

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



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Views expressed in this report are fully claimed by the writers and may not necessarily be those of the International Waters Program, the Environment Unit, Island Consulting or those consulted.

Acronyms and Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
BOD	Biochemical Oxygen Demand
CaCO ₃	Calcium Carbonate
CNFC	China National Fishing Corporation
COLP	Code of Logging Practice
COM	Council of Ministers
CRP	Comprehensive Reform Programme
DCO	Development Committee of Officials
DGMWR	Department of Geology, Minerals and water Resources
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
FFA	Forum Fisheries Agency
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPZ	Groundwater Protection Zone
IWP	International Waters Programme
LGC	Local Government Council
MOH	Ministry of Health
MPA	Marine Protected Areas
NATPLAN	National Oil Spills Contingency Plan for Vanuatu
NBSAP	National Biodiversity Strategy Action Plan
NDIY	No Donor Identified Yet
NGO	Non-government organization
PEC	Priority Environment Concerns
PICCAP	Pacific Islands Climate Change Assistance Programme

POPs	Persistent Organic Pollutants
PRA	Participatory Rural Appraisal
PSC	Public Service Commission
PTS	Persistent Toxic Substances
PVMC	Port Vila Municipal Council
RAMCIS	Resource Assessment, management, Computer and Information section
REDI	Rural Economic Development Initiative
RFDP	Rural Fisheries Development Programme
RWS	Rural Water Supply Section of the DGMWR
SMP	Sanitation Master Plan for Port Vila
SOPAC	South Pacific Applied Geo Science Commission
SPC	Secretariat of the Pacific Community
SPREP	South Pacific Regional Environment Program
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UNELCO	Union Electrique du Vanuatu Ltd
VANRIS	Vanuatu Resource Information Systems
VCH	Vila Central Hospital
VMA	Vanuatu Maritime Authority
VQIS	Vanuatu Quarantine and Inspection Service
WHO	World Health Organization

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Map 1: Vanuatu showing fragile coastal zones recorded by VANRIS.

Executive Summary

This report highlight priority environmental concerns (PEC) for the Vanuatu IWP Project on key environmental sectors of waste, agriculture forestry, biodiversity, water, and fishery. The main issues identified and discussed include the major constraints or vulnerabilities, and various opportunities in the sectors. Due to the time frame given to the consulting team, consultation was only carried out Port Vila.

The desk review of priority environmental concerns (PEC) focused on key national documents such as NBSAP, NATPLAN, National Waste Policy, National Forest Policy; DGWR Corporate plan; MALFF Corporate Plan; Tuna Management Plan, and other research reports o the various sectors. The various opportunities identified in these sectors are then prioritized and used with the factors below as a guide to selecting the possible pilot project for IWP. The factors are:

- The maximum number of people to benefit
- Benefit to Vanuatu IWP
- No. of sector opportunities addressed
- No. of IWP focal areas addressed
- Duplication of efforts
- Cost effectiveness
- Long term requirements from Government
- Likelihood of being sustained post IWP and
- Weaknesses

The review is recommending a total of six possible projects for IWP National Task Force consideration. Using the above criteria, the one possible project that really stands out between all the other is the Vanuatu Integrated Coastal Land Management project. This project would try to employ a holistic approach as a pilot in addressing the focal IWP issues of protection of freshwater resources, sustainable coastal fisheries, marine protected areas and community based waste reduction. It is hoped such a project could demonstrate the many benefits from inter sectoral co-operation and will enable subsistence as well as commercial interests and environmental pressures to be addressed. Although it would be a huge investment, the benefits would be felt throughout Vanuatu especially as important lessons learnt are shared and practiced.

Another possible project with similar wide reaching scope is the Vanuatu Integrated Watershed Management. Other recommendations include capacity building for community based coastal fishery resource management and monitoring, waste management institutional capacity building, water quality monitoring and surveillance capabilities and the development of a cross sectoral code of practice for subsistence resource use.

Table 1: Summary of Priority Projects Identified:

1. Background Information

This report compiles and documents priority environmental concerns for the International Waters Project (IWP) in Vanuatu. A majority of the issues and information were gathered from referenced materials provided by the various government departments and people consulted (See List of People Consulted, Appendix 1).

