 and 1990, respectively [35]. Butterflies and other insects have also formed part of the traditional wildlife trade while, more recently, white cockatoos (*Cacatua ducorpsi*) and cardinal lorikeets (*Chalcopsitta cardinalis*) have been exported [16].

Marine Environment and the Coastal Zone

The marine environment is, along with the lowland forests, the most heavily used resource in the Solomons. The islands are surrounded by extensive fringing reefs and seagrass beds which act as nurseries for the inshore fish stocks. The dredging of coral and sand from shallow coastal areas for construction has damaged this ecosystem, although the extent and degree of degradation are not known. Sand and gravel excavations along the coast have created coastal erosion and sedimentation, threatening the reefs.

Many marine species have been affected by over-exploitation. While there is no national assessment of bêche-de-mer stocks there are indications, at least in Ontong Java where fishermen are probably the largest producers, that the bêche-de-mer population is being affected by fishing pressure. A decrease in size of preferred species and fewer numbers are reported [17]. Three commercially important species of pearl shell continue to be harvested:

goldlip pearl oyster (*Pinctada maxima*) is believed to have been systematically over-exploited, but the blacklip pearl oyster (*P. margaritifera*) may be under most pressure due to its accessibility to divers. There are also indications that the green snail stocks are being over-exploited to take advantage of current high prices. Several species of lobster have also been exploited on a small scale by joint ventures. Because of concern at over-exploitation of the coconut crab (*Birgus latro*), the government imposed a moratorium on exports, but this is being circumvented [17] (see also Biodiversity).

Mangrove stands occur on most coasts. They are extensive on Santa Isabel, Malaita and in the New Georgia group islands and are believed to have an important role in the production of anchovy-type fish used as bait in the skipjack tuna industry [9] (see Deforestation for details of mangrove destruction).

Very little scientific work has been carried out on the reefs themselves. A 1965 Royal Society Expedition, which produced the only substantial account, found that in general the Solomon Islands lacked the luxuriant reefs of many parts of the Pacific, because of unfavourable environmental conditions such as steep and exposed shores with little suitable substrate for coral growth.

The most common pollution of the marine habitat is from untreated sewage in areas of concentrated population. Several studies of the South Pacific region indicate high levels of coliform bacteria in shellfish in waters near urban areas. Eutrophication produced by sewage threatens offshore coral reefs.

Oil pollution although of great concern to island communities is not widespread in the region. Oil spills have generally been restricted to small harbour accidents during fuelling or trans-shipment and the spillage of fuel oil from wrecks. Even such small spills could have serious effects if they occur in critical habitats such as mangroves or major fishing areas on a small island, but most spills to date have either been on remote reefs or in the already disturbed environment of harbours. The region is not on a major shipping route, and attempts to find oil within the region have not yet been successful [5].

Urban Environment

The effects of a growing urban population are felt particularly in Honiara. Recent problems include water supply contamination, soil erosion, deforestation, poor sewage treatment and solid waste disposal. These have been caused by unplanned expansion and the inability of urban services to keep pace with the increase in population.

In the urban centres, the inadequate disposal of solid wastes for garbage dumps is the main pollution issue. In most urban areas, the disposal of household waste is poor. Litter and other garbage are commonly seen. The problem is most acute in Honiara but none of the provincial centres has adequate garbage disposal [17].

Concern has been widely expressed at the Honiara Municipal dump at Tanandi. Leaching of its water, contaminated additionally by pesticides used in fly control at the dump, is believed to be causing pollution problems off the adjacent coast. Poorly planned urban expansion could also lead to contamination of the Panatina Boreholes which provide part of Honiara's water supply.

High levels of filamentous green algae have also been noted along the coast of Guadalcanal from Randi to Kokomobona. Phosphorus and nitrogen from sewage and household waste are likely to be the major causes. Watercourses in the Honiara area (Cruz Creek, White River, Mataika River) are showing signs of pollution, which largely results from the rapid expansion of smallholder settlement behind the town and the dumping of household wastes [4].

In addition, increasing levels of air pollution from vehicle exhausts, burning of grasslands and garden litter and regular firing of the minicap dump have been noted in the Honiara area. The loss of many areas of important gallery rain forest including the former Queen Elizabeth National Park at Mount Astin has been a direct result of urban expansion [4].

