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Acronyms and Abbreviations:

ACIAR	Australia Centre for International Agricultural Research
ADB	Asian Development Bank
AFD	Agence Française pour le Développement
AUSAID	Australian Aid
BSE	Bovine Spongiform Encephalopathy
CBD	Central Business District
CCA	Community Conservation Area
CIRAD	Centre International de Recherche Agronomique pour le Développement
CLT	Customary Land Tribunal
COT	Crown of Thorns (starfish)
CRP	Comprehensive Reform Program
CSIRO	Commonwealth Scientific and Industrial research Organisation
DARD	Department of Agriculture and Rural Development
DESP	Department of Economic and Social Planning
DOF	Department of Fisheries
DOS	Department Of Statistics
DPI	Department of Primary Industries (Australia)
DSM	Department of Strategic Management
EEZ	Exclusive Economic Zone
EIA	Environment Impact Assessment
EMC	Environmental Impact Assessment
ENSO	El Niño Southern Oscillation
FAD	Fish Aggregating Device
FED	Fonds Européen de Développement
FSP	Foundation for the People of the South Pacific
FSPI	Foundation for the People of the South Pacific International
GDP	Gross Domestic Product
GEF	Global Environment Facility
GSM	Global System for Mobile Communication
HDI	Human Development Index
IGFA	International Game Fishing association
IRD	Institut pour la Recherche et le Développement
IUCN	International Union for the Conservation of Nature and Natural Resources
IWP	International Waters Programmes
LDC	Least Developed Countries
MLSEEMWR	Ministry of Lands, Survey, Environment, Energy, Mineral and Water Resources
MOH	Ministry of Health
NBS	National Biodiversity Strategy
NFTP	Non Forest Timber Products
NGO	Non Governmental Organisation
NTO	National Tourism Office
NZAID	New Zealand Aid
OECD	Organisation for Economic Cooperation and Development
OFC	Offshore Financial Centre

ORSTOM	Office de la Recherche Scientifique et Technique Outre Mer (now IRD)
PCB	Polychlorinated Biphenyls
PEA	Preliminary Environment Assessment
pers. com	Personal Communication
PICs	Pacific Island Countries
POP	Persistent Organic Pollutant
POPACA	Projet d'Organisation des Producteurs pour la Commercialisation Associative
PWD	Public Works Department
REDI	Rural Economic Development Initiatives
SHEFA	Shepherds and Efate Province
SPREP	South Pacific Regional Environment Programme
SPRIG	South Pacific Regional Improvement on Forest Genetic Resources
TDO	Tourism Development Office
TEM	Traditional Environment Management
TVL	Telecom Vanuatu Limited
UK	United Kingdom
UN	United Nations
UNELCO	Union Electrique du Vanuatu
UNEP	United Nations Environment Program
UNFPA	United Nations Population Fund
USGS	United States Geological Services
VAM	Vanuatu Maritime Authority
VANGO	Vanuatu Non Governmental Organisations
VANRIS	Vanuatu Resource Information System
VARTC	Vanuatu Agricultural Research and Training Centre
VASTP	Vanuatu Sea Transport
VEU	Vanuatu Environment Unit
VIPA	Vanuatu Investment Promotion Authority
VNCW	Vanuatu National Council of Women
VNPF	Vanuatu National Provident Fund
VT	Vatu (Vanuatu's currency unit)
WHO	World Health Organisation
WTEC	Wantok Environment Centre

1. Executive Summary

As part of the mid-term review of the implementation of the indicative programmes for Vanuatu the European Commission requires a Country Environmental Profile.

The objective of this study is to provide decision makers in the European Commission and other partner countries with sufficient information to identify European Commission cooperation activities with specific environmental objectives and to establish environmental safeguards for other activities.

Vanuatu is a Western South Pacific Island nation constituted of approximately 80 islands of volcanic origin. Although biodiversity is often rated as low in comparison with neighbouring countries such as New Caledonia, Papua New Guinea and even the Solomon Islands, it is of paramount importance to Ni-Vanuatu.

A country where cultural diversity is represented by the number of vernacular languages (105), Vanuatu is united through a sense of identification to the Land. One of the major reforms following the country's independence in 1980 was related to land tenure.

Vanuatu is a signatory of many major international conventions relating to the environment such as the Rio Declaration on Environment and Development and the provision of Agenda 21, UN Convention on Biological Diversity, and UN Convention on Climate Change.

In March 2003 an important Environmental Act was implemented: the Environment Management and Conservation Act No. 12 2002. Under this Act it is now compulsory to provide an Environmental Impact Assessment with every new development project that could interfere with the environment. Compliance with all aspects of this Act is mandatory and monitored by the Vanuatu Environment Unit. Non-compliance may result in financial penalties or even jail term. This legislation is starting to be enforced fully but effective enforcement of the Act could be a problem as it is in other legal areas. A recent review of environmental legislation has identified overlaps, gaps and conflicts between the various Acts. Harmonisation with other legal environmental provisions will therefore be required

To fully achieve implementation of the EMC act it is necessary to consolidate the knowledge of Vanuatu biodiversity and to document the Traditional Environment Management method employed for centuries by the various communities in Vanuatu. Effective sustainable development will not be achieved without involving the custom landowners to the management processes.

Although traditional environment management systems are still in use in most islands, environmental awareness is low in Vanuatu. Raising environmental awareness at various levels from political to individual is still on the agenda of the Vanuatu Environment Unit.

Some endemic species, and some important areas have been identified as threatened and urgent action is needed to ensure that they will be protected. Forestry activities that represent an important source of revenues for the country need to be strengthened towards sustainability. Vanuatu, in accordance with the international conventions that were signed, will take steps to regulate the potential sources of pollution. Lastly and importantly, a matter of real concern in developing urban Vanuatu is the management of both solid and liquid wastes.

2. Background:

Physical Condition, Geography and Climate

Vanuatu is an archipelago of around 80 islands and numerous islets located between latitude 12° and 23° south and longitude 166° and 173° east. The global shape of the country is roughly that of a 'Y'. As part of the South West Pacific Ocean, Australia lies at around 2,000 km to Vanuatu's west. Vanuatu's closest neighbours are the Solomon Islands (170kms north), New Caledonia (230kms south-west) and Fiji (800kms east).



Fig. 1: Location of Vanuatu in the South West Pacific Ocean

The total area of Vanuatu is approximately 860,000km² taking into account the Exclusive Economic Zone of 200 miles from the shores. The total land area is only 12,336km² which represents 1.4% of the total country area. Only 12 islands can be considered as significant in terms of economy and population. The eight largest islands contribute 87% of the total land area (Weightman, 1989). The capital city, Port Vila, is located on the island of Efate.

Geologically, Vanuatu is part of the Pacific Ring of Fire and is an island arc resulting from the geological activity of the New-Hebrides subduction zone. Geologically young, the islands are mostly mountainous and volcanic with some raised reef islands and a few low coral islands and reefs. Corollaries of the subduction are the numerous volcanoes that constitute the majority of the islands as well as contribute to the very active seismicity Vanuatu experiences.

The climate in Vanuatu varies from wet tropical in the northern islands to dryer sub-tropical in the south of the archipelago. Average temperatures range between 21°C and 27°C and average humidity ranges between 75% and 80 %. Average annual rainfall declines from over 4000 mm in the north to less than 1500mm in the south. The country is prone to cyclones during the warmer months from November to April.

Current Economic Trends and Social Conditions

Vanuatu was admitted to the group of the Least Developed Countries (LDCs) in 1985. Today it is still part of this group although its per-capita GDP exceeds the LDC threshold. This situation has occurred due to the adjustment based on the 'vulnerability index' which takes into account the vulnerability of Vanuatu's economy to natural disasters (earthquakes, cyclones, tsunamis¹). Vanuatu obtained a score of 46.4 while the threshold for graduation from LDC status is a vulnerability rating of less than 33. The next UN review of LDCs is due in 2006, however, indications are that if Vanuatu was able to meet the required ratios it would be at least 2009 before Vanuatu could be officially recommended for graduation.

Vanuatu's economy is highly dualistic. There clearly is an urban economy in Port Vila and Luganville and a rural economy for the rest of the country.

Vanuatu has a per-capita GDP of US\$ 1,315 in 2002 (Statistic Office). Vanuatu's GDP is made up of three sectors: Agriculture (14.9%), Industry (8.5%) and Services (76.6%). Four commodities (copra, beef, cocoa and timber) made up the bulk of the domestic exports from 1992 to 1996. A new commodity then emerged with the development of kava² (*Piper methysticum*) trade in 1997. The kava trade dramatically reduced following a ban on kava products put in place in importing countries. The fisheries sector contributes minimally with only 1.0% of GDP.

Tourism represents 40% of GDP and it is concentrated around the two main urban centres. This activity is expected to gain importance with the establishment of a second airline on the routes between Australia/New Zealand and Vanuatu.

Vanuatu's trade deficit showed an improvement of VT392 million in 2003 (VT-9,451 million) compared to 2002 (VT -9,843 million). While the European Union (EU) is the main buying partner for Vanuatu (21% of exports go to EU), the majority of the goods imported in Vanuatu originate from Australia (40%) and New Zealand (13%) (Statistics Office, 2004).

Average inflation rate is 2.5% (2000). It is expected to be around 3 percent in 2004 (Reserve Bank of Vanuatu). Real growth rate is 2.9% (2000). The average exchange rates in August 2004 are: USD 1.00 = VT 116.51 and EUR 1.00 = VT 141.53.

The Human Development Index (HDI) for 2000 is 0.542 (ADB, Key Indicators, 2003) decreasing from 0.627 in 1997. This places Vanuatu as 131st on a worldwide ranking. Life expectancy is 69 years and child mortality is 26.5 for 1000 in 1999 (Statistics Office).

¹ *Tsunami*: a large destructive ocean wave caused by an underwater earthquake or some other movement of the earth's surface.

² *Kava*: the Pacific ritual drink. It is made from the roots of a pepper family plant *Piper methysticum*. Considered a narcotic it has many beneficial effects (relaxant, antibiotic) and some possibly harmful effects that are currently under investigation (hepatotoxicity, ichthyosis).

Within the economically active part of the population (78.2% of total), only 25.5% are engaged in paid employment. 67.2% are engaged in subsistence farming with the remainder 7.3% being unemployed. The employed population has access to the Vanuatu National Provident Fund (VNPF) with a monthly 8% contribution to this fund.

Politics, Population, Education, Environmental Awareness

The Republic of Vanuatu achieved its independence from France and the United Kingdom on 30 July 1980. Vanuatu has a Westminster-style constitution. The constitution created a republican political system headed by a President who has primarily ceremonial powers and is elected by a two-thirds majority in an electoral college consisting of members of the Parliament and the Presidents of Regional Councils. The President serves a 5-year term. The President may be removed by the Electoral College for gross misconduct or incapacity. The Prime Minister, who is the Head of Government, is elected by a majority vote of three-fourths quorum of the Parliament. The Prime Minister in turn appoints the Council of Ministers, whose number may not exceed one-fourth of the number of parliamentary representatives. The Prime Minister and the Council of Ministers constitute the executive government.

The single legislative chamber or Parliament sits in Vila. The 52 members are elected through universal suffrage by all persons over 18 years old. The latest election was held on the 6th of July 2004. The Parliament normally sits for a 4 year term unless dissolved by majority vote of a three-fourth quorum or a directive from the President on advice of the Prime Minister. The National Council of Chiefs, called the Malvatumauri and elected by districts councils of chiefs, advises the government on all matters concerning ni-vanuatu culture and language.

Vanuatu has currently 12 government ministries and a Prime Minister, as well as a further 38 government agencies under ministerial control. The Constitution states that there can be a maximum of one ministry for every four Members of the Parliament. This represents a maximum of 13 ministries.

Since 1994, the country has been divided into six provinces:

- TORBA (Torres and Banks)
- SANMA (Santo and Malo)
- PENAMA (Pentecost, Ambae and Maewo)
- MALAMPA (Malekula, Ambrym and Paama)
- SHEFA (Shepherds and Efate)
- TAFEA (Tanna, Aniwa, Futuna, Erromango and Aneityum)

Each province hosts a provincial government that delivers services to the inhabitants.



Population:

In 1999, at the time of the last national census, the total population of Vanuatu was 186,678 (Statistics Office, 2000) with 98.7 % being of Ni-Vanuatu ethnicity. Urban population growth rate is high at 4.2% whereas the rural areas growth rate is considerably lower at 2.2%. In 2004 the estimated population would be 215,541 with a median age of 19.1. The adult literacy rate is 64%. 21.5% of the population is classified as urban. A current trend of rural out migration is established and tends to promote the apparition of urban drift with unemployment among young ni-vanuatu rising.

Vanuatu is one of the most complex nations in the world in terms of the number of languages per head of population. 105 languages are spoken in Vanuatu, some only by a few surviving members of ancient clans (in the South West Bay area, Malekula). A coherent cultural group can be associated with virtually each language. Dances, ceremonies, funerals, weddings, initiations, status, systems of authority, artistic styles and animal and crop husbandry all differ from island to island, and often from one district to another within the same island. For example in Malekula two very distinct groups can be identified with the '*small nambas*' in the south and '*big nambas*' in the north.

Competition and tension often arise between different cultural groups. This variety of cultures is inherited from the various waves of migrations to Vanuatu from other areas in the Pacific. Links have been established with both Papuans and Polynesians. For example, people from the village of Mele (Efate) have a language that is very close to Polynesian languages. Skin and hair colour varies greatly from one cultural group to another.

Education:

In 2002, 28.5% of the National budget has been allocated for education. The educational environment is complex: there are over 100 local languages used in three quarters of the households. Furthermore there are in Vanuatu two official languages (English and French) and one national language (Bislama). Consequently Vanuatu operates a costly dual-language education system.

In 1999, nearly 20% of the population over 15 had never been to school. If 57% attended primary school, only 1.9% (rural population) to 3.9% (urban) achieved senior secondary school (Statistics Office, 2000). Although environmental awareness is included in Vanuatu's school curricula at Junior Secondary Level, the number of students reaching this level means only a limited number of students benefit from this tuition.

It is important to note that the Prime Minister during the CRP (Comprehensive Reform Program) summit of November 2002 stated that one of the priorities of the government was:

“Increasing equity in access to income and economic opportunity by all members of the community. Specific areas of focus include: enabling universal access to primary education by school-age children...” (Government of Vanuatu, 2003).

Environmental Awareness:

The Prime Minister during the same CRP (Comprehensive Reform Program) summit stated that another of the priorities of the government was:

“Improving the lives of the people in the rural areas by improving service delivery, expanding market access to rural produce, lowering costs of credit and transportation, and ensuring sustainable use of natural resources.”(Government of Vanuatu, 2003)

Each cultural group in Vanuatu has a traditional approach to the management (*custom management*) and conservation of their environment. The traditional farming system of subsistence gardening is based on the annual clearing, from forest or bush fallow, of one or more areas for a multi-crop family food garden. After one or two years of rain fed cultivation the plot is returned to fallow for seven to ten years. A broadly spread traditional management tool is the setting of ‘tabu’ (i.e restricted or no access) areas by the chiefs once a threat to the sustainability of a specific area is identified. These ‘tabu’ zones may be land areas, expands of sea shore or reef zones. They are usually signified to the rest of the population by the setting of posts on which a cross is made with *namele* (*Cycas spp.*) leaves. Failure to observe the ‘tabu’ could require the payment of pigs as a penalty, or even the death of the transgressor. Although still in use in most places these traditional methods are now declining in line with the culture changes that the country is experiencing. The Vanuatu Cultural Centre in association with the Vanuatu Environment Unit is documenting the use of traditional resource management systems, their application and effectiveness.

In 1992, the authorities (Republic of Vanuatu, 1992) estimated that the level of environmental awareness was increasing as local communities were seriously considering the establishment of community parks, forests and marine reserves. Such developments were attributed to the efforts of the Environment Unit which operated a weekly radio programme and visited local government councils, communities and church groups. In 1992, Vanuatu signed the Convention on Biological Diversity and has since taken part in various regional and environmental programmes. In the first National Biodiversity Conservation Strategy and Action Plan published in 1999 (Environment Unit, 1999) environmental education and awareness is one of the six objectives identified. Despite the many activities outlined above that were undertaken to raise environmental awareness during the 1990’s, today **the level of environmental awareness remains globally low within the population even if it is on the rise.**

It appears for example that for many ni-Vanuatu, the environment can only be conserved at the expense of on-going human and economic development (Environment Unit, 1999). The low level of environmental awareness has been reported as a major hurdle for the implementation of recent legal acts by the Forestry, Agriculture and Fisheries

Departments (Personal Communications, 2004). This low level of environmental awareness has been attributed to the fact that environmental degradation is not yet severe in Vanuatu. Therefore, the general public does not seem to be concerned by these issues (Republic of Vanuatu, 1992).

Overall Administrative and Legal Context for Environmental Protection

Article 7 of the Constitution of the Republic of Vanuatu states:

‘Every person has the following fundamental duties to himself and his descendants and to others:

(d) To protect Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present and of future generations”

To serve that purpose, various Acts have been implemented since the birth of the Republic of Vanuatu. They are regularly updated and they will be analysed in more details in Part 4.1 of this report. Many Ministries and Department are involved in environmental matters (see Part 4.2). Consequently each concerned service has developed legal tools to promote environmental awareness and enforce environmental regulations. Local Provincial Governments are also authorised under the Decentralisation Act to make regional laws which still require the approval of the Minister responsible for local government affairs. Enforcement of regulations is supported by the local legal system.

The Supreme Court consists of a Chief Justice and up to three other judges. Two or more members of this court may constitute a Court of Appeal. Magistrate courts handle most routine legal matters. The legal system is based on British Law. The Constitution also provided for the establishment of Village or Island Courts presided over by chiefs to deal with questions of customary law. As presented in the section on archaeology and cultural heritage (p.24) ‘custom’ plays a crucial role in the daily life of Vanuatu. Recognizing the major importance of custom in the management of natural resources was a positive step, however Islands Courts did not fulfil their considerable potential. Island Courts were given very little support in the way of both financial and technical resources (Forster, 1991). To address this issue, The Customary Land Tribunal Act No. 7 was enacted in 2001 by Parliament to provide for a system based on custom to resolve disputes about customary land. It involves the use of custom chiefs to deal with disputes to customary lands at various levels of indigenous communities. Appeal provisions lie with the Supreme Court of Vanuatu.

3. State of the Environment:

The Department of Statistics (DOS) engaged in environmental statistics collection in 1996 and 1997, through an ADB/SPREP funded project. It encountered major difficulties and the project was later abandoned (Simil Johnson, Personal Communication, 2004). A

database frame had been organised and the DOS sent forms to various government departments and private enterprises to gather information. The DOS faced very poor returns with few forms returned. Collected data has been entered in the database but cross-checking of the information was not carried out. Analysis and publication of the data did not eventuate. A lack of awareness about environmental issues by the general public as well as a lack of training in environmental data collection/analysis is identified as the major reason for the problems encountered. Information about the environment in Vanuatu therefore needs to be compiled through a thorough literature review across the various fields that are relevant to environmental issues.