The purposes of this report are:

- To prepare a written report summarizing available information on the state of the Vanuatu's environment (forestry, fisheries, agriculture, biodiversity, water, health and waste management), current management and perceived conservation practices.
- To describe priority issues for consideration by the Vanuatu International Waters Project (IWP) in choosing community level activities from within the SPREP IWP's program areas: freshwater resources, waste management and coastal fisheries and marine protected areas

The methodology employed for the review of environmental concerns for the Vanuatu IWP project comprise of the following:

- Briefing by the Vanuatu IWP Coordinator on what is required;
- Meetings and discussions with the Government, private sector and the Non-governmental organization officials;
- Review of published and unpublished documents;
- Review of the rapid appraisal survey of Vanuatu Priority Environmental Concern by the International Waters-Vanuatu Secretariat;

The consulting team comprised Abel Tapisuwe, Albert Williams and Michael Vari.

1.1 The International Waters Project

International Waters is one of the four focal areas of the Global Environment Facility (GEF) which was created in 1994 to provide a unique niche – that of providing financing for programs and projects to achieve global environment benefits in four focal areas: biodiversity, climate change, international waters and ozone layer depletion and also in land degradation as it relates to these focal areas. International waters extend far inland and far out to sea. This is because the global hydrological cycle links watersheds, air sheds, estuaries, coastal and marine waters through the trans boundary movement of water, pollutants and living resources.

The SPREP International Waters Project (IWP) seeks to sustainably manage and effectively conserve coastal and marine resources and habitats in the Pacific Islands region. It has two main components: oceanic and coastal.

The **Oceanic component** is “to enable conservation and sustainable yield of ocean living resources”. This is being done through a coordinated program involving the SPC and Forum Fisheries Agencies to provide improved information on the exploitation of the tuna resource in the region.

The **Coastal component** is “to address root causes of the degradation of international waters in coastal regions through a program focused on improved integrated coastal and watershed management through community level participation to address priority environment concerns within countries relating to:

- Marine and fresh water quality
- Habitat and community modification and degradation
- Unsustainable use of living marine resources.

At the regional level IWP SPREP will support the establishment of 14 pilot projects, one in each of the participating countries. Each project will seek to strengthen capacity and provide lessons for best practices and appropriate methodologies for sustainable resource management and conservation in four focal areas relating to:

- Marine protected areas
- Sustainable coastal fisheries
- The protection of freshwater resources
- Community based waste reduction

1.2 IWP Vanuatu Secretariat appraisal of Priority Environmental Concerns

The Vanuatu IWP secretariat was established in 2002 and has provided background and supporting information to the consultancy team. The Vanuatu IWP staff sent out a questionnaire to get information from communities on their priority environment concerns. At the time of preparing this report only 14 surveys from 14 islands had been received (Table 2 below). Consequently the information from this survey is not conclusive.

Important concerns identified by respondents to the survey are destruction of forest, degradation of coral reef, shortage of water due to clearance within catchments, impact of invasive species, species depletion, over exploitation, excessive waste, destructive harvesting, long dry seasons, storms and cyclones.

A table next page summarizes the findings.

Table 2: Summary of Priority Environment Concerns Survey findings.

2.0 Physical and Social Context of Vanuatu

The Republic of Vanuatu comprises an EEZ of 710,000 sq. km and some 80 islands with a total surface area of 12,200 km². Topography varies from low coastal plains to rough, mountainous and heavily forested interiors, with the highest peak rising to over 1,800 meters on Espiritu Santo. Vanuatu is located in the cyclone-prone, tropical southwestern Pacific Ocean.

2.1 Population Dynamics

Some key aspects of Vanuatu's population dynamics taken from the 1999 Population Census (National Statistic Office, 2000) can be seen below:

- The average annual growth rate between 1989 and 1999 was 2.6% of which the urban growth rate was 4.2% and the rural growth rate was 2.2%. The rural population was 78.5% down from 81.8% in 1989
- The age dependency ratio (i.e. the sum of the young and old as a portion of the working age population of 15 – 64) was very high at 85% with 42.7% of the population under 15 years and 3.4% over 65 years
- Crude birth rate per 1000 is 33
- Fertility rate is 4.5% with child bearing starting at age 15
- More males than females were in paid employment (30.1%) compared to 19.8% and more females than males were subsistence farmers (72.9% compared to 62.5%)
- Infant mortality rate is 25.5% for female and 26% for male
- Crude death rate per 1000 is 6% (8-10% in 1999) with life expectancy for females now 70 years and males 67 years

2.2 Political/Geographic Structure of the Country

The Republic is a parliamentary democracy with executive power vested in the Prime Minister and the council of thirteen Ministers (2000 figures), which is responsible for government departments, national administration and the provision of government services. The Head of State is the President.