Government recommendations for the urban environment have included accelerated programmes of tree planting coupled with burying of power cables along major thoroughfares. An alternative, less environmentally sensitive location for the dump should be found [4]. More monitoring and control of sewage and waste disposal are clearly needed.

Energy Issues

Official policy of the Solomon Islands is to reduce dependence on imported mineral fuels, which accounted for 9.6% of total import costs in 1989. To this end small hydro-electric schemes are planned, with Japanese aid, for the provincial centres of Auki, Buala and Kira Kira [2]. Another hydro project, the Komarindi dam, to be built in 1992-1993 at a cost of SI\$75 million with potential output of 8MW, has been abandoned because authorities could not reach agreement on compensation with the groups [4].

Continued growth of demand, particularly from the Gold Ridge mine, will require a 4MW extension to the Lungga diesel station serving Honiara. This extension is expected to cost SI\$12 million.

Seismic studies carried out over the past ten years suggest that there may be offshore petroleum deposits. Legislation was passed in 1987 in the expectation that more detailed exploration work will be conducted [3].

Solar energy is fairly widely used, particularly in rural areas [2].

Industry

Industrial pollution is not extensive because the region has few industries. At one time bauxite mining posed a serious threat, particularly to Rennell, and substantial compensation payments were made to Rennellese communities, but this did not come to fruition. There is a current

nationwide threat of environmental degradation from gold prospecting, and environmental damage has been experienced on Fauro Island [1].

Small-scale extraction of aggregates, sand and gravel from alluvial and marine sources is carried on in Guadalcanal. Although quantities are small, environmental problems such as consequent coastal erosion and inundation have arisen [4].

The main sources of pollution emanating from industrial processing have been identified as the Ranandi Industrial Estate in Honiara, the fish cannery and associated port and shipping facilities at Noro and Tulagi, and the oil palm processing plant on Guadalcanal [17].

BIBLIOGRAPHY

- 1 IUCN. 1992. *Protected Areas of the World*. IUCN, Gland, Switzerland, and Cambridge, UK.
- 2 Europa. 1991. The Solomon Islands. In: *The Far East and Australasia*. Europa Publications, Ltd., London, UK.
- 3 The Economist. 1991. *The Solomon Islands Country Profile*. The Economist Intelligence Unit, London, UK.
- 4 UNCED. 1992. *The Solomon Islands*. Prepared for the United Nations Conference on the Environment and Development. Rio de Janeiro, Brazil.
- 5 Linden, O. 1989. *Environmental threats against fisheries development: review of the situation in the developing world*. The South Pacific Region. National Swedish Board of Fisheries Development Series No. 26.
- 6 The Economist. 1992. *Pacific Islands Country Quarterly Report, No. 2*. The Economist Intelligence Unit, London, UK.
- 7 Douglas, N. and Douglas, N. (Eds) 1989. *Pacific Islands Yearbook*. 16th edn. Angus and Robertson, London, UK.
- 8 Dahl, A.L. 1986. *Review of the protected areas system in Oceania*. IUCN, Gland, Switzerland, and Cambridge, UK. 239pp.
- 9 IUCN. 1991. *The Conservation Atlas of Tropical Forests: Asia and the Pacific*. Collins, N.M., Sayer, J.A., and Whitmore, T.C. (Eds) MacMillan Press, London, UK.
- 10 Anon. 1992. Solomon Islands. *The Courier, No. 132* (March-April 1992).
- 11 Robinson, D. 1992. Endangered Species Protection and Environmental Management in the Solomon Islands. In *Environmental and Planning Law Journal*, Vol. 9.
- 12 Anon. 1988. Deforestation Problems in the Solomon Islands. *Forest* 15:11.
- 13 UNEP/IUCN. 1988. *Coral reefs of the world. Volume 3: Central and Western Pacific*. UNEP Regional Seas Directories and Bibliographies. IUCN, Gland, Switzerland and Cambridge, UK and UNEP, Nairobi, Kenya. 329pp.
- 14 United Nations. 1989. *World Population Policies Volume III*. United Nations, New York, USA.