Physical Environment

Geology, Topography, Natural Disaster Risk

Vanuatu consists of an archipelago of about a dozen large islands and 70 smaller islands inhabited by humans. Around 200 islets are not inhabited. Vanuatu islands are rather mountainous with 35% of the country being above 300 metres and 55% having slopes greater than 20°. Most of the high lands and steep areas are covered with lush forest and are virtually impenetrable. Coconut plantations and other agricultural activities are located in the coastal plains while traditional gardens are on the edge of the cultivated areas, advancing towards the non-cultivated areas.

There are few known mineral deposits of commercial interest. There has been epithermal gold prospecting in the 1980s (South Santo and Malekula) and therefore mining legislation has been developed to control potential mining activity. A manganese mine operated in Forari (Efate) from 1971 to 1982. It is now closed and installations are derelict. There is a potential source of hydrocarbon lying in the sedimentary bases between Santo and Malekula and between Maewo and Pentecost. Extensive deposits of pozzolona occur on many islands. Large areas of raised coral limestone offer a potential source of lime for industrial/agricultural purposes (Thistlethwaite, 1993).

Santo is the largest of the islands and is 4,010km². Malekula follows with a land area of 2,069km² and Efate where the capital city Port Vila is located has a land area of 980km². Erromango closely follows with a land area of 900km² however is sparsely populated (1,560 people according to the 1999 Vanuatu National Census). Tanna has a land area of 565km² and is ranked as the sixth largest island after Ambrym (682km²). Tanna however has the highest population density with 45.7 habitants/km² (Statistics Office, 2000).

Almost all the islands are 'high islands' of volcanic origin. Indeed, the islands of Vanuatu are the result of tectonic activity, as a subduction zone of around 1500 km long marks the convergence of the Indian-Australian tectonic plate and the Pacific plate. The Indian-Australian plate descends beneath the Pacific plate at a rate of 4cm to 14cm/year depending on the zone (Calmant *et al.*, 1995). As a corollary of this tectonic activity, a deep trench (New Hebrides Trench) runs along the western side of the country reaching depths of 9,000m but averaging at 6,000m.

Vanuatu is vulnerable to a broad range of natural hazards. The United Nations Population Fund (UNFPA, 1996) quoting an earlier analysis indicated that ‘*Vanuatu was highly susceptible to cyclones, coastal flooding, river flooding, earthquake, landslides, tsunamis and volcanic eruption.*’ It therefore ranked alongside Solomon Islands as the most disaster prone nation in the region. (ADB, 2002b).

✧ **Earthquake Risk**

Earthquakes are frequent in Vanuatu. The USGS recorded about 4000 earthquakes of magnitude greater than 4 between 1961 and 1982 (Prevot & Chatelain, 1983). They often originate at considerable depth and are therefore not too destructive (large magnitude but low intensity). Nevertheless, some earthquakes have caused extended damages in the past. The last major earthquake occurred in January 2002 and was located 35 km west of the capital Port Vila. Reaching 7.3 on the Richter scale, this earthquake caused widespread damages to buildings and infrastructures. Some of the consequences of this episode are still being felt in 2004. Some faults movements have produced in the past changes in shoreline elevations of up to two metres as islands have tilted. Destructive tidal waves (tsunami) occur occasionally as the result of an earthquake. The last tsunami which resulted in approximately twelve fatalities occurred in November 1999, following a 7.3 earthquake located near the island of Pentecost.

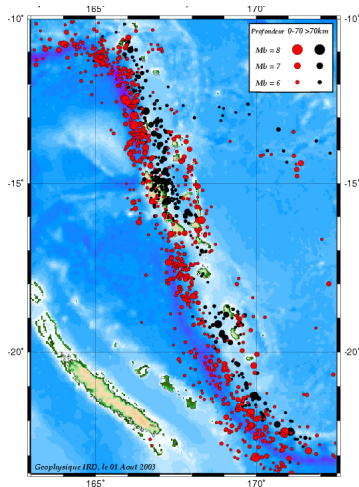


Fig. 2 Harvard epicentres from 01/97 to 04/03 (from IRD Nouméa)



Fig. 3: A bridge damaged in January 2002

ORSTOM in 1983 carried a study on seismicity and seismic hazard in Vanuatu (Prevot & Chatelain, 1983). The reported maximum possible magnitude (Richter scale) of an earthquake is 7.6 with an attached possible intensity (Mercalli scale) of 11 or 12 in the epicentral region.

The two major cities of Port Vila and Luganville are located in areas where maximum intensity could reach 8. Major destructions due to earthquake activities in Vanuatu are due to landslides triggered by the tremors. ORSTOM’s study shows that the regions with

the highest earthquake risk in Vanuatu are the Torres Islands, Santo, Ambae, North Malekula, Maewo and Pentecost. The main reason for this is the frequent occurrence on these islands of strong shallow earthquakes. This risk is well identified in Vanuatu. To minimise potential damage, new buildings and infrastructures need to adhere to earthquake resistant design standards although there is no building code in Vanuatu to enforce this.

✧ **Volcano Risk**



Volcanoes are a feature on nearly all the islands of Vanuatu. Today nine volcanoes are still active. The most dangerous is Mount Garet (797 m) located on the island of Gaua (Banks). A large lake (Letas = 800 millions cubic metres) is located very close to the magmatic chamber. A fresh water lake, the water temperature is 32°C, and only eels and shrimps survive in Lake Letas. The rupture of the fine layer of rocks separating the magmatic chamber and the Lake would lead to an enormous, potentially devastating explosion. The island was temporarily evacuated in 1973 due to this risk. The volcano-island of Lopevi (1450 m) is very active and the entire island was also evacuated in 1970. All the inhabitants have been relocated on the island of Efate. The most famous volcano of Vanuatu is the Yasur in Tanna. Numerous tourists come every year to admire one of the most accessible volcanoes in the world. Furthermore the Yasur represents an important site for the followers of the “John Frum” cult, a cargo cult well developed in Tanna.

Volcanoes are a well identified natural disaster risk in Vanuatu. In islands where volcanic activity constitutes a real danger, the population has been evacuated. In other areas, a monitoring network has been organised in cooperation between the Department of Geology and the IRD based in Noumea (New-Caledonia). Mount Yasur is monitored via remote sensing equipment, to provide up-to-date information on the volcano's activity levels. When specified levels of activity are registered, increased restriction perimeters are established to provide safety to visitors. In Yasur's case a danger level scale of I-III is used to gauge the access danger level for tourists.

A corollary of the volcanic activity is the localised occurrence of acid rains that have an impact on both the natural vegetation and farmed plants.

✧ **Cyclonic risk**

During the cyclone season (November to April), cyclones can cause extensive damage to infrastructure (bridges, houses ...) as well as to food gardens, commercial crops, tree crops and forests. Cyclones also have a major influence on the coastal zone, including coral reef systems, shallow water marine communities and mangrove areas which play a crucial role for the reproduction of many marine species. The largest and most destructive cyclone to hit Vanuatu in recent times was Cyclone Uma in 1987.

Climate/Micro-Climate:

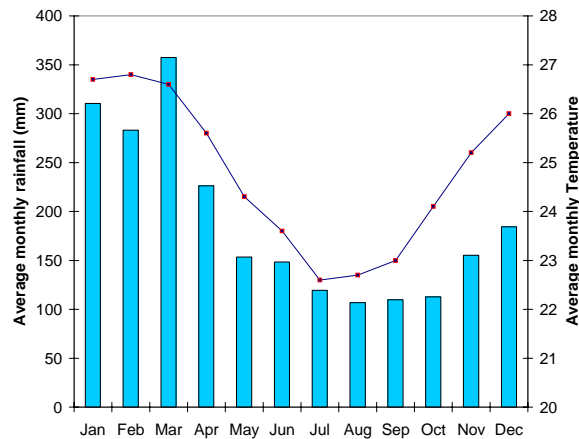
Vanuatu is located within the tropical climate range and two distinct seasons can be identified:

November to April is the traditional wet season when temperatures and humidity levels are higher, and when cyclonic episodes may occur. Cyclones are generally more frequent in El Niño Southern Oscillation (ENSO) years. ENSO episodes are usually associated with a drier than usual climate as well when periods of drought are often experienced.

May to October is the dryer season when established south-easterly trade winds produce mostly sunny days and cooler nights. Due to the latitudinal extent of Vanuatu there are noticeable thermic and rainfall contrasts between the North and the South of the Vanuatu archipelago. Average temperature and rainfall are respectively 26.1°C and 4,136mm in the Banks (North) compared to 23.8°C and 1,597mm in Tanna (South).

On the high islands there is a climatic differentiation related to altitude (i.e. temperature) as well as to the exposure to trade winds: south-east windward slopes receive more precipitation than north-west leeward ones. These factors have an influence on the agricultural potential of each zone.

Fig. 4 Average temperature and rainfall on Efate (1961-1983) (source: Department of Meteorology)



Today there is anecdotal evidence that Vanuatu's climate is changing. Dry seasons tend to be less dry than earlier years particularly during La Niña episodes. There seems to be a possibility for heavy storm rains at any time during the year. Cyclones appear to increase in intensity/frequency in parallel with global warming (ADB, 2002b). The 1990s have seen droughts in Vanuatu (1992/93 and 1997/98) which led to a decline in agricultural production and exports. Whether this is linked to the effect of Global Warming remains to be proved. Another well documented corollary of Global Warming is sea level rise. Current evidence is predicting a rise of between 0.5 and 1.0 m over the next 100 years. In that occurrence Vanuatu is fortunate in comparison to other islands (such as Tuvalu, Kiribati, and Marshall Islands) because most of its islands are high above sea level. Therefore little impact is anticipated on biodiversity, natural forests and

agriculture/forestry. Coastal infrastructures (roads/housing) and communities may be at risk. Urban planning should make allowance for such a scenario so that measures to protect coastlines are taken. Sand mining from beaches which is a somehow common practice should be discouraged. It is reported by E. C. Darby (1993) that the effect of sea level rise globally could be more than compensated in Vanuatu by the natural elevation of the land due to the tectonic activity.

Hydrogeology

Throughout the country there are many springs, streams and rivers. Many of them can dry up towards the end of the dry season especially on the drier western sides of islands. Few villages have access to a permanent water supply, especially in coral rock areas where water retention is very poor. Some islanders experience periods where water access is severely restricted especially in the Banks and Pentecost islands (Randy Frink, Personal Communication, 2004). A UK based NGO is planning to identify a project in these areas. Water used in villages comes from the above sources or from rainwater catchments with small storage tanks/drums. Water pollution by agricultural fertiliser/pesticide runoff and mainly by sanitary wastes is an increasing concern. Two Global Environment Facility (GEF) projects are addressing these concerns: the International Water Programme (IWP) based at the Environment Unit and the Persistent Organic Pollutants (POPs) project based with the Department of Quarantine.

Some fresh water lakes can be found in various islands in Vanuatu. Some of these lakes constitute a source of water for the population. Proper management of this resource is required as in north-eastern Ambae for example (Waimemea and Wilebutaga), a coastal lake is used for waste disposal (ADB, 2002b). It is necessary to raise the population's awareness about health risks associated with this practice. Solid waste management in many islands will become a priority as the population is increasing.

Around the city of Port Vila, the water quality of the lagoons is important as it represents a fundamental attraction for both tourists and city dwellers. Furthermore fishing activities/shell collection are still taking place in both lagoons (Port Vila Harbour and Erakor lagoon). Unfortunately, both waterways appear to be polluted according to the results of water quality tests monitored by the Department of Geology, Mines and Water Resources. Leachate from poorly sited urban and domestic rubbish dumps, ineffective septic tanks and stormwater containing light industrial wastes as well as road runoff are all contributing factors to the current state of the lagoons. Both ADB (2000b) and ADB (1998) are reporting alarming results from water quality tests: *'bacteriological tests indicate that the waters in Fatumaru Bay, Paray Bay, and in Ekasuvat Lagoon (Tassiriki) are unsafe for fish and shellfish harvesting, and at time unsafe for bathing'*. Quarterly water sampling under the Port Vila coastal water quality monitoring program (Department of Geology, Mines and Water Resources, 2000) indicates high pollution loads: Total coliform counts were high (60% "too numerous to count"), while faecal coliform counts were variable, but nearly always above acceptable levels. Phosphate levels in the lagoons were also high. A sanitation master plan has been prepared with funding from the Asian Development Bank (ADB) in 1998, but is yet to be implemented (pers. com. from Dalesa Malcolm, 2004).

Soils

Soils are the result of interaction between the geological constituents of a substratum and both the climatic and the biotic factors. Soils in Vanuatu are originating either from volcanic rock or from the coralline limestone of uplifted reefs. Quantin (1981) has carried out an extensive survey of the soils of Vanuatu and published pedological maps covering the whole of the country. Agronomic potential maps were also published (1/500,000 and 1/100,000). This study demonstrated that Vanuatu benefits now and potentially from soils of good fertility (41% of the total area) located in climatic and topographical conditions that are favourable to agricultural and pastoral activities.

Today, less than half of these areas are farmed. The high fertility of soils, in spite of heavy rainfall, is due to frequent rejuvenation by volcanic ashes (Weightman, 1989). According to Quantin (1982), 73% of the favourable land in Vanuatu is found in: 31% on Santo-Malo; 16% on Efate; 14% on Malekula; and 12% on TAFEA. These islands still have a large portion of this suitable land available for agricultural development. Soil erosion is a localised problem in Vanuatu. Some occurrences have been identified in Paama, Aneityum and Nguna (Shepherds). They are the object of soil erosion control projects financed by various donors such as AUSAID, The Peace Corps, and NZAID).

Miscellaneous

Restricted data is available on air quality and odour in Vanuatu. The Little Green Data Book (2004) provides some data on CO₂ emissions per unit of GDP: with 0.2 kg/PPP \$ GDP Vanuatu is ranking very low within the East Asia & Pacific Region (0.6). Likewise, Vanuatu CO₂ emission per capita: 0.4 mt is very low in comparison with 2.1mt for the East Asia & Pacific Region. Due to a very low level of industrial activities, it is assumed that air quality is very good in Vanuatu. Local areas of concerns may exist around the Port Vila dump where bulk waste is burned, and in the vicinity of the many vehicles whose exhaust pipes release heavy black smoke. Similar problems at a lower scale are encountered in Luganville. Unlawful burning of bulk waste by the population may generate local air pollution. Awareness about the danger of such actions and about air pollution is very low within the local population.

It is expected that this awareness will be raised in the country as soon as the Persistent Organic Pollutants Project is in full operation mode. POPs are a group of twelve particularly hazardous chemicals that have been singled out by the Stockholm Convention signed by Vanuatu on 22/05/01 (see Appendix VII). Vanuatu is currently developing a National Implementation Plan for the Stockholm Convention with funding from UNEP/GEF. Phase II of the Implementation plan started in August 2003 and should last for two years. It includes surveying the country to identify sources of POPs. The POP project has been officially launched in September 2003 although the Stockholm Convention is still awaiting ratification.

Noise and vibration are not a general concern to Vanuatu (except when generated by tremors). Nevertheless, locally notorious sources of noise and vibration are the

UNELCO power stations. One power station located within the CBD of Port Vila is still in operation and generates a significant level of noise as well as vibration.

Biological Conditions, Biodiversity, Ecology and Nature Conservation

Terrestrial flora and fauna

Vanuatu is located at the eastern limit of distribution of indo-malaysian species and at the western limit of many pacific species. However compared to other neighbouring biogeographic regions such as Papua New Guinea, New-Caledonia or the Solomon Islands, Vanuatu does not present high levels of diversity or endemism of terrestrial species. Overall richness and endemism in Vanuatu range from low to moderate in comparison with those of other eco-regions. This seemingly impoverished state results from the islands' size, geological youth and their relative isolation from large expanses of land. Frequent damages inflicted by cyclonic, seismic and volcanic activity have further impacted on the development of a rich biodiversity (Thistlethwaite, 1993). Nevertheless, a certain number of endemic species have evolved in an environment isolated from other genetic resources. Today it is likely that all endemic species have not yet been identified and catalogued and more prospecting is likely to be required.

In 1990-1993, CSIRO and the Queensland Forest Service of the Department of Primary Industries (DPI) were contracted to undertake the Vanuatu Forest Resource Survey Project. During the project a computer based planning tool called VANRIS (Vanuatu Resource Information System) was developed. A summary of the main physical traits of Vanuatu arising from VANRIS is presented in Appendix III.

The same study identified 10 major landforms on which land cover and fauna have developed/evolved. Land cover in Vanuatu is therefore a complex mosaic of primary and secondary vegetation resulting from interaction between natural disturbances (cyclones) and agroforestry/gardening systems used for food production.

Dahl (1980) listed 37 different ecosystems for Vanuatu. Nine types of forest and woodland cover nearly 77% of the country. Scrub, grassland and freshwater/marine ecosystems make up most of the remainder. The vegetation types of Vanuatu are presented in the following table. The forests of Vanuatu are not as tall as those of PNG and Solomon Islands. They rarely exceed 30m in height.

Vegetation type	Area (ha)	Percentage of land area
Midheight forest (20-30 m)	205,307	16.73
Low Forest (10-20 m)	234,089	19.08
Woodland (<10m)	386	0.03
Thickets (3-8 m)	433,941	35.37
Scrub (<3 m)	45,018	3.67
Grassland	51,128	4.17
Swamp Communities	2,261	0.18
Mangroves	2,519	0.21
Other ¹	252,256	20.56

Land Area (ha) 1,226,905 100.00

¹ Bare ground or agricultural and inhabited land

Table 1: Vegetation cover of Vanuatu (ACIAR, 1997)

Vanuatu forest types have been described by several authors (Dahl, 1980, Schmid, 1978) and a detailed classification can be obtained with VANRIS. They can be summarised as follows (ACIAR, 1997):

(a) Lowland rainforest

(1) Climax closed canopy high forest, found mainly on windward wetter slopes;

(2) Cyclone-perpetuated two-storeyed closed-canopy high forest, such as the kauri (*Agathis macrophylla*) forest on Erromango.

(b) Semi-deciduous forest – mainly found on leeward drier slopes, such as those forests found on Malekula;

(c) Altitude-influenced forest (montane and cloud forest), found on Santo and Tanna;

(d) Riverine and swamp forest;

(e) Mangroves

The loggable forest area is about 27% of the total forest area (Baldwin et al., 1993). It is important to highlight here that a lot of products are derived by Ni-Vanuatu from their environment (food, firewood, medicines, building material for boats, houses and handicrafts). Some of these products are referred to in the literature as non timber forest products (NTFPs) (de Beer and McDermott, 1989). In order to provide these NTFPs, forests areas are under some form of management by the local population, and NTFPs are providing sizeable economic benefits. As such, these products may be a sustainable alternative to the logging of forests (ACIAR, 1997).

The number of botanical and zoological species found in Vanuatu is not exactly known as new taxonomic discoveries are still being made. Nevertheless it is possible to find in the

literature exhaustive descriptions of the various species of plants and animals found in Vanuatu (David, 1985; Chambers and Bani, 1988; Bregulla, 1992; Environment Unit, 1999). A summary of the various species found in Vanuatu is presented in Appendix IV.