The Decentralization Act passed at independence established eleven Local Government Councils (LGC) to be the communicating link from government to rural areas, and formalized the formation of a national council of chiefs (the Malvatumauri) and island councils of chiefs, which play an advisory role to local and national government. These LGC were later replaced with the current six Provinces comprising: TORBA, SANMA, PENAMA, MALAMPA, SHEFA and TAFEA provinces.

It is anticipated that the Provincial Government Centres will become vigorous growth centres, in a better position to address the widely different circumstances and needs of rural districts and to ensure that rural areas get an equitable share of government services.

They have recently launched their Rural Economic Development Initiatives (REDI) plans (2002) as bases for their 5- year development programs. These initiatives have had wide consultation to include inputs from affected communities. It is still much too early to comment on the success of these plans. An important factor for success will be the funding levels the Provinces get to implement their REDIs.

The country has two urban municipalities, the Port Vila Municipal and the Luganville Municipal located on the islands of Efate and Santo respectively.

2.3 Culture

About one million people were living in the islands of Vanuatu when the first European settlements were established (ADB, 2002). Miller (1980) cites how in the late 1880s, deaths occurred from new diseases such as dysenteries, whooping cough and measles. People were taken to Fiji and Australia during the black-birding days. At one stage, it was thought that the New Hebrideans (now Ni-Vanuatu) were a dying race. This historical part of the Vanuatu's demography is noted here mainly to show that with higher population in the past, resources were in abundance through careful management under the traditional resource management systems. Numerous community PRA exercises on resource management suggest that resources were more plentiful in earlier times than in the last twenty years (Tapisuwe et al., 1998). Though Vanuatu has limited resources, resource stocks are thought to have been more plentiful in the past. This reflects different resource use and management systems. Traditionally, there was a symbiotic relationship between people and their environment. Respect for the environment was part of the well being of both people and their environment. Spiritual beliefs that people had toward particular species were part of this relationship. For example, trees such as the kok tree (*Bischofia javanica*) and the large nambanga trees (*Ficus subcordata*) were the home of spirits who guarded surrounding areas, while snakes were often believed to be spirits themselves.

Some areas were established as tabu areas, guarding these fauna and flora species. Other tabu areas were established in memory of an event: a chief's death, rank taking ceremonies and someone being killed in a location. However, such sacred places played an important role in biodiversity conservation such as around pools, creeks and plants (Naupa, 2001). Naupa cites that hunted animals on entering these areas were left alone in case the spirits were disturbed.

Conservation areas were traditionally established for a diversity of traditional resource management purposes including:

- Appease the spirits who guarded or lived in certain areas;
- In memory of a traditional ritual ceremonies performed in specific locations;
- Value a clan's origin etc; and
- Commemoration of an important event.

In addition traditional resource management decisions were taken to sustainably manage resource stocks (Tapisuwe, 2001). These decisions were taken on consideration of:

- Changes in time taken to harvest a certain volume of specified species;
- Changes in the abundance of target species;
- Volume of resources harvested;
- Changes in the average physical sizes of resources caught;
- Abundance of resources in their locations especially of fauna in both sea and land;
- Adequacy of harvest.

In Vanuatu, tradition and culture is having an impact on natural resource management. Out of 106 conservation areas identified in 2001, only four had received financial and western type legal assistance. The rest were initiated through traditional and cultural input (Tapisuwe, 2002).

To safe guard this symbiotic system, chiefs were appointed to serve their communities uphold peace and stability. As traditional leaders, they held the obligation to protect and uphold all that is regarded as custom, culture and tradition. They played the role of supervisor, judge, prosecutor, investigator, developer and police, making it a most effective and cheap system of governance to ensure peace and stability (Garu and Yakan, 2001).

Respect was the key tool of the highest-ranking chief in the area. He held authority over all matters including over live and death (Garu and Yakan, 2001). As Father Lini once put it, "Respect is honourable". Respect is a two- way behaviour: Chief respects his people and his people respect him. If there is no respect then something definitely is very wrong. The respect was also shown to the traditional resource management systems that existed under the chief's authority to ensure that peace and harmony is maintained between people and nature.

2.4 Education

According to the 1999 Census (National Statistic Office, 2000) of the population aged 15 years and above:

- 18% had never attended school (22% in rural areas)
- 55.5% had reached no higher than primary school
- 21% had attended vocational schools or post secondary schools (teacher's college and nursing schools)
- 1.3% had attended a tertiary institution

In relation to gender differences, more women than men had not been to school (20.6% compared to 15.5%), more men than women received some level of secondary school certificate (15% compared to 12%) and more men than women attained qualifications at university level (1.8% compared to 0.8%)(Quinn and Clark, 2001).