Bibliography

- 15 WHO. 1991. *The Work of the World Health Organization in the African Region 1989 - 1990: Biennial report of the Regional Director*. World Health Organization, Geneva, Switzerland.
- 16 Leary, T. 1991. *Solomon Islands State of the Environment Report*. Ministry of Natural Resources, Environment and Conservation Division. 72pp.
- 17 Anon. 1991. *Solomon Islands National Environment Management Strategy*. Asian Development Bank/IUCN/SPREP. 170pp.
- 18 UNEP. 1990. *Environmental Data Report*. UNEP, New York, USA.
- 19 WHO. 1990. *World Health Statistics Annual*. World Health Organization, Geneva, Switzerland.
- 20 United Nations. 1989. *Demographic Yearbook*. United Nations, New York, USA.
- 21 United Nations. 1989. *Compendium of Social Statistics and Indicators*. United Nations, New York, USA.
- 22 United Nations. 1990. *Handbook of International Trade and Development Statistics*. United Nations, New York, USA.
- 23 UNDP. 1991. *Human Development Report*. UNDP, New York, USA.
- 24 UNESCO. 1991. *Statistical Yearbook*. UNESCO, New York, USA.
- 25 World Bank. 1987. *World Debt Tables*. The World Bank, Washington D.C., USA.
- 26 The Economist. 1991. *Fiji, Solomon Islands, Western Samoa, Vanuatu, Tonga Country Profile. 1992-1993*. Annual Survey of Political and Economic Background. The Economist Intelligence Unit, London, UK.
- 27 Blaber, S.J.M. and Milton, D.A. 1990. Species composition, community structure and zoogeography of fishes of mangrove estuaries in the Solomon Islands. *Marine Biology* D105: 259-267.
- 28 Messel, H. and King, W. 1989. *Report on CITES and Solomon Islands Government national survey of the crocodile populations of the Solomon Islands*.
- 29 * Leary, T. 1990. *Survey of wildlife management in Solomon Islands*. SPREP Project PA 17, Final Report.
- 30 Leary, T. 1990. *Marine turtles of Western Province. A report of a survey of nesting beaches 9 November - 10 December 1990*. MNR, Honiara.

The Solomon Islands

- 31 Whitmore, T.C. 1969. Land flora - geography of the flowering plants. *Phil. Trans. Royal Soc.* B255: 549-566
- 32 Henderson, C.P. and Hancock, I.R. 1988. *A Guide to the Useful Plants of the Solomon Islands*. Ministry of Agriculture and Lands. Govt. Printer, Honiara.
- 33 Leary, T. 1990. *Survey of wildlife management in the Solomon Islands*. Supplementary Document. Notes on the ecology of trade species and a systematic checklist of the fauna of the Solomon Islands. SPREP Document No. PA17. SPREP, SPC. Noumea.
- 34 Collar, N.J. and Andrew, P. 1988. *Birds to Watch - The ICBP World Checklist of Threatened Birds*. ICBP Technical Publication No. 8. Cambridge, UK.
- 35 Leary, T. 1991. A review of terrestrial wildlife trade originating from Solomon Islands. *Aust. Zool.* 27 (1&2): 20-27.
- 36 Solomon Islands Government. 1989. *Forest Policy Statement*. Forestry Division, Ministry of Natural Resources.
- 37 CSIRO. 1987. *The Solomon Islands National Forest Inventory Project*. Phase I Report, Prepared for AIDAB.
- 38 United Nations. 1992. *Statistical Yearbook 1988-1989*. United Nations, New York, USA.
- 39 United Nations. 1992. *Yearbook for Asia and the Pacific. 1991*. Economic and Social Commission for Asia and the Pacific, Bangkok.
- 40 WHO. 1993. *Global Programme on AIDS. The Current Global Situation of the HIV/AIDS Pandemic*. World Health Organization, Geneva, Switzerland.
- 41 Encyclopedia Britannica. 1992. *Britannica Book of the Year*. Encyclopedia Britannica, Inc. Chicago, USA.
- 42 Gale Research. 1991. *Nations of the World*. Gale Research, Inc., Detroit, USA.
- 43 World Bank. 1992. *World Debt Tables 1992-1993. External finance for developing countries. Volume 2*. The World Bank, Washington, D.C., USA. 490pp.
- 44 FAO. 1991. *FAO Production Yearbook 1990-1991*. FAO, Rome, Italy.
- 45 UNESCO. 1991. *Statistical Yearbook*. UNESCO, New York, USA.
- 46 WHO. 1992. *World Health Statistics Annual 1991*. World Health Organization, Geneva, Switzerland.