The National Bioconservation Strategy (NBS) (Environment Unit, 1999) provides a listing of plants, animals and habitats that are known to be significant elements within Vanuatu's biodiversity. Ecological factors (such as species rarity) are not the only ones to be considered to assess the importance of a species/ecosystem to the people of Vanuatu. Social, cultural and economic factors are also relevant. On such assessment biodiversity in Vanuatu is important in the following ways:

- Rural communities are using cultivated and wild biological resources for food (fruit trees such as *Artocarpus altilis* (breadfruit), *Barringtonia edulis* (navele), *Cordyline fruticosa* (nangaria), *Canarium harvei* (nangai), *Syzygium malaccense* (nagavika), *Terminalia catapa* (natapoa)), root crops, firewood, medicine, construction material (*Metroxylon warbugii* (natangura)), and fodder for domestic animals;
- Cultivated and wild biological resources are used for commercial purposes (nut trees (see above), kava (*Piper methysticum*), sandalwood (*Santalum austrocaledonicum*));
- Some species or places have a special importance in local custom which is still very strong in Vanuatu. Tree ferns (*Cyatheaceae spp.*) are used for carving tall figures for 'nimangki' or 'grade taking' ceremonies, leaves of *Cycas spp.* Locally called 'namele' are used to signify taboos and are represented on the national flag. The kava is a very important custom plant as it was traditionally used before holding village meetings in the 'nakamal'.

Tables provided in the NBS document highlight the endemic species, species of cultural or economic value, species that are locally vulnerable to over-exploitation and species that are rare or vulnerable. Important, damaged or degraded as well as vulnerable places /habitats are listed as well (see appendix V).

Threats that are impacting upon the status of biodiversity are:

- Over-exploitation of many plants and animal resources that are causing a decline in the abundance and distribution of species such as the coconut crab (*Birgus latro*), green snail (*Turbo marmoratus*), trochus shells (*Trochus niloticus*) or even lobsters (*Panulirus spp.*). Plants such as kava (*Piper methysticum*), sandalwood (*Santalum austrocaledonicum*) whitewood (*Endospermum medullosum*) and the melektree (*Antiaris toxicana*) are experiencing a decline as well. New development practices are leading to the degradation of some ecosystems but more disturbing is the countrywide declining respect for traditional resource management systems and traditional authority structures.

- Another threat to the environment is the introduction of invasive species. Although the Quarantine Department is acting as a watchdog today, most of these invasive species have been imported in the country in the past.
 - Some vines imported during World War II are now a source of concern for many of the islands. Mile a minute (*Mikania sp.*) and American rope (*Merremia sp.*) are suppressing regrowth of tree forest and can cause loss of wildlife. The Quarantine Department is ensuring that these vines are not transported to newer grounds within Vanuatu.
 - Water hyacinth (*Eichhornia sp.*) is under scrutiny from the Quarantine which is considering introducing a beetle for biological control. It is effectively invading fresh water streams/lakes.
 - Some grass and many trees and shrubs are invasive as well and are now taking over prime agricultural land (Quarantine Department, personal communication, 2004).
 - Some introduced animals can be very destructive as well for the environment. Feral pigs are causing trouble for communities in the Port Olry (Santo) area and are damaging natural environment elsewhere. Rats cause considerable damage to agricultural crops (cocoa, coconuts ...) and can be a threat to the local bird population.
 - Most threatening is a tiny ant: *Wasmania auropunctata* or fire ant. Probably introduced from the Solomon Islands it is now present in the Banks Islands (Vanua Lava and Mota). Native from tropical America this ant gives a horrible sting to people and can cause blindness/death to large animals (birds). An eradication campaign needs to be organised before this ant reaches other islands of Vanuatu and becomes an economical burden: gardening can become an extremely painful activity, and plants may be affected too by this ant.
 - The African snail (*Euglandina fulica*) has been a pest but has been controlled since the introduction of its natural predator (*Euglandina rosea*). This snail however has been feeding on other native snails some of which were endemic.
 - The last important invasive species is the Indian Mynah Bird (*Acridothera tristis*). Native to India this bird is highly successful in competing with native birds and taking over their habitat by destroying their eggs and nests. In places where this bird is established other birds are rarely seen.

To address these threats to Vanuatu Biodiversity, a new piece of environmental legislation has been recently introduced: The Environmental Management and Conservation Act No 12 of 2002. This act provides for the conservation, sustainable

development and management of the environment of Vanuatu, and the regulation of related activities. It covers four important areas: Environment Impact Assessment (EIA), Biodiversity and Bioprospecting laws and Community Conservation Areas (CCAs). This latest Act is a new legislation that completes previous existing ones. These will be reviewed later.

Marine resources

The largest ecosystem in Vanuatu is related to saltwater environments. This encompasses mangrove forests, enclosed and opened lagoons, seagrass beds, fringing coral reefs and deep water environments. Various biological surveys of coral reefs and sea grasses provide inventories of the major groups of plants and animals as well as an assessment of the condition of these environments throughout the country (David, 1985; UNEP/IUCN, 1988; Chambers and Bani, 1989; Lal and Esrom, 1990; Done and Navin, 1990; Chambers and Esrom, 1991). In August 2004, a survey is in progress to assess the species/state of the population of reef fish targeted by commercial aquarium trade (Kevin George, Personal Communication, August 2004).

Although Vanuatu's scenery includes many areas of exceptional aesthetic appeal, neither the corals, nor the shallow water reef fishes are unique to Vanuatu. Vanuatu's marine ecosystems are similar to those that could be found under similar latitude in Australia or other Pacific Islands. Some sea shells maybe endemic to Vanuatu but further research may be required to assess the full extent of the diversity. The red-lip olive *Oliva rubrolabiata* is commonly found in the Banks, whereas some cowries that are rare in other regions seem to be found more commonly in Vanuatu (*Cypraea mariae*, *Cypraea catholicorum* and *Cypraea childreni*). Likewise some reef fish that are valuable in aquarium trade seem to be found in good quantities in Vanuatu: *Centropyge loriculus* (Flame Angelfish), and few members of the Pomacentridae family (anemonefish or clown fish). These fish are in high demand since the screening of a now famous Pixar movie: 'Finding Nemo'. The Department of Fisheries is now engaged in stock assessment in view of better regulating the activities of the aquarium trade which has so far experienced a mixed reception in Vanuatu.

Coral reef habitats are often damaged during cyclones, and outbreaks of the coral-eating crown of thorns (COT) starfish (*Acanthaster planci*) have also caused damage. Local communities (Malo, Aore in Santo), with the help of the Department of Fisheries and funding from the Foundation for the South Pacific have engaged in campaign of clearing the reef of the COT (Vanuatu Daily Post, 07/08/04). Coral reefs are also at risk from human activities: siltation (resulting from uncontrolled logging practices), pollution, fresh water and overuse. Reef deterioration is reported in localized areas mainly surrounding human implantation (Port-Vila, Luganville...).

Seagrass habitats, that are sheltered from the prevailing southeast trade-wind, are host to the famous mammal that is elsewhere in the world under severe threat: the dugong (*Dugong dugong*). The dugongs in Vanuatu do not appear to be under specific threat and the population is healthy (Thistlethwaite, 1993).

Mangroves in Vanuatu are generally found in small clumps except for a large area in Malekula (1975 ha). Mangroves play an important role in the supply of fish in local waters as it acts as a nursery shelter for numerous species. Mangroves are used for house construction and fuel by nearby villages. The mangrove crab (*Scylla serrata*) is highly appreciated and actively gathered. 13 species of molluscs and 20 species of crustacean have been collected from mangroves. 42 species of fish have been identified as well.

Although the marine resources are important both culturally and economically, the people of Vanuatu do not traditionally make as heavy a use of marine resources as some other Pacific Islanders. Marine exploitation is mainly in the form of subsistence and artisanal fishing and resources are still plentiful although they may appear overfished in localised areas. To relieve the pressure on near shore resources, commercial fishing was promoted for deep-sea fishes on outer-reef slopes (*Lutjanidae*, *Serranidae* and *Etelidae*) from 1981. Today this activity has still not significantly developed/progressed and only two companies are fishing on a relatively small scale. Pelagic resources are not fixed but migration through Vanuatu EEZ waters of these species (*Katsuwonus pelamis*, *Thunnus albacares*, *Thunnus alalunga*, *Thunnus obesus* and *Thunnus thynnus*) are attracting a growing number of foreign vessels. While some of these vessels are licensed, a growing number seem to be fishing illegally. The Fisheries Act (1982, 1989, and 2003) aims at regulating all activities related to marine environments.

The coconut crab (*Birgus latro*) is the object of special consideration by the Fisheries Department as well: local government are encouraged to place temporary bans on coconut crabs harvesting to help replenish populations. FSP has been instrumental to the campaigning for preservation of the crab stocks through awareness raising activities. Properly managed the coconut crabs could be sustainably harvested and this activity would provide a source of income for remote areas of Vanuatu.

Two molluscs have been largely exploited in Vanuatu for the pearl buttons industry and inaly work of arts respectively: *Trochus niloticus* and *Turbo marmoratus*. The DOF has put in place mechanisms to help restore the populations through reseedling. It has been recently reported that the population of trochus has been on the increase again in the SHEFA, MALAMPA and PENAMA Provinces (Vanuatu Daily Post, 10 July 2004). The population of green snail (*Turbo marmoratus*) is still endangered in Vanuatu.

Fresh water environment in rivers and lake host various species of freshwater prawns (*Macrobrachium pp.*) and some fishes (*Stenogobius sp.*, *Sicyopterus sp.*, *Stiphodon sp.*, *Vivineala pryhotigris sp.*) but they are not commonly identified. A threat to these environments is the quality of water that can be altered by agricultural activities in the riparian zone. Invasive species of fishes such as tilapias (*Oreochromis spp.*), *Gampusia sp.* and *Poecilia sp.* can represent a threat as well. The Vanuatu Environment Unit (VEU) is responsible for deciding upon the importation of a new species to Vanuatu. Once agreed, the Quarantine Department then issues a permit on the advice/recommendation of the VEU.

It appears from the previous paragraphs that the natural environments of Vanuatu are still in good condition. Problem areas are located near the zone of human implantation and /or are related to human activities. Natural disasters play as well an important role on Vanuatu's environment sustainability.

Socio-Economic Conditions, Socio-Cultural Conditions and Human Health

Archaeology, cultural heritage, values and aspirations

“Kastom” plays a crucial role in Vanuatu society today. This is illustrated by the provision in the constitution that:

“Parliament may provide for the manner of the ascertainment of relevant rules of custom and may in particular provide for persons knowledgeable in custom to sit with the judges of the Supreme Court and the Court of Appeal and take part in its proceedings”.

The concept of kastom relates to cultural, historical and religious traditions. This tradition is most intimately tied to the land, natural resources and reverence held for the spiritual forces of nature. Chambers and Bani (1988) identify the “*close identification that all ni-vanuatu feel with the land, their own custom land in particular*” as a major reason for natural resource protection. As the custom land provides all traditional resources necessary for survival, it is anticipated that degraded land will not provide physical or spiritual resources needed to achieve security, protection and well-being. According to these authors, “*ni-vanuatu living in a degraded environment will suffer a spiritual or cultural loss with a consequent lowering of the quality of life*”. For all Ni-vanuatu ‘land is everything’ and is basic to their identity. Land is the mainstay of a world-view by which Ni-Vanuatu cultures operate: it is the foundation of all custom and represents both material and spiritual life. Arutangai (1987) relates the following statement by people from Raga (Pentecost):

“We are from Raga, we are Raga, this ground is Raga. These are my children. I cannot buy or sell them. This ground is like our roof. If we do not care for it, it will not shelter us and we will die out”.

Consequently, although there are only a few areas officially designated as protected areas under appropriate legislation, there are many thousands of sites which are preserved throughout the islands by their custom-owners (taboo or restricted access/use areas). These sites may have a sacred or cultic nature, or there may be present on these sites some trees/plants/minerals or other items of cultural or traditional significance. According to Forster (1991) the custom land owners have had a long experience and tradition of sound and sustainable management of these sites. This experience qualifies them as site managers and they should therefore be involved in any future natural resource management scheme. Tapisuwe *et al.* (2003) report that out of 106 conservation areas identified in 2001, only four had received financial and western type assistance. The rest were initiated through traditional and cultural input. The distribution of customs sites is not only related to present-day settlement patterns. It relates as well to ancient sites of settlements which may have disappeared a long time ago as a consequence of the

various diseases imported to the country by early colons. Indeed estimates of the Vanuatu population prior to the colonial era indicates between 500 000 and 2.5 million (Thistlethwaite, 1993). Vanuatu is therefore rich in cultural and historical sites, but only few of them have been located and explored. Garanger (1972) relates the exploring of such sites, the identification of the remains of the Lapita civilisation in Vanuatu and the finding of the remains of Roy Mata a very important chief in Vanuatu's history. A new Lapita site, rich in Lapita pottery and skeletons was discovered very recently (2004) in Teouma, Efate. This site could take the archaeologists back 3200 years, 200 years more than the previous oldest site located in Malo (Daily Post, 07/08/04). Although a major effort is being made to survey important sites Thistlethwaite (1993) suggests that some sites may be regarded as so sacred that their very existence is remaining a closely guarded secret.

In accordance with the previous considerations, land and land tenure in Vanuatu are of fundamental importance. Article 73 of the Constitution provides that "all land in the Republic of Vanuatu belongs to the indigenous custom owners and their descendants" except land that Government acquires in the public interest. This reinstatement of customary principles followed years of colonisation where a different tenure system was imposed on the customary background. The introduction of the Alienated Land Act in 1982 aimed at regularizing the situation with regard to pre-independence alienated land that had come to be owned either by Ni-Vanuatu or by the Government. Ample literature addresses the complexity of the politics of land and land tenure in Vanuatu (Alatoa *et al.* 1984, Arutangai, 1987; Van Trease, 1991; Atanroi, P *et al.* 1995.). **The question of custom land ownership and tenure will have to be considered for any sustainable development project** as custom owners have the inalienable right to do as they wish with their land (Thistlethwaite, 1993).

Recreational, landscape and visual aspects

"Anthropisation" is a French word that relates to the intervention of human societies on the natural environment. Effects of *anthropisation* are generally seen on the landscape but may be identified through variations in the biodiversity. *Anthropisation* in Vanuatu is very limited and most noticeable in the main cities of Port Vila and Luganville, and at a smaller scale around other settlement areas. Agricultural activities have modified the landscape but this is limited to areas of plantation agriculture, mainly on the coastal plains. Traditional gardening is virtually unnoticeable for inexperienced persons walking in a forested area. The general landscape in Vanuatu is virtually unaltered by human activities to the extent that it has been modified in Europe. To a new comer Vanuatu is still very much the 'untouched paradise' advertised on tourist brochures. Although human activity did have an impact on the original environment (through the import of new species, agroforestry systems) its extent is still limited today. Current trends of economic activities (logging, identification of natural resources of commercial interest, increasing demography) may alter this statement in the future.

In the Port Vila Municipality area and in Luganville, there are no specific rules on building style, size and shape to protect the visual aspect of the city (Dalesa Malcolm, Personal Communication, August 2004). A massive multistorey hotel has just been

completed on Port Vila seafront, in total contrast to the rest of the low-lying buildings of the town. There are also no specific restrictions on cutting older trees within the Municipal area.

Recreational activities are rather limited in rural Vanuatu. They often consist of hunting or fishing expeditions followed by a picnic. Whilst both hunting and fishing could have an impact on the environment it is in fact very limited. Access to guns is strictly restricted and ammunition has not been available in the country for the past three years. Flying foxes, pigeons (nautous), wild fowls and feral pigs are hunted with traditional means. Combined with the absence of means to preserve the result of hunting for lengthy periods (no fridges or deep freezers), and with the difficulty of transporting game meat to possible markets (restaurants, Port Vila market) the hunting groups are targeting only what they can consume immediately. This does not always apply in the case of some well equipped hunters living in the cities. Hunting is therefore regulated and there are periods at which it is illegal to hunt certain species. The same findings apply to recreational fishing. The purpose is often limited to sharing a feed of fish together at the end of the day. Picnic activities often involve a fire to cook the food that has been gathered. Low level of packaging of traditional food (often using banana/laplap leaves) ensure that minimal waste is discarded on the site.

Around the cities, more activities are available (sporting, musical shows, church gathering). Bulk waste may then be a concern as a result of such activities: paper plates, plastic bags and cans are often found scattered after such events. The population is generally cleaning the grounds the next day.

More expensive recreational activities are available such as: golfing, scuba-diving, big game fishing. Scuba divers today are respectful of the environment they have come to admire and would most probably be supporting environmental legislation that would ensure preserving reef areas of special interest. The population of big-game fishermen is divided amongst some groups that are promoting International Game Fishing Association's (IGFA) spirit of tagging and releasing billfishes, and some other groups that do not always apply these principles. Big Game fishing is an activity that could provide Vanuatu with a sizeable economic return in tourism, as long as there are billfishes that can be caught. In this light, a living billfish is potentially worth VT400,000 in plane fare, hotel, charter while a dead billfish on the market is only worth VT30,000. It would be therefore recommended that big game charter boats, whose activity relies on the availability of billfish in Vanuatu waters, are not allowed to kill/sell the result of their catches if it consists of billfish. The situation regarding billfish is different for a small local fisherman whose survival/children school fees may depend upon the selling of a fish. The local Game Fishing Club is endeavouring to promote IGFA standards.

Economy

Vanuatu per capita GDP is estimated at USD1,259 (Statistics Office, 2002) in 2001. As it can be assessed in Table 3, Vanuatu's GDP is made up of three sectors: Agriculture, Industry and Services.

Services, which includes tourism contributes in average 76% to total GDP whilst agriculture contributes 14.9% and Industry 9.1%. A comparison of these figures with that of ten years ago shows that the contribution of the Services has increased 10% (from around 66%) whilst that of Agriculture has decreased from 23% to 15% (-8%). Industry has experienced a decrease of 6% from approximately 15% in 1994 (Statistics Office, 1994).

(At current prices)	1999	2000	2001	2002
Gross Domestic Product (in VTm's)	34,015	35,283	35,927	34,652
Agriculture	5,263 (15.5%)	5,245 (14.8%)	5,148 (14.4%)	5,128 (14.9%)
Industry	3,123 (9.2%)	3,130 (8.9%)	3,105 (8.6%)	2,964 (8.5%)
Services	25,629 (75.3%)	26,909 (76.3%)	27,674 (77%)	26,560 (76.6%)
GDP in million (US\$)	265	257	248	266
GDP per capita (US\$)	1,419	1,340	1,259	1,315

Table 2: National Accounts

Since 1980 the GDP of the three sectors has grown at an average annual rate of only 1.6% in real terms compared with 2.2% growth for the economy as a whole and an average population growth rate of 2.6% per annum. In 1999 the GDP in real terms decreased of 5.6% and remained nearly constant the following year. In 2001 it recovered its level of 1998 and decreased again in 2002 (-1.6%). The real GDP per capita is now 10% lower than in the 1980's as a result of a poor growth in the agricultural and fisheries sectors (ADB, 2002a). The amount of annual per capita aid in 1999 reached USD 222 reflecting an important involvement of aid donors.

Vanuatu's economy is highly dualistic. There are two sectors: the urban economy in Port Vila and Luganville and rural economy for the rest of the country. The quality and availability of public services is very poor outside these two town areas. Furthermore, if household income disparity is around 1:5 between the highest and the lowest over the country there is a big difference between urban and rural area. In the urban areas the highest quartile earns almost 52 times that of the lowest (Satish Shand, 2002). In the rural area income disparity is very low. A result of that disparity is that the rural-urban income gap is 1:16, hence the movement towards rural out migration.

Tourism

Tourism is an important source of revenue for Vanuatu and it accounted for 40% of the GDP in 2000. This activity is almost exclusively concentrated around the two main urban centres (90% of Vanuatu's hotel capacity is focused in Port Vila). Around 50,000 to 55,000 visitors come to Vanuatu every year, but the room occupancy rate is barely above 50% (Statistics Office, 2002). Tourism could become a better source of revenue for Vanuatu in a time where other countries in the region are facing political problems. That would mean that action to support increasing tourist numbers would need to be taken (air ticket costs, tourist activities, land lease access for foreign investments, services attached to tourism...). Likewise rural areas could benefit from such growth through improved air links (price and frequency) or quality sea links. Some magnificent areas remain untouched and a profitable eco-tourism industry could be developed. The development of Mystery Island (formerly Inyeung Island) could provide an example for the rest of the country. Members of the Lory Cooperative in Port Olry expressed in 2002 their interest into organising a form of eco-tourism in their village which is magnificently located in north-eastern Santo (pers. com., 2002).

A scuba-diving industry is fast developing in Vanuatu. Wrecks from the Second World War and reefs are the main points of interest for divers coming to Vanuatu. Scuba diving tourists are often advocates of environmental protection and this industry is currently questioning the impact on the environment of some activities such as aquarium fish trade and long-line fishing close to the shore. It is argued that a decrease in fish quantities and varieties has been noticed in areas where the aquarium fish collectors have been working. Likewise a noticeable decrease in shark population is reported. Their decline is linked to the allowance of three fishing licences for shark finning to foreign vessels.

High exchange rates although beneficial to the country in terms of lowering the cost of imported goods are unfavourable to the agricultural and tourism sectors of the economy that are competing with their products on a global market.

Financial Centre

Although with limited impact on the environment, a sector that provides important revenues to Vanuatu is linked to the existence of the Offshore Financial Sector (OFC) established in 1971. Vanuatu is a pure tax haven and has benefited from the absence of taxes (income, company, capital gains, death ...), the exemption of international companies not engaged in the domestic economy from the statutory requirements of lodging audited annual financial returns and confidentiality protection by statute. These factors have contributed to the growth of the OFC to become an important sector of the local economy. In the second quarter of 2001, the OFC contributed some VT11 million to the national budget and provided some 300 jobs (Satish Chand, 2002). The existence and sustainability of this sector is linked to the existence of the previously listed factors. Moves from the OECD (April 2002) to place Vanuatu on a list of 'uncooperative tax havens' are factors that could adversely affect the growth of the OFC and places a threat to the continuing growth of the OFC within the economy of Vanuatu. Vanuatu has been removed from this list in 2003.

✧ Agriculture:

Agriculture in Vanuatu is very important as 78.5% of the population is involved in that sector. Agricultural activities provide the sole income for 62% of the rural population. Agriculture represents as well 83% of Vanuatu's total exports, which was approximately VT2,000 million in 1993. In 2003 Vanuatu's domestic exports (excluding re-exports) amounted to VT2,600 million of which 69% is still derived from the agricultural sector.

From 1992 to 1996, four commodities (copra, beef, cocoa and timber) made up 76% of total domestic exports. In 1997-2001 the same commodities constituted only 70% of the exports earnings due to the emergence of kava (*Piper methysticum*) exports which commenced in 1997. Unfortunately the initially promising new commodity now has an uncertain future due to the ban on kava products put in place by most of the former importing countries (France, England, Germany ...). These bans were put in place following the suspicion that kava products could be linked to liver toxicity problems that have occurred in these countries. Consequently kava exports decreased from 935 tonnes in 2001 to 491 tonnes in 2003 (Statistics Office, 2003). Research is now being undertaken to provide a better understanding of the effects of kava on humans.

(In million vatus)	1999	2001	2003
Imports	12,451	13,118	12,703
Exports (total inc. re-exports)	3,327	3,205	3,252
Copra	1,384 (41%)	323 (10%)	282 (8.7%)
Coconut Oil	-	362(11%)	382 (11.7%)
Beef	404 (12%)	239 (8%)	287 (8.8%)
Cocoa	148 (4.5%)	64 (2%)	296 (9%)
Timber sawn	363 (11%)	334 (10%)	249 (7.6%)
Kava	478 (11%)	503 (16%)	228 (7%)
Trade Balance	-9,124	- 10,328	- 9,843
Export to import ratio (%)	27%	24%	21%

Table 3: Vanuatu Foreign Trade. Source: Statistics Office, 2001.

Although Vanuatu's agriculture sector has been targeting niche markets for organic products on the basis that a premium price is paid for certified organic goods, the current tendency is to revise this analysis. It appears to be more profitable for the farmers to use limited amounts of pesticides and increase their production even if it is later sold at a lower price per ton. This newer option is under scrutiny especially in the cocoa industry where fruit flies/rats control is a major issue both before harvest and after processing.

✧ Forestry

Some 36% of the total land area of Vanuatu is forested. The loggable forest area is about 27% of the total forest area. This is mainly due to the poor quality of the timber and/or difficulty in accessing the sites. Forestry activities nevertheless are the main source of

cash income for many rural communities. Forest product exports peaked in 1998 at VT 521 million. It accounts for approximately 7.6 to 13% of total merchandise exports earnings depending on the year. More than 500 people are employed in forest operations, fixed sawmills and wood processing industries. Their wages amounted to an estimated VT 120 million. Several hundred more people are involved full or part-time with mobile sawmills (Department of Forests, 1999).

The main export markets are in Asia (People's Republic of China, Japan and Republic of Korea). Export of unprocessed logs has been banned since 1994. Some limited export is possible when a species cannot be processed in Vanuatu or where a higher return can be demonstrated.

The total volume of wood harvested in 2000 was 35,143 m³ and landowners were paid nearly VT 33 million in royalties. Management charges paid to the government by commercial operators totalled VT 9.9 million. VT 31.7 million was paid to landowners for sandalwood as well. The level of harvest is well below the sustainable yield of 68,000 m³ based on the National Forest Inventory (ADB, 2002b). Nevertheless four areas of concern are that:

- Most of the logging is concentrated on the island of Espiritu Santo (86% of the total);
- Logging activities concentrate on just two species: *Endospermum medullosum* (White Wood), and *Antiaris toxicana* (Melektree). Such a concentration is not sustainable and it results in the underutilisation of other commercial species available in Vanuatu.
- Total timber harvest far exceeds the rate of replanting. Although Government policy calls for the establishment of 20,000 ha of new timber plantings over the next 25 years, this is not happening (ADBa, 2002).
- Many disputes arise between forestry leaseholders and custom landowners.

Nevertheless Vanuatu forestry sector is one of the better organized in the region with a progressive regulatory system (ADB 2002a). 2002 was declared the "Yia blong Planem Wud" (Year of Wood Planting) and a Reforestation Committee spearheaded by the Chamber of Commerce and Industry was set up. The main function of the Committee was to address the issues affecting the small saw-mill industry in terms of timber imports and exports and to look into methods of enhancing and improving the replanting program. Proposals were submitted to donors and the EU, New Zealand High Commission and Australian High Commission funded some of the Projects.

The forestry sector presents considerable opportunities: Vanuatu has excellent soils and growing conditions for trees. There exists in Santo and Erromango a potential for high growth rates for both short-term pulpwood and longer rotation timber for saw logs or veneer. Agroforestry could provide an interesting alternative to the communities and

NTFPs represent an interesting alternative to logging. Even in the case of a pilot tree farm project, an agroforestry option in which the land is used for the short term production of crops is preferred. This project is located at the Industrial Forest Plantation (IFP) site on East Santo and has been endorsed by the Council of Ministers in June 2003.

Some forested areas are currently officially protected such as the Erromango Kauri Reserve which extends to about 1,200 ha of some of the best remaining kauri (*Agathis silbae*) forest. Other forested areas are informally protected: Big Bay Forests in Santo (supported by SPREP) and the Kohle Forests Reserve (Santo).

✧ Fisheries:

Although being an archipelago with 98.6% of its area being occupied by the Pacific Ocean, Vanuatu fishing industry is minute. The fisheries sector contributes approximately 1% to overall GDP and makes up only 5.5% of primary production sector. In 1999, 35% of the urban households are fishing for subsistence only while 0.3% is fishing for resale. For rural households the figures are 59% for subsistence and 0.2% for resale (Statistic Office, 2000). In 2003, 236 tonnes of fish were exported while in the same year 1,335 tonnes of canned fish were imported at a cost of VT188 million. Licensing and access fees paid by foreign tuna fishing vessels for access to Vanuatu waters amounted to approximately VT82million in 2000. This situation has not always been the case as up to 1987, fishery activities were accounting for 26% of the total export value as a result of the activities of the South Pacific Fishing Company. This tuna loining factory was located in Santo and has been closed since 1987 after nearly 30 years of activity.

The fishery resources can be divided into deepwater, coastal and reef components. The exploited deepwater resource is tuna (albacore (*Thunnus alalunga*), skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), and big eye (*Thunnus obesus*)). In the Vanuatu EEZ, the total allowable annual tuna catch is 8,250 tons based on the Forum Fisheries Agency estimates. This includes 3,000 tons albacore, 3,000 tons skipjack, 2,000 tons yellowfin and 250 tons big eye. Unfortunately comprehensive information on the volume of tuna caught annually in Vanuatu's EEZ is lacking since many of the licensed vessels fail to submit the mandatory catch logs to Vanuatu's authorities. Furthermore, unlicensed vessels continue to fish in Vanuatu's EEZ as well.

The main coastal commercial fish is commonly known as 'poulet' a name applied to several types of snappers (*Etelis spp.* and *Pristipomoides*). Although these fish could have good export potential the estimated annual sustainable catch is only about 300 tons and this could be overstated (ADBa, 2002). A comprehensive study on Vanuatu fishery can be found in the Coastal Fisheries Atlas of Vanuatu (Cillauren *et al.*, 2001). Fishing pressures have been relatively light with about 63 tons caught in Vanuatu in 2000.

Most of the reef fish that are caught are consumed at home. Suspicion of ciguatera³ is restricting the commercial sale of reef fish.

In mid-2001, a survey by a fisheries consulting team determined that they were 'alarmingly few' food fish to be found in the waters around Efate (ADB, 2002). While reef fish stocks are underfished in much of Vanuatu, results of serious overexploitation are felt in the waters around Efate and in some areas around Santo.

Population

Population densities vary from island to island depending on size, topography and agricultural capacity. The densities are comprised between 5 people per sq km (Torres) to close to 1000 people per sq km on Atchin Island off the coast of Malekula (land area 0.8km²) or Ifira Island (the islet within Port Vila harbor). The average density is 11.7 people per sq km. 63% of the population lives in Santo, Malekula, Efate and Tanna

According to the 1999 census (Statistics Office, 2000), 21.5% of the population is classified as urban. There are only two major urban centres in Vanuatu: Port Vila, the capital city on the island of Efate which has a population of 29,400 while Luganville on the island of Santo has 10,700 inhabitants. If we compare the last two censuses (1989-1999), there is an interesting variation in population growth rate between the urban area (+ 4.2%) and the rural sector (+ 2.2%). This highlights a substantial rural out migration from the rural areas towards the urban centres. Young Ni-Vanuatu have high expectations that coming to an urban centre they will secure employment. This coupled with the fact that 43% of the population is under 15 years of age has resulted in this rural out migration and urban drift. Unfortunately employment is hard to find and these younger Ni-Vanuatu are dependant on their extended family for survival. Every year around 3,500 school leavers finish formal education and there is only approximately 1,000 jobs available to them (Satish Chand, 2002). This situation has led and will lead to urban drift and development of a delinquency that is often not managed adequately by the Police Force.

The option of sending back the young potential delinquents to their island of origin is often discussed and even envisaged by the Council of Chiefs but however it is contrary to the Constitution of Vanuatu. One option is to provide employment opportunities in the rural areas to prevent such migration from taking place. Due to the agricultural potential of the soils in the various islands the development of agricultural activities could assist and somewhat alleviate the problems associated with the current rural out migration.

The development of a rural economy is dependent on the access to some form of funding (credit) to help rural entrepreneurs start a productive activity. This rural economy should not only be focused on farming activities but should consider as well fishing activities, which are largely underdeveloped (Mourgues, 2003) and services.

³ Ciguatera is food poisoning contracted by eating perfectly fresh fish from coastal coral and ocean environments. The causal agent is *Gambierdiscus* of which six species have been described worldwide.

Demographic impact on environment is exacerbated by density. Islands with the highest densities are facing soil erosion problems (Aneityum, Paama, Shepherds ...) as well as heavy pressure on natural resources to provide food, firewood, and construction material for everyone. In the vicinity of Port Vila sand is mined from beaches (Blacksand Beach in Mele) contrary to the recommendation of engineers. As a result the century-old trees along the beach are dying, threatening the sustainability of the beach itself. In contrast some other islands of Vanuatu are virtually empty (Erromango). Inter-island migrations, resettlement and intermarriages pose interesting problems in matter of land tenure/absentee landowner related to the custom system. As more ni-vanuatu migrate to the cities of Port-Vila and Luganville they descendants may one day have lost links with their original island and want to settle in their new environment. Land dispute may be on the rise, as less fertile lands will be recruited (Arutangai, 1987).

In the cities, poor town planning has resulted in poor housing conditions for large parts of the population. Lack of sewerage systems, poor management of many individual septic tank systems has resulted in high level of pollution of the water of surrounding lagoons as exposed earlier. Water runoff during heavy rains contributes as well to the pollution of waterways. Management of solid wastes has been highlighted as the biggest challenge faced by the Municipality of Port Vila (Malcolm Dalesa, Personal Communication, Tapisuwe *et al.* 2003, Caron, 2003). In Port Vila the output of solid waste is estimated at 0.6kg/pers/day due to the ample packaging of imported goods. As there is no national legislation to deal with solid wastes management (Tavala and Hakwa, 2004) and only limited recycling is available, the bulk of the waste is transported to the Municipal Dump at Teouma. No survey had been organised prior to the establishment of the dump and it is estimated that the site will reach full capacity in 10 to 15 years. Old cars are disposed of in the dumps as well. Old machinery is kept on the seashore close to the harbour, proving a real eye sore for tourists coming to Port Vila from the cruisers that stop in the country. Used motor oil is disposed of in the Municipal Dump where a pit dug in clay is expected to prevent any spillage in the underground water. UNELCO, the biggest consumer of oil for its generators has an agreement with MOBIL to ship its used oil to Fiji. The Municipality of Port Vila recently addressed the growing concern about plastic bags pollution: the 2002 Municipal By-Law No 4 banning non-biodegradable plastic from being used in the urban area was a positive step. Unfortunately, some major shopping outlets refused to abide the law and no legal back-up of the By-Law was in place to enforce it (Malcolm Dalesa, Personal Communication, August 2004).

As the population is increasing the above problems are likely to increase unless action is taken to prevent the worsening of the situation. A corollary is that traffic management in the capital city is quickly becoming a matter of concern. Many private cars and public transport (taxis and buses) are generating polluting smoke which contributes to localised pollution.

Another corollary of the population increase is an increase in petroleum products demand. These products are used for both: electric generators, energy for transportation and for cooking. The sitting of Port Vila's petroleum storage is a matter of considerable local concern, not only for the danger of accidental pollution during tankers approach to

the site, or during ship-to-shore transfer but because it cause a real hazard for nearby residents.

Little consideration has been given to public access to the foreshore and no set-back area has been enforced. Therefore valuable potential public amenity has been lost for the benefit of a few landowners with waterfront properties. A new Port Vila development plan would assist in defining how public amenities can be maintained or improved and the attractiveness of the town enhanced for both residents and tourists. The public waterfront area in town could become a real asset for the capital with proper action taken to ensure beautification of the current promenade.

Utilities, infrastructures, transportation

Water

The water supply of the two large cities of Luganville and Port Vila originate entirely from groundwater. No information on the rate of recharge of the aquifer has been provided. Port Vila and Luganville water supply are owned by the State but are managed, maintained, expanded and operated by a private company UNELCO. UNELCO is a company that has the monopoly of electricity provision in Vanuatu. UNELCO is under a concession contract that runs to 2032. In Vila, UNELCO provides water supply of 9,200 m³ per day from boreholes. The ultimate capacity of the resource is 60,000 m³ per day. The reticulation network is in good condition with unaccounted for water in 2000 being 21%. No major health problems have been encountered. However, Port Vila catchment area of the Tagabe River is currently threatened by the encroaching urban development for residential, agricultural (subsistence) and industrial activities. In order to protect the Tagabe River Catchment area many governmental agencies (Agriculture, Quarantine, Forestry, Port Vila Municipality, Environment Unit...), the SHEFA Province as well as NGOs (FSP) and donors (American Peace Corps, AUSAID...) have joined forces: in August 2004, the Matnakara Water Protection Zone of the Tagabe River has been implemented. This Project, overseen by the Environment Unit, was able to be implemented following the publication in the Official Gazette of the new Water Protection Zone. The new WPZ should now be protected from dangerous pollutions as it is regulated under the Water Resources Management Act N0. 9 of 2002. The entire zone is divided into three sub-zones with various restrictions that apply to each zone. Operation and maintenance practices for the water supply network are good and consistent with water utilities in developed countries. Provision for extension of the network is made under the concession agreement.

The Public Works Department (PWD) is responsible for the operation of the provincial town water supplies in Luganville, Isangel (Tanna) and Norsup/Lakatoro (Malekula). Luganville water supply has been recently upgraded through an ADB-funded Urban Improvement Project. In the other locations the water supply systems would benefit from upgrading as infrastructure is in a poor condition and contamination has been identified (ADB, 2002b).

Electricity:

90% of the electricity in Vanuatu is generated from thermal generators with the remainder being produced by the Sarakata Hydroelectric Scheme in Santo. The hydroelectric scheme could be expanded to double its production but it is currently facing problems with customary owners of the land surrounding the hydroelectric facility.

Both Port Vila and Luganville municipal electricity networks are operated and maintained by UNELCO through a concession contract until 2031 and 2010 respectively. Electricity consumption in these two cities amounts to 40.5 million kWh supplied to 7036 consumers.

Electrification of provincial centres is an important factor for the development of outer islands. Both private and public sectors would benefit from it. Unfortunately, financial limitations of the PWD are constraining these initiatives.

Electricity in Vanuatu is expensive in comparison with other South Pacific countries. As a result business costs are driven up and economic development is slowed down.

Alternative sources of energy are being investigated. UNELCO is testing the possible use of windmills. The Energy Unit is promoting a number of mini hydro schemes as well as geothermal power for Efate. Some donors have funded electrification of rural clinics, schools and private dwellings through solar panels (around 500). Utilisation of coco fuel is being experimented by both private (VASTP) and public groups (POPACA in Port Olry (Santo).

Although thermal generators are producing CO₂ that participates to the general increase of this gas into the atmosphere and subsequently to the worsening of the greenhouse effect, Vanuatu's output is minimal in comparison with developed countries such as the USA. A bigger concern for Vanuatu's environment is the by-products of the provision of electricity: used oils and disposal of old transformers that contain hazardous chemicals such as polychlorinated biphenyls (= PCBs): an AUSAID/SPREP financed project linked to the POPs Project is currently assessing stockpiles of waste and obsolete chemicals in the country in order to ship them out of Vanuatu and to destroy them. The major sources of unwanted chemicals are old UNELCO transformers. All identified sensitive matters include 130 tonnes of PCB liquids and 60 tonnes of pesticides (with 3 tonnes of POPs pesticides). Together with associated contaminated soil these pollutants would fit in two 20 ft containers (SPREP, 2002, unpublished).