- 47 FAO. 1992. *Fisheries Statistics Yearbook: catches and landings. Volume 70*. FAO, Rome, Italy.
- 48 UNICEF. 1993. *State of the World's Children*. UNICEF, Oxford University Press, New York, USA. 100pp.

NOTE ON DATA SOURCES

Wherever possible, original data sources have been used as a reference or, failing that, data have been checked against several other sources. Recent publications on the state of the environment [4, 16, 17] are particularly recommended for more in-depth reading.

A number of publications can be recommended for further investigation of a particular topic. These include the regular country reports of the Economist Intelligence Unit [3, 6, 26] and the Europa Handbook [2] which provide a well-balanced review of the political (historical and present) and economic situations. A wide selection of useful statistical data are to be found in [14, 18, 19, 20, 21, 22, 23, 24, 25, 38, 39, 41, 42, 43, 44, 45, 46, 47 and 48]. Information on biological diversity, deforestation and wildlife issues has been drawn from a number of publications [1, 4, 8, 9, 10, 13, 16, 17, 29, 30, 31, 32, 33]. Demographic, health and similar data have been obtained from a wide range of sources within the United Nations (such as WHO and UNICEF). No attempt has been made to provide full coverage of the activities of multilateral and bilateral assistance agencies in this report. Such material goes rapidly out of date. For current information on their activities, we advise contacting the agencies themselves.

One of the primary objectives of this overview has been to highlight gaps in information in the hope that government and development agencies alike will take this need into consideration when planning and implementing future projects.

ANNEX I

Vegetation pattern of The Solomon Islands (See also Fig. 3)

Forest cover data are based on a hand-coloured map prepared by the Forestry Division, showing plantation forests, logged forests and logging concessions overlain onto the published 1:1 million scale map *Solomon Islands*, Edition 2, revised and published by The Survey and Mapping Division, Honiara, in two sheets. Additional information was added by G. Chaplin, based on his personal experience of the region.

Digitised data are held at the WCMC Biodiversity Map Library, WCMC, Huntingdon Road, Cambridge, CB3 0DL, UK.

ACRONYMS

AIDAB	Australian International Development Assistance Bureau
CDC	Commonwealth Development Corporation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSIRO	Australian Commonwealth Scientific and Industrial Research Organisation
CEC	Commission of the European Communities
ECD	Environment and Conservation Division (of the Ministry of Natural Resources)
EDF	European Development Fund
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
FD	Forestry Division
FSPSI	Foundation for the Peoples of the South Pacific (Solomon Islands)
GDP	Gross Domestic Product
GWh	Gigawatt-hour(s)
ha	hectare(s)
IUCN	The World Conservation Union
km	kilometre(s)
MNR	Ministry of Natural Resources
MW	Megawatt(s)
NEMS	National Environment Management Strategy
NGO	non-governmental organisation
SIDT	Solomon Islands Development Trust
SPREP	South Pacific Regional Environment Programme
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WCMC	World Conservation Monitoring Centre
WHO	World Health Organization

Titles in this series of Environmental Synopses include:

Angola	Liberia
Barbados	Malawi
Belize	Malaysia
Bénin	Mauritania
Bolivia	Mauritius
Burkina Faso	Mozambique
Burundi	Namibia
Central African Republic	Niger
Colombia	Nigeria
Comoros	Peru
Congo	Rwanda
Côte d'Ivoire	São Tomé and Príncipe
Dominican Republic	Sierra Leone
Djibouti	Solomon Islands
Equatorial Guinea	Somalia
Ethiopia	Swaziland
Fiji	Togo
Gabon	Vanuatu
Jamaica	Western Samoa
Lesotho	Zaire