Public Health

Environment and public health are closely intertwined. The health of the people is, in part, a reflection of a healthy environment. Therefore both the environment and human health can be damaged by pollution. Pollutants are waste material released into the environment mainly as a result of human action/activity.

ADB (2002b) provides the following indicators on health for Vanuatu in 2001:

Life expectancy at birth (years)	68.5
Population with access to safe water	87%
Infant mortality rate	2.6 %
Underweight children (<5years)	23%
Population per doctor	10800
Immunisation coverage	75%
People without access to health services	20%
Expenditure on Health	AUD 54

In Port Vila, giving birth is the principal reason for visiting the hospital with 38% of discharges. Respiratory disease with 5.4% is the second cause for admission. Medical cases reported in the country demonstrate that skin diseases are dominant in Vanuatu representing 22% of the cases, with occurrence being high in the PENAMA Province. Malaria follows with 15% of the case and a high occurrence in the PENAMA Province as well. TAFEA Province had very few cases of malaria. Acute respiratory infection (13%) and flu (9%) constitute the rest of the major diseases encountered in Vanuatu.

Malaria remains a public health problem in Vanuatu and so are other mosquito-borne diseases such as dengue fever and lymphatic filiriasis. Since 2000, the Ministry of Health (MOH) has carried a mass drug administration campaign to eliminate lymphatic filiriasis. Tuberculosis is present in Vanuatu but prospects for eradication are good, unless budget limitation threatens the campaign. Two cases of HIV/AIDS have been reported in Vanuatu in 2004.

The Environmental Health Services of the MOH, in collaboration with the local office of the World Health Organisation (WHO) is responsible for a number of programs in relation to rural sanitation, food safety and water safety. Waste disposal and pollution by littering or release of sewage are under the authority of the MOH as well, according to the Public Health Act No 22 of 1994.

4. Environmental Policy, Legislative and Institutional Framework

4.1 Environmental Policy and Legislation

The 1980 Constitution of Vanuatu refers to natural resources or environment in two places. Firstly it imposes on every Ni-Vanuatu “*to protect the Republic of Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present generation and of future generations*”. Secondly it sets out the broad outlines of the land tenure systems of the country: Ni-Vanuatu indigenous custom owners collectively own all land in the country in perpetuity. Environmental management must therefore be a prime concern of every indigenous Ni-Vanuatu.

Vanuatu from an early stage (Second National Development Plan 1987-1991) had two objectives relevant to the environment:

- Increase productive utilisation of the country's natural resource base as a means of generating viable and sustainable growth; and
- Ensure that Vanuatu's unique environmental and cultural heritage is not damaged in the process of economic development and change.

Today, government policy on environment and conservation is to provide an affordable framework of environmental protection and compliance within Vanuatu. This policy has been materialised through the enactment of the Environmental Management and Conservation Act No 12 of 2002 (EMC). As from 9 March 2003 this represents the only legislation governing environmental protection of all natural resources in Vanuatu. The law applies throughout Vanuatu and includes its lands, air and waters. Under this Act it is now mandatory for any development proposal or application to be the subject of a Preliminary Environment Assessment (PEA) to be carried out by the Ministry, Government Agency, Provincial Government or Municipal Council to which it is submitted. Subsequently, and on the advice of the Director of Environment, an Environment Impact Assessment (EIA) will have to be carried out before any local or national authority gives consent to developers and project proponents.

Part 4, Division 1 of the EMC Act addresses Biodiversity and Bioprospecting and defines the establishment of a Biodiversity Advisory Council. This *'Council is responsible for advising the Minister (of Lands, Survey, Environment, Energy, Minerals and Water Resources) on any matter relating to the implementation of the Convention on Biological Diversity.* Bioprospecting in Vanuatu will now require a permit issued by the above Council.

Part 4, Division 2 of the EMC Act addresses the Community Conservation Areas (CCA). Custom landowners are able to register their land or site as CCA if the site:

- Possesses special genetic, cultural, geological or biological resources; or
- Contains good habitat for species of wild fauna or flora; or
- Merits protection under the Convention Protecting World Cultural and Natural Heritage.

As of August 2004 a Director of Environment has not yet been appointed and the EMC Act No 12 of 2002 is currently implemented by the Vanuatu Environmental Unit (Tavala and Hakwa, 2004).

Several governmental institutions are delegated to enforce this legislation and all other pieces of legislation pertaining to environmental issues. Environmental provisions are scattered and various ministries and departments bear natural resources responsibilities. A review of environmental laws in Vanuatu was undertaken in 1991 by ADB (Forster, 1991). A new review of environmental legislation and policies in Vanuatu has just been completed in July 2004 (Tavala and Hakwa, 2004). This latest review provides a

comprehensive review of the current legislations covering environmental and natural resources and other legislations which has a bearing on such resources. Objectives of the legislation, its administration, regulatory and planning provisions are presented as well. Furthermore overlaps between legislation are commented and recommendations are made to address the areas of conflict. Appendix VI presents a list of environment related laws and policies.

Each Act, at the moment of its publication defines its objectives, designs its administration and in some cases establishes specific bodies. Finally regulatory and planning provisions are made. It is out of the scope of the Vanuatu Environment Profile report to address each of the previous legislation as that is the object of the Tavala and Hakwa (2004) review.

The various laws can be divided into three groups: Acts pertaining to land tenure, Acts aiming at regulating the development of Natural Resources (Mines and Minerals, Petroleum, Forestry...) and Acts aiming at protecting certain species or natural resources in Vanuatu (Plant Protection, National Parks, Convention on Biological Diversity...). Other legislation (Vanuatu Maritime Authorities, Public Health...) do not relate directly to the conservation of natural resources but contribute indirectly to safeguarding the environment.

The scope of the body of legislation encompassed demonstrates that Vanuatu is adhering to its commitment to the Rio Declaration on Environment and Development and the provision of Agenda 21, as well as the Barbados Declaration on the Sustainable Development of Small Island Development States and Actions Agenda for the World Summit on Sustainable Development (Government of the Republic of Vanuatu, 2003). Vanuatu policies and strategies in the matter of environmental issues are presented in two major documents: *Vanuatu National Conservation Strategy* (1993) and *Vanuatu National Biodiversity Conservation Strategy* (1999).

The body of legislation in Vanuatu is well developed and the recent introduction of the Environmental Management and Conservation Act No.12 of 2003 should complete the panel of environment oriented regulations. Non compliance to the EMC Act is punishable on conviction to a fine of not more than 1,000,000 vatu or to imprisonment for a period of not more than 2 years, or both. The major problem encountered in Vanuatu is the enforcement of regulations. Three reasons can be identified:

- Lack of awareness from the general public about the existence of some recent regulations;
- Lack of funding to finance supervisory functions and to enforce regulations on an archipelago where transport is costly and unpractical;
- Lack of coordination between the Acts that produces legal and administrative overlaps, gaps and sometimes conflicts. These problems are reviewed in Tavala

and Hakwa, (2004). The authors have provided recommendations to address these issues.

Vanuatu is a signatory to many international conventions that relate to environment. However not all signed conventions have been ratified in Parliament. These conventions, their objectives as well as their status are presented in Appendix VII.

Both the considerable legal framework presented earlier (see details in Appendices) and the number of international conventions/treaties of which Vanuatu is a party demonstrate Vanuatu's concern and commitment about environment. To confirm this commitment the Parliament will have to ratify the conventions that have not been acted upon in the near future.

The Government of Vanuatu clearly states its objectives in the 'Priorities and Action Agenda' (2003):

“The general objective of the Government is to contribute towards achieving balanced and mutually supportive policies in the economic, social and environmental dimensions of sustainable development. Specific objectives to achieve this goal are:

- *To develop appropriate legal framework for the conservation and management of the environment;*
- *To promote sound and sustainable environmental management practices;*
- *To ensure ecosystems must be managed in an integrated manner and at appropriate scale;*
- *To ensure sustainable management and conservation of Vanuatu's biodiversity;*
- *To implement the Environmental Management and Conservation Act No.12 of 2002 and the regulation of related activities; and*
- *To ensure also that biodiversity must become an ever greater priority, with resources pooled and political will mobilized behind winning strategies to protect it.”*

Government approach to key environmental conventions such as Climate Change, Biodiversity and Desertification and Land Degradation can be assessed through the table provided in the Technical Appendix VI.

Public participation to environmental management issues is favoured by the strong connection that exists between Ni-Vanuatu and the land as outlined earlier. Furthermore, the provision by the Constitution of perpetual ownership of the land by Ni-Vanuatu custom owners enhances the involvement of the population in land management.

Environmental information is not easily accessible. The Statistics Department does not maintain a database of environmental data. Due to the fact that ‘environment’ issues are intertwined with all aspects of human endeavours and that therefore many different Ministries and Departments are involved, environment information is scattered. The Vanuatu Environment Unit could centralise all the reports/data available but this is not the case. Both human and financial resources are the key to increase accessibility to environmental information.

Environmental policy and legislation is now comprehensive in Vanuatu. Although a few problems have been highlighted by Tavala and Hakwa, (2004) the major hurdles are enforcement and awareness. The Conservation Strategy is well developed and addresses a wide scope of issues. Implementation of the recommendations of the National Biodiversity Conservation Strategy is hindered by the problems encountered in a small developing country: lack of resources to employ the appropriately trained personnel. When a suitably qualified person is employed the office often faces a rapid staff turnover due better employment opportunities being found elsewhere. Consequently most of the actions identified in the NBCS in 1999 and due to be completed in 2004 are still not completed. Nevertheless they remain on the agenda and the Biodiversity Office is currently working towards achieving the goals set out in the NBCS document.

4.2 Environmental Institutional Framework

The Vanuatu Environment Unit (VEU) of the Ministry of Lands, Survey, Environment, Energy, Minerals and Water Resources is the major body dealing with environmental matters.

The VEU is headed by a Director who reports to the Director General of the Ministry of LSEEMWR who himself is reporting to the Minister. A Vice-Director, a Senior Biodiversity Officer, a Senior Environment Impact Assessment Officer and a Senior Education and Extension Officer are completing the VEU team. Some positions still remain to be filled such as:

- For the research and monitoring wing: a marine biologist, terrestrial biologist and pollution controller;
- For the environment and conservation wing: Various assistants to the senior officers.

Since the enforcement of the EMC Act, the VEU is exploring the possibilities of sharing officers with other ministerial Department that share responsibilities on environment. A marine biologist could be employed on environmental matters by both the VEU and the Department of Fisheries (E. Bani, pers. com., August 2004).

The VEU is the focal point for SPREP and the national operational focal point for GEF, the focal point for GEF being the Ministry of Foreign Affairs.

Until the enforcement of the EMC Act in March 2003, the VEU had mostly an advisory role to the Government and to the municipal councils of both Port Vila and Luganville. One of the main responsibilities of the VEU was to ensure that Vanuatu's international commitments (acquired through the signing of international conventions) were met and acted upon. Improving environment awareness has been a major responsibility of the VEU which ran numerous workshops and seminars at different levels (grassroots, communities, chiefs, local and provincial councils, ministries...). The VEU has been instrumental to the establishment of both POPs and Biodiversity Project within the Quarantine Department. The VEU has also importantly advised the Municipalities on solid waste management. With obvious limitations in human resources the VEU has been able to maintain a high standard of involvement in environmental matters for Vanuatu on both the local and the International scenes.

Today, with the enforcement of the EMC Act, the VEU has no longer an advisory role but is mandated to take action on environmental issues. In a short term the VEU may become a fully independent Department of Environment. This evolution may see a small reorganisation within various offices that deal with environmental issues within other Departments. One of the newer roles of the VEU is related to the provision of mandatory Environmental Impact Assessments for every future project taking place in Vanuatu.

Due to the particular nature of environmental issues environmental responsibilities are shared by various governmental institutions for they are mandated to enforce regulations or because they are directly dealing with environment related issues. These can be summarised as:

- Department of Forestry (Forestry Act 2001; Code of logging practice 1998; Forestry Rights Registration and Timber Harvest Guarantee Act 2000);
- Department of Fisheries (Fisheries Act 1982, 1988, 1989);
- Vanuatu Quarantine and Inspection Services (plant Protection Act 1997; Animal Importation and Quarantine Regulation 1994; Animal Importation and Quarantine Act 1988);
- Department of Geology, Mines and Rural Water Resources (Water Resources Act 2003; Mines and Minerals Act 1986);
- Department of Agriculture and Rural Development (Vanuatu Agricultural and Training Centre Act 2002; Pesticides Act 1993);
- Vanuatu Maritime Authority (Vanuatu Maritime Authority Act 1998; The Maritime Act 1982; Shipping Act Chapter 53 1968;1987)
- Department of Lands (Land Lease Act 1987);
- Departments of Ports and Harbours (Ports Act 1957;1985);

- Ministry of Internal Affairs (Foreshore Protection Act);
- Vanuatu Cultural Centre (World Heritage Convention, document and promote traditional practices for conservation);
- Meteorological Department (Climate Change)
- Ministry of Education (Environmental awareness through Schools)
- Public Works Department (ensuring the provision of EMC Act with new projects in liaison with VEU);

The six local governments (i.e Provincial Councils) and the various municipal councils are dealing with environmental issues in liaison with the VEU. REDI (Rural Economic Development Initiatives) for the six provinces of Vanuatu are designed to promote rural development by providing key stakeholders with support for business development, protecting and promoting rural practices and traditions and focusing government and external assistance funds on rural development. Each Provincial Council is constituted of 10 to 12 officers. The officer in charge of physical planning usually deals with environmental matters as well. Sanma and Tafea are the only Provincial Councils with an Environmental Officer. Under the Physical Planning Act of 1986, physical planning units within the Department of Provincial Affairs provide planning guidance and advice to province-based planners, local government councils and municipal councils.

Municipal Councils have allocated human resources (two persons in Vila) initially to assessing compliance with health regulations in shops/restaurants. Today these officers are trying to deal with the biggest challenge faced by the Municipalities: solid waste management. Both local Governments and Municipalities can develop by-laws to enforce regulations on their respective grounds.

Various other structures/institutions are dealing with environmental issues:

- The International Waters Programme (IWP) in the Pacific is a five-year regional programme (2002-2007) funded by the Global Environment Facility, implemented by the United Nations Development Programme and executed by the South Pacific Regional Environment Programme. In Vanuatu it is hosted at the VEU. The IWP has two main components:
 - An oceanic component focusing on the management and conservation of tuna stocks in the Western Central Pacific. These activities are coordinated by regional organisations such as the Secretariat of the Pacific Community and the Forum Fisheries Agency.
 - A coastal component that focuses on integrated coastal watershed management implemented through SPREP.

In Vanuatu, a National Task Force (NTF) committee has been established in 2003 to provide technical advice, guidance and directives to the implementation of the project at communities, provincial, national and at the regional level. The NTF members represent various government departments, media and NGOs. The Chairman of the NTF is the current Head of Environment, Mr. Ernest Bani.

- National Tourism Office and the Tourism Development Office: Investigating the potential of eco-tourism defined as ‘ecologically sustainable tourism that fosters environmental and cultural understanding, appreciation and conservation’. These Offices have been promoting ventures with local population, one example being ‘Mystery Island’. This island formerly known as Inyeyung is now welcoming stop-over for a day or two from cruise ships visiting Vanuatu mainly from Australia.
- Malvatumauri Council of Chief: The Malvatumauri comprises Chiefs from the various islands/districts of Vanuatu. The members of the National Council of Chiefs are elected by their peers. There are currently 22 members of the Malvatumauri. The Malvatumauri is attempting to carry out a description or codification of custom in collaboration with the Vanuatu Cultural Centre. This is a very substantial task as customary rules vary markedly from island to island. The document produced would facilitate introducing a legal mechanism to protect the intellectual property rights of ni-Vanuatu with respect to their knowledge and use of biodiversity (Environment Unit, 1999). The Council is facing problems due to a poorly organized communication network. Furthermore the advisory aspect of the Council has been rarely used by parliamentarians (Selwin Garu, pers. com.).
- Vanuatu National Council of Women: Women are central to the food production system in Vanuatu as well as their many other domestic roles. The National Council of Women has representatives in most villages throughout the country. These representatives are the key contact points for public awareness raising activities on issues of environmental importance to households and the community at large. The Council’s newsletter ‘Nius Blong Ol Women’ used to carry articles on environmental issues. Due to a lack of funding the newsletter is no longer published. The Council has a total of 2 full time workers (from 10 in the past) and another 6 members working as volunteers within Provincial Councils. The VNCW is currently preparing new projects proposals (on health (AIDS), and women’s right awareness).
- Save the Children Fund (7 full time workers) has been working on the conservation of the South Santo Bush. It is celebrating this year its 20th year of work in Vanuatu.
- Wantok Environment Centre is a local organisation located in Santo. WTEC is promoting environment awareness of the primary school students by organising

the Environment Education Curriculum Support Project. This Project focuses on workshops followed by environment field trips including visits to marine and land conservation areas.

Policy development under the CRP process on which the Government has embarked is initiated by the Department of Strategic Management (DSM). The DSM prepares a CRP Matrix which collates input from national and provincial government departments, the private sector through Business Forum, and the community through REDI process. Information is then channeled to the Government on the occasion of the National Summit which reviews and updates the policy process to ensure that policy development proceeds according to an agreed timeframe. The State Law Office then drafts appropriate and constitutional legislation.

In the current situation, community appraisal and participation in development control/environmental planning as well as injection of Traditional Environment Management notions in new regulations would require improvement. The current level of public awareness is probably a factor that would influence current level of public participation. Nevertheless there exist some examples like Vathe (Santo) where public involvement has been instrumental to the success of a preservation project.

Environmental education, awareness and information are topics that have been identified by the NBCS (1999). The Ministry of Education is currently revising the education system, extending primary schooling from Year 6 to Year 8. Curriculum will therefore be developed to integrate the changes. Environmental education should be one of the subjects taught in school. Secondary education is going to be reformed next and harmonisation of both the francophone and the anglophone stream is the main concern. Nevertheless environmental awareness should be included as part of the new programs as well.

Within the current economic situation as exposed earlier, financial resources are scarce and environmental issues often remain less of a priority to the government than say education and health issues. International funding through UNEP/GEF as well as various donors allow for the availability of limited financial resources. Capacity exists in Vanuatu and the policy of the VEU is to retain project officers that are finishing their private contracts within the Unit. Therefore the positions that are still vacant today should be filled in the near future. The Director of the VEU indicated that both resources and capacity levels are low but that they would allow for a fair level of action if it were to be wisely coordinated and allocated.

4.3 Sectoral Integration

Virtually no sector of the economy is exempt for environmental concern. This point has been demonstrated earlier through the scope of the various Acts and regulations adopted by Vanuatu. Browsing through these regulations may allow for a better understanding of the concerns of every sector (from Hakwa, 2003, Unpublished):

Agriculture:

The VARTC Act 2002, establishes the Vanuatu Agricultural Research Training Centre. This institution is mandated to coordinate and conduct agricultural research in Vanuatu. The Pesticide Act 1993 provides for the regulation and control of the importation, manufacture, sale, distribution and use of pesticides. The Plant Protection Act 1997 provides for the exclusion and management of quarantine pests and includes broad provisions for inspection and quarantine of craft entering Vanuatu. Animal Importation and Quarantine Regulations 1988; 1994 aim at preventing diagnosed and suspected animal diseases from entering Vanuatu. Currently Vanuatu has been cleared of infection by BSE which is a major economic advantage on other countries that may be affected.

Forestry:

The Code of Logging Practice 1998 sets minimum standards which will allow selected forest areas in Vanuatu to be harvested with minimum adverse impact. It balances the needs for protection of environment values with safety and commercial considerations. The Forestry Rights Registration and Timber Harvest Guarantee Act 2000 provides for the registration of certain forestry rights granted in respect of land and to the harvesting and accreditation of timber plantations. The Forestry Act 2001 makes provision for the protection, development and sustainable management of forests and the regulation of the forestry industry in Vanuatu.

Fisheries:

The Fisheries Act 1982; 1988; 1989 provides comprehensively for the control, development and management of fisheries and matters incidental to fisheries. It applies to waters of the EEZ, territorial sea, internal waters and any other waters over which Vanuatu claims fisheries jurisdiction. Regulations under the Act specify procedures and conditions on the issue of foreign and local fishing licenses, and regulates (size limits, closed seasons) to manage commercial fishing stocks.

Mineral resources:

The Mines and Minerals Act 1986 regulates exploration for and development of mineral resources. It monitors exploration and mining activities. The Water Resources Act 2003 mandates the Department of Geology Mines and Rural Water Resources to manage and regulate for the protection, management and use of water resources in Vanuatu. This includes groundwater, surface water, water constrained by works, estuarine water and coastal waters.

Energy, power:

The majority of the energy in Vanuatu originates from thermal engines. Vanuatu is a signatory to the International Convention on Climate Change. It has therefore engaged, with the cooperation of the provider UNELCO, and financial support from international

donors (UNEP GEF, SPREP/UNDP), into a number of programs aiming at addressing greenhouse gas emissions: Pacific Islands Renewable Energy Program, GEF Preparatory funding for Efate Geothermal Energy Resource. Concerns have arisen as well from the implementation in Vanuatu of the Stockholm Convention. Preparatory works to implement the Convention have included a POPS/dangerous chemicals assessment which revealed the dangers of PCBs localised in old transformers.

Transport:

Concerns are essentially related to sea transport where pollution accidents are more likely to arise. The Vanuatu Maritime Authority Act 1998 establishes the Vanuatu Maritime Authority and provides for the regulation, administration and promotion of the maritime transport industry. Responsibilities of the VMA include provision of an effective marine pollution prevention programme and ensuring provision of an effective marine pollution system.

Tourism:

On one hand, tourism may impact in many different ways on the environment. However, on the other hand, it is one of the main reasons tourists come to Vanuatu: “to discover the untouched paradise”. The Foreshore Protection Act 1975, regulates on the development of activities/infrastructures beneath the mean high water mark on any island of Vanuatu. This is clearly in response to potential resort developments infringing on that area. The National Park Act 1993 could promote the creation of park and reserves that will draw tourists’ interest. The new EMC Act 2002 will integrate future development through the provision of EIA requirements. The Land Lease Act is regulating as well the tendency to speculate on land that could potentially be developed for tourism. Under this Act conditions to preserve water resources or prevent soil erosion can be imposed within the terms of leases.

4.4 EC and Other International Development Assistance

Foreign representations of major importance in Vanuatu are: Australia, China, European Union, France, Great Britain and New Zealand who all have in-country resident representatives. A summary of recent international development assistance that is relevant to environment is provided in appendix VIII. Often the number of projects mentioned is positively correlated with the availability of information rather than with the number of projects actually supported by a delegation.

Australia: The objective of Australia’s aid program is to advance Australia’s national interest by assisting developing countries to reduce poverty and achieve sustainable development (AusAid, undated). One of the five themes guiding the delivery of Australia’s aid program is:

“Promoting sustainable approaches to the management of environment and the use of scarce natural resources”.

In 2003-2004 rural development represents 5% of the funding directed to Vanuatu. Australia is participating in the financing of the REDIs programmes for Vanuatu and financially supports a variety of regional programmes focused on agriculture and natural resources: ACIAR, SPREP, SPRIG.

AusAID supports as well a Small Grant Scheme (< €40,000) in which environment related actions are undertaken: Aquatic Health Surveillance Feasibility Study (1999), various rural water supply initiatives, solar stills demonstration units, Coconut crab management (1991), Certification of organic producers in Vanuatu (2002), Workshop for the formulation of National Agricultural Policy (2003) and Reforestation Program 2002.

China: China does not have current involvement with environment related issues apart from a biogas project. A major fishing project is currently under negotiations. This project would see the establishment of a Tuna Fishing Base in Vanuatu.

European Union: EU does not currently have specific projects in Vanuatu under the Environment and Forest Programme for developing countries. In 2002 EU provided funds to the Foundation of the People of the South Pacific International (FSPI) to implement in the Pacific the Coral Garden Initiative. This initiative aims at alleviating poverty through capacity building in communities and is based on management and coral reef restoration.

EU is contributing as well for just over 50% of the POPACA (Projet d'Organisation des Producteurs pour la Commercialisation Associative) project which is jointly financed by France and Vanuatu as well. Environment issues are present through the involvement of the project with commodities such as cocoa, coffee and vanilla. Nevertheless these issues are not the main focus of the POPACA Project. Lastly EU is financing the 'Support for Non State Actors Programme'. This programme funded through the 9th FED provides financing for small scale projects such as:

- The rechargeable batteries and environment protection project in Nguna which focuses as well on alternate sources of energy (solar panels). A similar project will be implemented in West Ambae;
- A reforestation Project in collaboration with the Chamber of Commerce and Industry. This project focused on environment awareness, and extension about forestry activities.

France: The French Service de Coopération et d'Action Culturelle does not currently have specific projects on environment issues. As mentioned earlier, it is involved with the POPACA Project which has a limited environmental focus and with a small scale project aimed at developing small scale fishing of pelagic fishes (FAD Project). The impact of the latter project on marine environment would be minimal in comparison with commercial activities of foreign long-liners. French funds are disbursed as well through international and multilateral agencies like the UNEP and the World Bank.

French research organisations (IRD, CIRAD) are carrying out activities in Vanuatu. Some of these activities are related to environment. Research carried out by these agencies are not well publicised in Vanuatu and efforts could be achieved in that regard. Studies are often made in conjunction with a PhD: Taros and coconut diversity conservation (in 2000-2004), sustainability of agricultural activity in Malo (2000-2004), carbon sequestration, soil organic fertility evolution of coconut stands and alternate soil usage (1999-2004).

Great Britain: Great Britain does not have current projects of significant importance relating to the environment in Vanuatu. The Small Grant Scheme is the locally based portion of the British Assistance programme to Vanuatu. Projects financed under the SGS (< €4000) must be consistent with the strategic objectives of the UK aid programme as set in the two White Papers on International Development Act 2002. Environmental sustainability is one of the goals set for the Department of International Development. Again funds from Great Britain are disbursed for Vanuatu through Great Britain financing international and multilateral agencies.

New Zealand: NZAID environment policy goal is “*to promote environmentally sustainable development that is consistent with the economic and social needs and priorities of recipient countries*”. It highlights the requirement for cooperation with other donors to ensure that aid programmes facilitate environmentally sustainable forms of economic and social development.

NZAID is supporting a Small Grant Scheme which has financed projects such as: Aquaculture and Trade Show, VIBA (Vanuatu Island Bungalow Association) Ecosanitation, Community Fishing Projects, Vathe Conservation Area and Reforestation Project.

Cooperation between funding agencies is not well developed. AUSAID and NZAID are informing each other about aid issues: each party is an observer to the other party bilateral meeting with Vanuatu. A better coordination between donors was identified as a recommendation towards improvement of the aid offer to Vanuatu. The DESP could bear the role of coordinator among the various projects and donors as it centralises all the information relevant to such a task.

Some other agencies/organisations are particularly active in Vanuatu:

- The American Peace Corps Project in Vanuatu has an environmental component whose objectives are: increasing environmental awareness, piloting conservation strategies, establishing and strengthening collaborative efforts, greater involvement of youth and women.
- The FSP Vanuatu focuses on sustainable development through an intervention based on effective project management, training and local capacity building. FSP is focusing on community participation and responsibility for environmental protection.

- SPREP (South Pacific Regional Environmental Program) who maintains preferential relations with UNEP and ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) which has an office in Port Vila.

5. Recommended Priority Actions

The latest National Biodiversity Conservation Strategy from the VEU (1999) outlines six priority objectives and details the actions that should be undertaken to achieve these objectives (see Appendix IX). 12 priority actions (PA) have been identified during the current study and some are in line with the recommendations of the NBCS.

PA 1. Fully implement the EMC Act 2002.

PA 1.1. The VEU has to be remodelled to face its new challenges: evolving from an advisory role to mandated duties. A Department of Environment is to be created and provided with appropriate human and financial resources to carry out its new missions/objectives as identified in the EMC Act. Build capacity for environmental management.

PA 1.2. Raise the level of environment awareness in both the local population and amongst investors. Local population will be informed through the media (radio, newspaper, television), through the activities of the Small Bag Theatre, and more importantly through the implementation of new subjects in school curriculum. Investors should be informed through VIPA at the time of their investment proposal. So far this has been poorly done, resulting major tourism developments being put to a halt by the VEU (Irririki Residence Project, Kakula Island Resort) for non compliance to the EMC Act 2002.

PA 1.3. Achieve effective enforcement of the legislation. Today this is a major hurdle in many aspects of daily life in Vanuatu and not only for environmental matters. For example, as a result of poor coordination between various Government Departments and their general lack of awareness about environmental threats, the introduction of species foreign to Vanuatu's biodiversity is proceeding (eg. Tilapias). Appropriate resources (human and financial) need to be allocated to enforcement.

PA 2. Consolidate knowledge of Vanuatu's biodiversity and its traditional use/management.

PA 2.1. Carry out prospecting expeditions to complete the identification of species in Vanuatu, both on land and in water environments. Although a Japanese botanical expedition collected specimen on Mt Tabwemasana in 2002, such endeavour is very rare nowadays.

PA 2.2. Complete the documentation of traditional use of biodiversity for food, construction material, medicine and custom. Activities of the Vanuatu National Museum in that field need to be provided appropriate support.

PA 2.3. Complete the documentation of traditional environment management methods. Activities of the Vanuatu National Museum in that field should be linked with the Malvatumauri which has a similar duty.

PA 2.4. Identify endangered species/areas and implement actions for effective protection.

PA 2.5. Monitor evolution of ecosystems and species. This activity should be linked to the Department of Statistics. Consequently staff at the Department of Statistics will be trained on collection/analysis of environmental data.

PA 3. Involve traditional land owners in environment management.

PA 3.1. Carry out a thorough reflexion on land tenure and its impact on sustainable use of the land/reef areas.

PA 3.2. Use leasehold system to stimulate the establishment of protected areas, and make a rule of including covenants linked to environmental preservation.

PA 3.3. Reinforce the status of chiefs so that their decisions are respected. Reinstating the Malvatumauri Council of Chief in its consultative role for the Parliament could possibly help achieving this goal.

PA 4. Harmonise legislation across the various sectors dealing with environmental matters.

PA 4.1. Implement the recommendations made by Tavala and Hakwa (2004) about existing gaps and overlaps within the environmental legislation.

PA 4.2. Ratify International conventions already signed by Vanuatu.

PA 4.3. Define and implement a Code of Practice for Big Game Fishing activities. Such a Code is currently non-existent.

PA 4.4. Define and implement a Code of Practice for the aquarium trade. Currently only limited legislation is in place through the Fisheries Act No. 37 of 1982.

PA 4.5. Define and implement legislation regulating waste management. Currently Vanuatu has no legislation regulating waste management.

PA 5. Implement protection plans for species/areas already identified as threatened.

PA 5.1. Implement assessment/management of the coconut crab population. Organise and regulate a potentially profitable industry especially for the Torres Islands.

PA 5.2. Promote the establishment of protected areas in both terrestrial and aquatic environments. Implement legislation about sand beach mining.

PA 5.3. Monitor/regulate fishing activities at locations where food fish are depleted (around Efate and near densely populated areas).

PA 5.4. Ban shark fining in Vanuatu waters. Vanuatu is one of the last country allowing such a practice.

PA 6. Control invasive species.

PA 6.1. Eradicate the fire ant (*Wasmania auropunctata*) from the Banks islands to prevent its dispersal to the other islands of Vanuatu. Alternatively, efficient quarantine control will have to be put in place.

PA 6.2. Improve control of the Mynah bird (*Acridothera tristis*) which is threat to local bird population. Initiate a culling campaign.

PA 6.3. Improve control of imported vines *Merremia sp.* and *Mikania sp.* on islands where it is present. Organise effective quarantine to avoid exempt islands from being colonised.

PA 7. Limit sources of pollution.

PA 7.1. Regulate import/use of pesticide/herbicide/toxic substances in line with international conventions (Stockholm).

PA 7.2. Regulate and monitor the disposal of pollutants (batteries, used engine oil, plastics, clinical wastes...).

PA 7.3. Regulate and monitor emissions from vehicles exhaust pipes.

PA 7.4. Ensure that organic agricultural production remains attractive to local producers.

PA 8 Improve waste management and start planning for the future.

PA 8.1. Improve solid waste management primarily in Port Vila and Luganville, but in other islands as well. Explore the removal of compostable and recyclable waste that constitute close to 80% of the waste going to the Bouffa landfill (Tapisuwe *et al.*,

2003). Initial feasibility studies have been carried out on the Mele, Melemaat and Blacksands (Suburbs of the Capital) solid waste management (Caron, 2003)

PA 8.2. Improve sewage/waste water management in the urban areas. Improve operation and management of existing sewage treatment plants installed at hotels and institutions in Port Vila.

PA 8.3. Initiate and implement storm water management in Port Vila.

Nota Bene: A sanitation Master Plan for Port Vila has been produced by the ADB in 1998. Estimated cost for implementation of the plan was US\$ 16.15 millions. A 20 year investment plan was proposed as well. This study was thorough and would probably only require updating.

PA 9. Address the four main problems faced by the industry that are all impacting on environment.

PA 9.1. Promote forestry activities in islands other than Santo

PA 9.2. Promote the diversification of exploited species.

PA 9.3. Implement and monitor effective replanting schemes.

PA 9.4. Resolve disputes arising between custom land owners and lessors.

PA 10. Encourage eco-tourism ventures

PA 10.1. Identify in collaboration with NTO and TDO site of potential development

PA 10.2. Capacity building of village level population for management of eco-tourism ventures.

PA 11. Increase cooperation between funding agencies

PA 11.1. Increase exchange of information between the various donors to avoid duplication of projects/studies.

PA 11. 2. Improve the availability of information related to environment and projects linked with environment. The VEU library should centralise all the reports/studies and therefore should be provided with sufficient funding/space to achieve that goal.

PA 12. Explore the Potential of Trading Rights to Emit Greenhouse Gases

The Kyoto Protocol is nearing implementation with Russia's recent ratification. The Kyoto Protocol preparatory meeting (November 1998 Buenos Aires) explored the possibilities of trading rights to emit greenhouse gases. Sulfur dioxide emissions rights are already trading (USD 200 per ton) and some transactions have taken place with CO₂

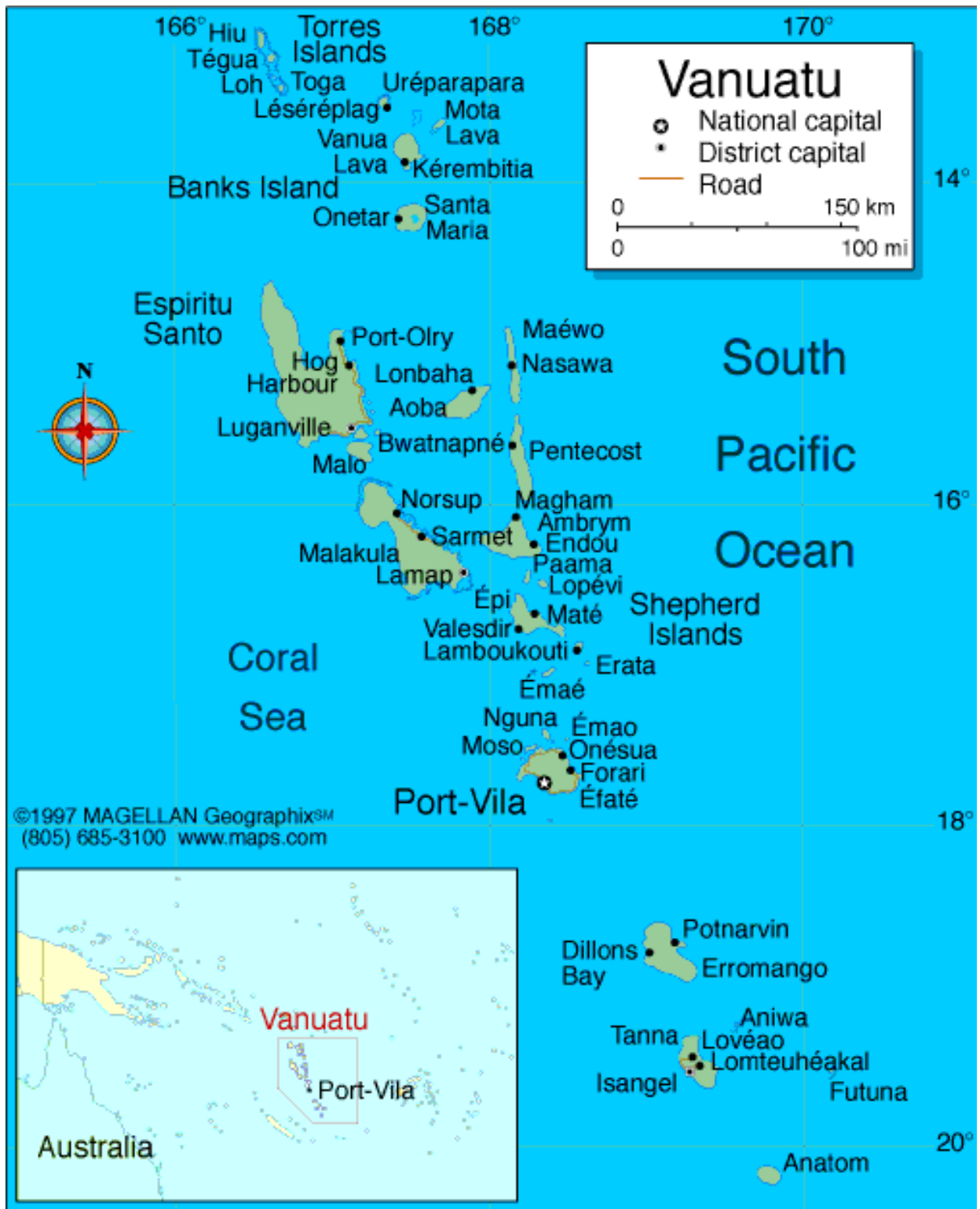
emission rights (Chicago Climate Exchange and European Climate Exchange). Japan is investing in India to acquire extra emission quotas. It is important that Vanuatu is aware of such mechanism and participate to a process that can potentially generate funds that in return can be invested in the sustainable development of the country.

PA 12.1. Approach the IETA (International Emission Trading Association) for assessment of the opportunities for Vanuatu.

PA 12.2. Set up the appropriate local organisation to manage emission rights (assessment of emission/sinks; participation to trades and fund management).

6. Technical Appendices

I. Map of Vanuatu



II. The first 12 POPs (*source: UNEP, 2002*)

Aldrin: A pesticide applied to soils to kill termites, grasshoppers, corn rootworm, and other insect pests;

Chlordane: Used extensively to control termites and as a broad-spectrum insecticide on a range of agricultural crops;

DDT: The best known of the POPs, DDT was widely used during World War II to protect soldiers and civilians from malaria, typhus and other diseases spread by insects. It continues to be applied against mosquitoes in several countries to control malaria;

Dieldrin: Used principally to control termites and textile pests, dieldrin has also been used to control insect-borne diseases and insects living in agricultural soils;

Dioxin: These chemicals are produced unintentionally due to incomplete combustion, as well as during the manufacture of certain pesticides and other chemicals. In addition, certain kinds of metal recycling and pulp and paper bleaching can release dioxins. Dioxins have also been found in automobile exhaust, tobacco smoke and wood and coal smoke;

Endrin: This insecticide is sprayed on the leaves of crops such as cotton and grains. It is also used to control mice, voles and other rodents;

Furans: These compounds are produced unintentionally from the same processes that release dioxins, and they are also found in commercial mixtures of PCBs.

Heptachlor: Primarily employed to kill soil insects and termites, heptachlor has also been used more widely to kill cotton insects, grasshoppers, other crop pests, and malaria carrying mosquitoes;

Hexachlorobenzene (HCB): HCB kills fungi that affect food crops. It is also released as a byproduct during the manufacture of certain chemicals and as a result of the processes that give rise to dioxins and furans;

Mirex: This insecticide is applied mainly to combat fire ants and other types of ants and termites. It has also been used as a fire retardant in plastics, rubber, and electrical goods;

Polychlorinated Biphenyls (PCBs): These compounds are employed in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, sealants and plastics;

Toxaphene: This insecticide, also called camphechlor, is applied to cotton, cereal grains, fruits, nuts, and vegetables. It has also been used to control ticks and mites in livestock.

III. Some Facts About Vanuatu (*CSIRO-DPI, 1993*)

Land Cover:

25% of the country is used for village and other agriculture
35% of the country is forested
40% is covered by other vegetation (eg. grassland, thickets)

Topography:

35% of the country is *highland* (above 300m altitude) and supports 10% of the population;
8% of the country has low slope (less than 2 degrees) and supports 32% of the population;
55% of the country is steep land (greater than 20 degrees slope) and supports 16% of the population.

Climate:

10% of the country has a drier season rainfall (less than 1800 mm/year) and supports 11% of the population

Landform:

0.2% of the country is mangrove and tidal flats;
5% are raised coral terraces supporting 25% of the population

IV. Vanuatu's Biodiversity: A List of The Various Species Found in The Country: (David, 1985; Chambers and Bani, 1988; Bregulla, 1992; Environment Unit, 1999)

- Plants: around 1000 vascular plants of which 150 are endemics and 700 species of bryophytes.
 - 158 species of orchids, including 7 endemics;
 - 21 species of palm trees, including one endemic monospecific genus (*Carpoxylon macrospermum* a palm tree) and 14 endemic species, 11 of which are rare or vulnerable (Environment Unit, 1999);
 - 12 species of araceae, including 8 endemics;
 - 161 species of orchids including 9 endemics;
 - around 250 species of pterophytes;

- Invertebrates: Many species probably remain to be discovered
 - 80 species of butterfly, including 5 endemics;
 - 12 species of bees including 7 endemics;
 - 12 species of ants and termites
 - over 200 species of flies;
 - Coleoptera: unknown;
 - 73 species of land snails;
 - 22 species of earthworms;
 - One of the best known invertebrate in Vanuatu is the coconut crab (*Birgus latro*). While the crab is not endemic, Vanuatu's population remains large enough to allow harvesting, and coconut crab is a gourmet dish in many restaurants. Measures are taken today to better control harvesting of this species which is endangered elsewhere in the Pacific (Fletcher, 1987).

- Birds 121 species some of which are rare or vulnerable: Green Palm Lorikeet (*Charmosyna palmarum*), Vanuatu Mountain Pigeon (*Ducula bakeri*), Pacific Imperial Pigeon (*Ducula pacifica*); Royal Parrotfinch (*Erythrura cyaneovirens*), Peregrine Falcon (*Falco peregrinus*), Santa Cruz Ground Dove (*Gallicolumba sanctaerucis*) and the Incubator Bird (*Megapodius Freycinet*).
 - 74 species are land and freshwater birds
 - 32 species are sea-birds of which few are resident
 - 15 species are shore birds, 7 are endemic.

- Reptiles and Amphibians: 30 species
 - 19 species of lizards, 4 are endemic and one species near extinction was introduced from Fiji (Green Banded Iguana *Brachylophus fasciatus*);
 - 2 species of snake (Pacific Boa *Candoia bibroni*), one was introduced; sighting of others;
 - 4 species of sea turtles all endangered worldwide (Green Turtle *Chelonia mydas*, Hawksbill Turtle *Eretmochelys imbricata*, Loggerhead Turtle *Caretta caretta* and Leatherback Turtle *Dermochelys coriacea*);
 - 1 species of salt water crocodile (*Crocodylis porosus*);
 - 2 species of sea snake *Pelamis platurus* and *Laticauda sp.*;
 - 2 introduced species of frog.

- Mammals: 12 species of chiropterae which represent the only native mammals with one endemic species.
 - 4 species of flying foxes (*Pteropus sp.*), all endemic
 - 8 other bats species (microchiroptera), 2 endemic of which the Nendo tube-nosed bat (*Nyctimene sanctaerucis*) is presumed to be extinct;
 - All other species have been introduced: rats (*Rattus exulans*, *Rattus norvegicus* and *Rattus vattus*), mouse (*Mus musculus*), feral cattle (*Bos taurus*), feral goat (*Capra hircus*), feral pig (*Sus scrofa*), feral cats and dogs.

V. Places and Habitats of Conservation Significance (verbatim from *Environment Unit, 1999*):

Important Places	Places that are damaged or degraded due to human impacts	Vulnerable Places
<p>Bat Caves – Malo, NW Malekula, Efate, Santo and Vanua Lava.</p> <p>Mangroves on Efate, Malekula, Santo and Vanua Lava.</p> <p>Coconut crab habitat on Hiu, Loh and Tegua (Torres Islands)</p> <p>Lake Letas & adjacent areas (Gaua)</p> <p>Petaview waterfall, catchment and inland lakes, Epi.</p> <p>Rivers on Maewo, Tanna, Vanua Lava, Efate.</p> <p>Undisturbed forest between Homo Bay and Ranwas (South Pentecost).</p> <p>Creek Ai (Efate).</p> <p>Flying foxes habitat in Mota Lava</p>	<p>Mangroves throughout Vanuatu.</p> <p>Coconut crab habitat</p> <p>Rivers on Tanna, Efate, Maewo and Vanua Lava and elsewhere</p> <p>Seagrass beds off Efate, Malekula and Santo.</p> <p>Remnant bush on Tanna.</p> <p>Low-land forest ecosystems most islands.</p> <p>Coastline at Mele Bay and Samoa Point (Efate) (sand mining)</p>	<p>Coconut crab habitat.</p> <p>Mangroves.</p> <p>Rivers on Tanna, Efate and Maewo.</p> <p>Forest on South Pentecost.</p> <p>Petaview waterfall on Epi and surrounding areas.</p> <p>Bat caves on Santo, Malo and NW Malekula.</p> <p>Seagrass beds on Efate, Malekula, Santo and Ureparapara</p> <p>Low-land forest ecosystems most islands.</p> <p>Sea bird rookeries.</p>

VI. Reference List of Environmental Policy Documents, Statements and Action Plans

a. The various Acts of the Law of Vanuatu.

Constitution

Constitution of the Republic of Vanuatu, 1980

Legislation

Alienated Lands Act Chapter 143 (No. 12 of 1982)
Animal Importation and Quarantine Act [CAP. 201] (Act No.7 of 1988)
Animal Importation and Quarantine Regulations (Order No.14 of 1994)
Coconut Crabs (Protection) Act 1981 (Act No.27 of 1981)
Convention on Biological Diversity (Ratification)(Act No.23 of 1992)
Customary Land Tribunal Act 2001 (No.7 of 2001)
Decentralisation and Local Government Regions Act No.1 of 1994
Environmental Management and Conservation Act 2002 (No.12 of 2002)
Fisheries Act Cap 158 (No.37 of 1982)
Fisheries Amendment Act (No.2 of 1989)
Fisheries Act [Cap.158] Notice of General Conditions for Foreign Fishing Vessels and Locally Based Foreign Fishing Vessels
Fisheries Act [Cap.158] Locally Based Foreign Licence Regulation Order No.42 of 2003
Foreshore Development Act 1975 (No.31 of 1975)
Forestry (Restriction on the Felling of Sandalwood) Regulation Order No.84 of 1999
Forestry (Setting of Minimum Price for Sandalwood) Order No.85 of 1999
Forestry Act 2001 (No.26 of 2001)
Forestry Rights Registration and Timber Rights Harvest Guarantee Act (No.28 of 2000)
International Trade (Flora and Fauna) (Act No.56 of 1989)
Land Acquisition Act 1992 (No.5 of 1992)
Land Lease Act Cap 163 (Act No.4 of 1983, No.10 of 1987)
Land Reform Act Chapter 123 (Joint Regulation 31 of 1980 – Act No.32 of 1985)
Land Valuers Registration Act 2002 (No.23 of 2002)
Maritime (Amendment) Act 1989 (No.8 of 1989)
Maritime (Amendment) Act 1990 (No.3 of 1990)
Maritime (Amendment) Act 1996 (No.13 of 1996)
Maritime (Amendment) Act 1998 (No.31 of 1998)
Maritime (Conventions) (Amendment) Act 1988 (No.17 of 1988)
Maritime (Conventions) Act Chapter 155 (No.29 of 1982 & No.29 of 1984)
Maritime Act Chapter 131 (No.8 of 1981 & No.36 of 1982)
Maritime Zones Act Chapter 138 (No.23 of 1981)
Mines and Minerals [Cap.190](Act No.11 of 1986)
National Parks Act, 1993
Pesticides (Control) Act 1993 (Act No.11 of 1993)
Petroleum (Exploitation and Production) Act No.13 of 1997
Petroleum Regulations No. 30 of 1997
Plant Protection Act 1997 (No.14 of 1997)
Ports (Amendment) Act 1998 (No.32 of 1998)
Ports (Amendment) Act 1999 (No.11 of 1999)
Ports Act Chapter 26 (Joint Regulation 12 of 1957 – Act No.6 of 1985)
Preservation of Sites and Artefacts [Cap.39] (Joint Regulation 11 of 1965)
Public Health Act No.22 of 1994
Public Health (Commencement) Order No.10 of 1995
Seashell (control)(Amendment) Regulation No.32 of 1973
Shipping Act Chapter 53 (Queens Regulation 1 of 1968 – Act No.7 of 1985)
Strata Titles Act 2000 (No.29 of 2000)

Valuation of Land Act 2002 (No.22 of 2002)
 Vanuatu Maritime Authority (Amendment) Act 2001 (No.33 of 2001)
 Vanuatu Maritime Authority (Amendment) Act 2002 (No.29 of 2002)
 Vanuatu Maritime Authority Act 1998 (No.29 of 1998)
 Water Resources Management Act 2002 (No.9 of 2002)
 Wild Bird Protection Act Chapter 30 (Joint Regulation 5 of 1962 – Joint Regulation 13 of 1971)
 Wild Bird Protection Act 1989

Policies and Programmes

Code of Logging Practice
 National Biodiversity Conservation Strategy
 National BioSafety Framework Project
 National Conservation Strategy
 National Waste Management Strategy
 Persistent Organic Pollutants
 Tuna Management Plan

b. Publications by the Vanuatu Environment Unit:

Vanuatu National biodiversity Conservation Strategy (1999)

Vanuatu National Conservation Strategy (1993)

A Review of Priority Environmental Concerns (PEC) with Possible Projects
 Recommended for International Waters Project Consideration (2003)

c. Action plans to answer Vanuatu’s duty as a signatory of major environmental conventions:

Table 1 Country engagement in GEF supported activities (source Hakwa, 2003)

UN Framework Convention on Climate Change			
Pacific Islands Climate Change Adaptation Project (PICCAP)	SPREP/UNDP GEF	1997 - 2001	The PICCAP project helped Vanuatu to better understand the implications of climate change and to more effectively participate in UNFCCC responsibilities. Under this project Vanuatu prepared its first national report to the UNFCCC, gained skills and experience through training in vulnerability assessment and climate change modeling, and prepared its first greenhouse gas inventory.
Pacific Islands Renewable Energy Programme (PIREP)	SPREP/ UNDP GEF	2002 ongoing	The regional PIREP project is enabling Pacific Island countries to mitigate against greenhouse gas emissions by facilitating the promotion and uptake of renewable energy technologies by addressing the financial, regulatory, market, technical and information barriers to renewable energy uptake.
National Adaptation Plan of Action (NAPA)	UNDP GEF	2004 onwards	The NAPA project will enable Vanuatu to develop a country wide program of immediate and urgent adaptation activities to address the current and anticipated adverse effects of climate change, including extreme climatic events.

Community Based Adaptation Management for Pacific Island Countries (CBAMPIC)	Canadian International Development Agency/SPREP	2003 ongoing	A regional project managed by SPREP that will trial community based approaches to vulnerability reduction and adaptation at 3 sites: Lateu Village (Tegua Island), Luli Village (Paama Island), Panita Village (Tongoa Island). The project will also address opportunities to mainstream adaptation management into national and sectoral planning and budgeting processes.
GEF Preparatory funding (PDF) for Efate Geothermal Energy Source	WB/IFC	PDF A rec'd PDFB in pipeline.	Mitigate against greenhouse gas emissions by facilitating use of geothermal energy from North Efate. Ongoing work delayed due to difficulty gaining market agreement on a pricing policy with UNELCO.
UNFCCC Second National Communication	UNDP		Vanuatu submitted a letter of endorsement for UNDP assistance for assistance in development of a program of assistance for development of the second national communication to the UNFCCC COP.
UN Convention on Biodiversity			
National Biodiversity Strategy and Action Plan	UNEP GEF Enabling	1997 - 2000	Consultation, information gathering and preparation of a National Biodiversity Strategy and Action Plan. Participation in the CHM process. National reporting to the UNCBD COP.
National Biodiversity Strategy and Action Plan Capacity Building Add-on	UNEP GEF Enabling	2001-2003	Assessment of capacity needs for implementation of the National Biodiversity Strategy and Action Plan in 4 priority areas: scientific capacity, functional biodiversity conservation, traditional knowledge and sustainable financing. Participation in the CHM process. National reporting to the UNCBD COP.
Biosafety Enabling Activity	UNDP GEF Enabling	2003 ongoing	Awareness raising, stocktaking and identification of priority issues under the Cartagena Protocol.
Participation in the South Pacific Biodiversity Conservation Programme	SPREP/ UNDP GEF FSP	1994 - 2001	Pilot community based conservation initiative with Sara and Matantas villages, Santo
Participation in the International Waters Project.	SPREP/ UNDP GEF FSP	2002 ongoing	In-country conduct of a community based conservation pilot project to address the priority environment concerns in the areas of coastal fisheries and freshwater management.
MSP PDF: Strengthening landholder and community conservation capacity	UNDP GEF	2002-200	Consultations, research and documentation to support preparation of an MSP proposal to strengthen landholder and community conservation capacity.
MSP Proposal: Strengthening landholder and community conservation capacity	UNDP GEF	Before GEF	Three island pilot project to strengthen the capacity of landholders and their communities to manage international significant biodiversity.
MSP PDF: LINKS Project	UNESCO/UNEP GEF	2003	Demonstration activities to build capacity to incorporate indigenous environmental knowledge within the education curriculum.
Participation in PDF-B consultations: Invasive species project for Pacific Island Countries	SPREP / UNDP GEF	2003 ongoing	Consultations and documentation prior to submission of a Regional GEF FSP to address invasive species issues in the Pacific.

Participation in PDF-A	SOPAC/UNEP GEF	2004 ongoing	Consultations and documentation prior to submission of a Regional GEF to address the vulnerability of freshwater resources and build regional and in-country capacity to manage these resources.
Stockholm Convention			
POPs in PICS	SPREP/AusAID	2002 ongoing	Negotiations to enable export of POPs from Pacific Island Countries for destruction in Australia.
Enabling Activities for the Development of a National Plan for Implementation of the Stockholm Convention on POPs	UNEP GEF Enabling	2003 ongoing	Preparatory work for Vanuatu to implement the Convention and meet its obligations under the Convention. Will strengthen capacity to manage POPs and chemicals generally. Work includes a POPs inventory, assessment of capacity needs and review of the legal framework.

Table 2: National reports and action plans related to global environmental management (source Hakwa, 2003)

UN Framework Convention on Climate Change		
National Strategy for the Implementation of the UNFCCC (Draft)	In preparation	Establishes a plan of action to enable Vanuatu to meet its responsibilities under the UNFCCC
First National Report to the UN-FCCC COP	1999	Summarises Vanuatu's circumstances with respect to climate change and greenhouse gas emissions and outlines national concern at Vanuatu's vulnerability to the potential impacts of climate change. Proposes a strategy for action in response to the UNFCCC.
UN Convention on Biodiversity		
National Biodiversity Strategy and Action Plan	2000	Sets national goals and priorities for management of biodiversity, and proposes a broad ranging set of actions to meet these goals.
First National Report to the UN CBD COP	1998	Provided an overview of national activity to conserve biodiversity and implement responsibilities under the CBD, with a particular emphasis on opportunities for collaboration and partnership. The report identified some of the limitations and strengths of existing biodiversity conservation.
Second National Report to the UN CBD COP	2002	Summarises national progress toward meeting the obligations established in the UN-CBD and subsequent decisions of the CBD Conference of the Parties.
Thematic paper on invasive species	Draft in circulation. Not yet submitted.	Summarises national experience in invasive species and identifies capacity issues with respect to ongoing management and prevention of invasive species.
Stockholm Convention		
No reporting at present		
UN Convention to Combat Desertification and Land Degradation		
No reporting at present		

VII. International Conventions and Treaties signed by Vanuatu (from Hakwa, 2003, Environment Unit, 1993 (Unpublished) and pers. com. from VillardoIII, State Law Office).

Convention	Objectives	Status
United Nation Convention on Biological Diversity	Imposes obligation on Vanuatu to enact legislation to protect biological diversity	Ratified 1992
United Nation Convention for Climate Change	Commits Vanuatu to address a range of actions in this regard (information, assessment...)	Ratified 1992
Montreal protocol on Substances that Deplete the Ozone Layer		Ratified 1994
Vienna Convention for Protection of the Ozone Layer		Ratified 1994
Convention on the prohibition of Fishing with Long Drift Nets in the South Pacific		Ratified 1991
United Nation Convention on Law of the Sea	Regulates all ocean areas, all uses of the seas and all of its resources	Ratified 1982
Protocol of 1978 Relating to the International Convention for the Pollution from Ships		Ratified 1989
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Commits Vanuatu to regulate trade in species listed by parties to the convention	Ratified 1989
International Convention on the Establishment of an International Fund for Compensation for oil Pollution Damage		Ratified 1989
International Convention on Civil Liability for Oil Pollution Damage		Ratified 1983
International Convention for the Prevention of Pollution of the Sea by Oil		Ratified 1983
Rio Declaration on Environment and Development and Agenda 21		Ratified 1992
Plant Protection Agreement for the South East Asia and Pacific Region		Ratified 1997
Convention on Fishing and Conservation of the Living Resources of the High Seas		Not Ratified
Convention on the High Seas		Not ratified
South Pacific Nuclear Free Zone Treaty		Ratified 1995
Treaty of the Non-Proliferation of Nuclear Weapons		Ratified 1995
Waigani Convention	Bans the importation into Forum Island Countries of hazardous wastes and radioactive wastes. Controls the trans-boundary movements and management of wastes within the South-Pacific Region	Not Ratified
Convention on Wetlands of International Importance		Not Ratified
World Heritage Convention		Ratified 2002
Niue Treaty on Cooperation in Fisheries Surveillance and Law enforcement in the South-Pacific Region		Ratified 1993(Act 10 of 1993)
Stockholm Convention on Persistent Organic Pollutants	Controls and eliminates production and use of the 12 most dangerous POPs	Not Ratified
Rotterdam Convention	Prevents problems with hazardous chemicals by impeding exports of unwanted chemicals to countries that cannot manage them throughout their lifecycle	Not ratified
Convention on the Conservation of Nature in the South-Pacific (Apia Convention)	A regional legal framework for the protection of nature	Ratified 1994
SPREP Convention, Protection of the Natural Resources and Environment of the South-Pacific	A comprehensive legal framework for the protection, management and development of the marine and coastal environments and natural resources of the South-Pacific Region	Not Ratified

Agreement on the International Dolphin Conservation Program		Ratified 2003
Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean	Provides for international cooperation to manage sustainably highly migratory commercial fish stocks in the South-Pacific	Not Ratified
United Nation Convention to Combat Desertification and Land Degradation		Not Ratified
International Convention Relating to the High Seas in Case of Oil Pollution		Not Ratified
Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Material		Not Ratified
Convention on the High Seas		Not Ratified
Protocol Concerning Cooperation in Combating Pollution Emergencies in the South-Pacific Region		Not Ratified

VIII. A Summary of Recent International Development Assistance:

Donor	Project	Executor	Date
Australia			
	Financial support to REDIs	Provincial Governments	Current
	Sandalwood oil analysis and propagation project	Department of Forest, ACIAR, Ausaid	Current
	SPRIG	Department of Forest, Ausaid	1996-1999
	SPRIG 2	Departemnt of Forest, Ausaid	2000-2005
	Regional Waste Management	Ministry of Health	Completed
	POP in the PICs (phase II)	Department of Quarantine	2002 to today
	Climate Prediction in PICs	Weather Bureau	Current
	Greenhouse effects and Sea Level Monitoring	Ausaid	Current
	Coconut Crab Study	Ausaid, Fisheries Department	2003
	SPC Aquaculture Program	Ausaid, Fisheries Department	Ongoing
	Trochus Fisheries Project	Ausaid, Fisheries Department	Ongoing
	Efate Coral Reef Monitoring	Ausaid, Fisheries Department	Ongoing
	Health Good Governance and Environment Regional Project	Ausaid, Wan Smol Bag Theater	Ongoing
	Nursery Material Project	Ausaid, DoForest	Ongoing
China			
	Biogas Project in Efate	Community in North Efate	2004
European Union			
	Rural Tourism project	NTO	2001
	Pacific Coral Garden Initiative	FSPI, Department of Fisheries	2002
	Sustainable management of important biodiversity sites	Birdlife International	2002
	Reforestation Publicity Program	Reforestation Committee	2002
	POPACA	POPACA and DARD	2002-2005
	Nguna rechargeable batteries and environment protection	Support for non state actors programme	2004
	Reforestation Project	Chamber of Commerce and Industry	2004
France			
	POPACA	POPACA and DARD	2002-2005
	FAD Project	Department of Fisheries	2004
	Ex-situ genetic conservation of coconuts, root crops and bread fruits	VARTC	Ongoing
	Natural disaster and climatic changes	IRD	Ongoing
	Kava diversity	CIRAD, DARD	Ongoing
Great Britain			
	Investigation into the properties and marketability of Cordia Wood in Vanuatu	Department of Forest	2004
New Zealand			
	Water Resources Project	VEU	2003-2009
	Institutional Strengthening Project	Customary Land Tribunal, Ministry of Provincial affairs	Ongoing
	Soil erosion project Anneytium	Department of Geology Mines and Water Resources	2003
	Planter Bag Project	Department of Forest	2002

IX. National Biodiversity Conservation Strategy from the VEU (1999): The six priority objectives

- **Protection and wise use of biodiversity:**
 - Ensure wiser use of biodiversity (species, varieties or ecosystems) in a sustainable way;
 - Reduce threats to Vanuatu's biodiversity;
 - Protect indigenous biological resources;
 - Manage and protect endangered species and places that are under threat.
- **Application of policy, planning and legal mechanisms to enable sustainable management of biodiversity:**
 - Ensure all government planning documents, policies and laws recognise the importance and values of biodiversity;
 - Introduce EIA for any planned development project that could impact on environment;
 - Recognise the rights of all custom chiefs and local communities to safeguard biodiversity in the areas under their control;
 - Protect the intellectual property rights of Ni-Vanuatu in regard to their knowledge and use of biodiversity;
 - Establish local and national sources of funding to assist with the sustainable conservation of natural resources;
- **Research, assessment and monitoring of biodiversity:**
 - Increase knowledge of Vanuatu's biodiversity so that better suited management systems can be identified;
 - Monitoring evolution of ecosystems and species;
 - Monitor impact of development activities on biodiversity;
- **Capacity building for environmental management:**
 - Improve the technical capacity (sectors and resource people within government) to manage biodiversity;
 - Strengthen and support local communities and land owners for execution of sustainable biodiversity management activities;
 - Encourage strong local participation;
 - Establish local or national funding sources for financing biodiversity conservation activities
 - Secure access to international support for biodiversity conservation priorities;
 - Support effective traditional biodiversity management systems
- **Environmental education, awareness and information sharing**
 - Improve environmental education within the school system;
 - Raise wider awareness of biodiversity and its values;
 - Encourage information sharing and cooperation within and between sectors and between local communities;

Raise community awareness of the provisions of environmental and natural resource legislation.

- ***Participation of local communities in the management of biodiversity:***
 - Support cooperation of chiefs (Malvatumauri), local communities, resource owners and users to better manage the biodiversity;*
 - Recognise and strengthen local communities' rights and traditional conservation practices to manage and wisely use biodiversity;*
 - Involve local communities with biodiversity field surveys and conservation programmes;*
 - Strengthen and support local community decision making bodies.*

7. Administrative Appendices

I. Study methodology-Work Plan

The consultant has been a resident of Vanuatu for 6 years and therefore has substantial insight into the Vanuatu economy, culture and environment.

The methodology can be summarised as follows:

- Identification of existing sources of literature in Vanuatu;
- Sourcing and gathering of literature;
- Literature review
- Identification of key governmental departments, donor agencies, NGOs and community leaders;
- Appointments organised;
- Interview with persons listed under heading III;
- Writing of the Vanuatu Environment Profile document.

II. Consultants Itinerary

- 14 July 2004: Consultancy contract finalised.
- 15-20 July 2004: Literature review and meetings with various organisations.
- 21-26 July 2004: Absent from Vanuatu due to a Medic-Vac situation.
- 27 July 2004 – 20 August 2004: Further Literature/Meetings undertaken together with redaction of the Vanuatu Environment Profile document.
- 06 October: reception of 'comments to CEP Vanuatu' by AGRECO-MDF.
- 16 October: Meeting with EU representative in Port Vila and Technical Adviser to the National Authorising Office to discuss the comments.
- 17-30 October: Further meetings and finalising the CEP.

III. List of Persons/Organisations Consulted

Amos Moses, Director, Department of Fisheries

Bani, Ernest, Director, Vanuatu Environment Unit

Brink Randy, Marketing Adviser, Community Based Project Manager, Foundation of the South Pacific (FSP)

Chassate Benoît, French Technical Advisor Department Of Public Works

Dalesa Malcolm, Assistant Environment Officer, Port Vila Town Hall

Denise Benoît, Secretary General, NGO's Liaison Officer, French Embassy

Denise Shumei, Director, EU Support to Non State Actors Project

Garu Selwyn, Secretary, Malvatumauri Council of Chiefs

George Kevin, Peace Corps Country Director Vanuatu

Hakwa Marie, Lawyer Hakwa and Associate

Hamilton Dale, Principal Veterinary Officer, Department of Quarantine

Hillman Victoria, Senior Program Officer, Australian High Commission

Iakavai Judith, Vanuatu National Council of Women, Support Staff

Ioan Christopher, Director of the Geology, Mines and Water Resources Department

Johnson Simil, Department of Statistics

Kaloran Jimmy, Manager North Efate imber

Kalfatak Donna, Biodiversity Project Coordinator, Environment Unit

Kenneth Dorosday, Director Department of Agriculture, Research and Development

Laurent René, Cattle Property Owner Devil's Point Ranch

Moala Pita, Senior Project Implementation Officer, Asian Development Bank

Nari, Russel, Deputy Director Environment Unit

Vari, Michael, National Project Coordinator POPs Project

Villardo III Jesus Agura, English Text Consolidator, State Law Office, Port Vila

Tarilongi Benuel, Director of Department of Quarantine

Tekon Timothy Tumukon, Principal Plant Protection Officer

Tsilogiannis Costas, EU Representative in Vanuatu

Watson J. Lui, Department of Forest

Wilson Elizabeth, Deputy High Commissioner, New-Zealand High Commission

Whyte Jenny, British High Commission

Xinchao Zhang, First Secretary of the Chinese Embassy in Port Vila

IV. List of Documentation Consulted

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- Van Trease, H. N.**, 1987, The Politics of Land in Vanuatu From Colony to Independence, Published by the Institute of Pacific Studies, USP, Suva, Fiji, 313 pp.
- Weightman, B.**, 1989, Agriculture in Vanuatu, A Historical Review, The British Friends of Vanuatu (ed.), Grosvenor Press, Great Britain, 320 pp.

V. Curriculum Vitae of the Consultant

SUMMARY OF QUALIFICATIONS of ADRIEN MOURGUES

1995-2000 PhD candidate at James Cook University of North Queensland

1992 Post Graduate studies in “**Economics of the Development of Agriculture, Food Industries and Rural Areas**” at the Superior National School of Agriculture, Montpellier (France) and the University of Economic Sciences, Montpellier (France). (Until posting in the Kingdom of Tonga).

1991 Awarded Degree Status (Masters) of **Engineer of Tropical Agriculture. Major in “Agriculture & Development”** from the National Centre of Agriculture and Studies in Tropical Regions (CNEARC), Montpellier (France)..

1990 Awarded Degree Status (Masters) of **Engineer of Agriculture from ENSAIA** (Superior National School of Agriculture and Food Industry), Nancy (France) **Major in: Tropical Agriculture.**

1989 Degree in Agriculture from ENSAIA, Nancy (France).

PROFESSIONAL EXPERIENCE

PROJECT MANAGER: -Small Scale Commercial Fishing Development January 2003-August 2004

-Coordination of the DAEU B (foundation course project in science) (2004)

-Relieving French Agricultural Project in Tonga Manager (May-August 1993)

-Coconut Seed Garden Project Manager in Tonga (1992-1993)

CONSULTANT:

-Technical Advisor, French Embassy (Service de Coopération & d’Action Culturelle)

-Analysis of the socio-economic context of the archipelago of Vanuatu and on the definition of the general principles of a sustainable rural credit system appropriate to the aims of POPACA project. January 2003

-Financial and Economic Study of Coffee Processing in Tonga (1991)

-Study of the Diversity of Agrarian Systems in the Department of Kaffrine, Senegal (1990)

-Studies on *Sesbania rostrata* an efficient nitrogen fixing legume (1989)

RESEARCH

Genotype by environment interactions in Black Gram (*Vigna mungo*), CSIRO – James Cook University of North Queensland.

TEACHING:

-Mathematics, physics and chemistry at DAEU (1999-2004)

-Biology at the University of the South Pacific (foundation) (1999)

-Plant physiology (James Cook University – Australia) 1996

PUBLICATIONS

2004 Séismes au Vanuatu *in* 101 mots sur le Vanuatu, Nouméa (*in press*) ; Les volcans au Vanuatu, *in* 101 mots sur le Vanuatu (*in press*)

2003 (1) Projet de développement de la pêche artisanale commerciale au Vanuatu, 41 pp. French Ministry of Foreign Affairs; (2) Study to Establish a Credit Fund (in Vanuatu), Report submitted to the Producers Organization Project in Vanuatu, 100 pp plus annexure.

1996 A Scientific Approach to Improvement of Black Gram, a Crop with Export Potential. *In* New Crops, New products: New Opportunities for Australian Agriculture: Proceedings of the First International New Crops Conference, University of Queensland Gatton College, July 1996.(Eds B. C. Imrie, R. A. Bray, I. M Wood and R. J. Fletcher), Vol. 2, pp. 53-62.

1991 Etude économique et financière de la transformation du café dans le Royaume de Tonga en 1991. CNEARC, Montpellier, France. 98 pp.

1987 Diversité des systèmes agraires du Département de Kaffrine, Sénégal. CIRAD-DSA, Montpellier, France. 92 pp.

VI. Terms of Reference for the Country Environmental Profile

1. Study background

The European Commission requires a Country Environmental Profile as part of the on-going mid term review of the implementation of the indicative programmes for the Republic Vanuatu.

2. Study objective

The Country Environmental Profile study will provide decision-makers in the European Commission and the partner countries with sufficient information to identify EC cooperation activities with specific environmental objectives and to establish environment safeguards for other activities.

3. Study results

The study will deliver the following:

- An assessment of the environmental situation in the country covering the key issues and responses to these, environmental policy and legislation, institutional structure and capacity, the involvement of civil society, and international development assistance.
- Recommendations for priority actions.

4. Issues to be studied

The consultants will study the following issues:

4.1 The state of the environment

Including key issues (current status, pressures and trends), responses (objectives set, action taken /planned, regulations) and environmental performance in meeting objectives/plans and targets in the following areas (as applicable):

- **Physical environment** including climate/micro-climate, air quality and odour, water quality and resources, noise and vibration, topography and soils, geology and hydrogeology and natural disaster risks;
- **Biological conditions, biodiversity, ecology and nature conservation** including rare, endangered and protected ecosystems, habitats and species, species of commercial importance or with potential to become nuisance or dangerous;
- **Socio-economic conditions, socio-cultural conditions and human health** including archaeology and cultural heritage, values and aspirations, recreational, landscape and

visual aspects, socio-economic aspects (population, employment, income revenue), and land use, access/transportation, infrastructure facilities (power/fuel sources, water supply. Sewerage, flood control) agricultural development, mineral industry, tourism and other commerce and economic activity (formal and informal) and health aspects (public health). human health and access/transportation.

- Where possible, make reference to internationally recognised indicators and quality standards to establish a consistent basis for comparison of environmental performance.

4.2 Environmental policy and legislation

The assessment should include:

- policy and action plans (such as such as National Environmental Action Plans, sustainable development plans, Agenda 21) for natural resource protection and pollution control, and the effectiveness of enforcement;
- legislation, current and in preparation, covering development control, requirement for EIA/SEA, environmental auditing, natural resource protection and pollution control, and provisions for public participation and access to environmental information and the effectiveness of enforcement of legislation;
- government approach to key international environmental conventions such as climate change, biodiversity and desertification;

4.3 Environmental institutional framework

The assessment should include:

- institutional structure and responsibilities of national/federal regional to local authorities and agencies in dealing with environmental issues in policy making, the legislature, planning, environmental protection, monitoring and enforcement;
- formal structures and procedures for public participation in development control and environmental planning;
- capacity and financial resources of authorities responsible for environmental management.

4.4 Integration of environmental concerns into the main economic sector

The assessment should cover the following sectors:

- agriculture, fisheries and forestry;
- mineral resources;
- utilities including power, energy and water;
- industry (from heavy industry to tourism)

- transport
- any other sector relevant to the specific country.

4.5 EC cooperation with the country from an environmental perspective

This should cover experience relating to interventions with specific environmental objectives, and the integration of environment into programmes with other primary objectives, including the application of environmental assessment procedures.

4.6 Other funding agencies

This should cover:

- involvement of other funding agencies and their experience in the country and include a list of recent and planned projects;
- procedures for co-operation between funding agencies.

5. Work plan

The work plan should include but not necessarily be limited to the following activities:

- Consultation with EC country delegation, national organisations and agencies and local authorities, key international funding agencies operating in the country, key national and international development, environmental, and civil rights NGOs operating in the country;
- Review of evaluation reports with respect to environmental issues on development and economic co-operation produced by government, EC or other agency sources
- Review of environmental policy and legislation framework, legislation and regulations and enforcement relating to environmental issues, action plans, and progress in implementation
- Review of environmental performance indicators selecting appropriate indicators from those suggested by organisations such as EEA/OECD/Eurostat.

On the basis of the proposed work plan and time schedule outlined in this Terms of Reference, the consultants must detail their work plan for the Country Environmental Profile study in their offer.

6. Expertise required

The consultant/evaluator should be a professional with a well-established track-record in environmental related issues particularly within the context of small island development states (SIDS). A specific experience focusing on environmental assessment, environmental economics and/or environmental policies will be an advantage.

The consultant must have an University degree in a relevant field (environment, natural sciences, natural resources management, environmental economics or engineering) and at least five years relevant professional experience.

The consultant must also have proven analytical skills as well as written and presentational skills. The working language of the evaluation will be English. However, a good understanding of French (reading at least) would be an added advantage as would be a working knowledge of Melanesian Pidgin.

A good knowledge of the region – and more specifically of the country – is a prerequisite.

7. Reporting

The study conclusions must be presented in the Country Environmental Profile report in the format given in Appendix 1.

The draft report in 5 copies is to be presented to the National Authorising Officer and the European Commission within 30 days of the beginning of the assignment. Comments on the draft report will be received from the NAO and the European Commission, as the report is part of the joint annual reporting / mid term review. Comments will also be solicited from the Government's Environmental Unit.

Taking into account the forthcoming holiday season (August), it is expected that comments will only be received in September. The consultants will take account of these comments in preparing the final report (20–40 pages excluding appendices). The final report in English in 5 paper copies and one electronic version on CDrom is to be submitted within 15 days of the receipt of the consolidated comments from EU/NAO/national environment unit.

8. Time schedule

Beginning of the mission : July

Submission of draft report : end July

Submission of final report : end September

9. Appendices

- I. Report format for a Country Environmental Profile
- II. Supplementary data and information