The literacy rate in 1999 was 74% with the literacy rate in urban areas at 90% compared with rural areas at 69%)

2.5 Economic Activity

The National Statistic Office (2000) noted that of the working population of 97,642 between 15- 64 years:

- 67.2% were subsistence farmers
- 25.5% worked for pay/ salary/ profit
- 5.7% did unpaid work
- 1.6% were looking for work

2.6 Land

Vanuatu is an archipelago of over 80 islands, stretching 1,300 km from the north to south with a combined land area of only 12,190 square kilometers. Vanuatu's islands are young in geological terms, small and highly disturbed as a result of natural cyclone, seismic and volcanic activity.

One quarter of Vanuatu is mountainous; only 5% is of the land area is raised coral terraces; 22% is stepped terraces and plateau and highly dissected by creeks and; relic volcanic cones occupies 7% and volcanic foot slopes occupy 10% of the area; about 7% is taken up by rivers and freshwater lakes and comparatively lowlands useful for agricultural activities take up to 41% (Nimoho et al, 1998).

The Constitution provides that land tenure is based on traditional systems and that only indigenous Ni- Vanuatu can own land in Vanuatu. Land is inherited through paternal lines on some islands while in others through matrilineal lines. On some islands both systems exist. Land lease agreements have been used widely by developers for the purpose of business, commercial and agricultural undertakings.

The Constitution also allows the Government to declare portions of land to be public land if it is beneficial to the country for example the establishments of townships.

Approximately 41% of the land in Vanuatu is suitable for arable farming, mainly along the coast and flood plains such as the Mele flood plain on Efate. Most of this land has been used to support 78% of the population. As a result it is estimated that less than a 100 square kilometers of forest is available and is scattered throughout the islands. The forest is highly disturbed, yet is important as a source of firewood, building materials and other resources to communities using the land. (Dept. of Forests National Forestry Policy, 1997)

2.7 Review of current and planned capacity building projects

Vanuatu receives financial, technical and other assistance from the following agencies; AusAID, ADB, the British High Commission's Aid Management Office, Caisse Francaise de Développement; Canada Fund, the European Union's Sub-Office (Vanuatu), the French Embassy, JICA, the Peoples Republic of China and NZODA. Most of the

existing and planned activities that address some aspects of environmental management are approached through donor-funded programs. Table 3 below summarizes all ongoing and planned projects in the environment sector from the Government Investment Program (GIP).

Table 3: Government Investment Program Projects (Environment Sector).

No. ¹	Project name	Status	Source of funding
03C264	Natural Science annex to the National Museum	Project approved by MBC ²	NDIY ³
01I164	Boufa landfill & sludge Treatment Development and management	Project approved by MBC	NDIY
01I264	Vanuatu Solid Waste Action Work	Project documents submitted to donor	EU/ UNDP
01Q964	Twelfth SPREP meeting	Abandoned Project (9)	NDIY
02E564	National Climate Change Capacity Building Project	Project documents submitted to donor (4)	SPREP
02E664	Strengthening capacity for Conservation of Coastal Reef	Project unable to attract funding with selected donor	McArthur Foundation
02F264	Vanuatu National Biodiversity Phase 2	Project documents submitted to donor (4)	GEF
02J864	National environment week – 2002	Project on going (1)	British Bilateral Grant /Aid
01H964	National Waste Management Strategy	Project approved by MBC (5)	NDIY
03C164	Development of National Bio-safety Framework	Project documents submitted to donor (4)	UNEP/GEF
02P864	Vanuatu Strategic Action Program for International	Project on going (1)	SPREP
464133	National Biodiversity Strategic Action Plan	Project on going (1)	UN Pacific Energy Development Program
98D964	Environment Posters and Brochures	Project on going (1)	Canadian bilateral Grant/Aid
98G164	Climate Change Assistance Project	Project on going (1)	SPREP
99B764	School Environment News Letter	Project documents submitted to donor (4)	SPREP
99B864	Biodiversity Assessment Phase 2	Project documents submitted to donor (4)	NDIY
99Z764	Waste Project in Vanuatu	Project on going (1)	SPREP
03C464	Training of Trainers/ Technicians in good Practices	Project documents submitted to donor (4)	Australian bilateral Grant/Aid
03B964	Facilitating Community and Landholder initiated Community	Project documents submitted to donor (4)	UNDP/GEF

Source: Aid Management Division of the Department of Economic and Social Development (DESD), 2003

¹ Quote this number if requesting further information on these projects.

² MBC Ministerial Board Committee for projects. After approval the projects are circulated between possible funders.

³ NDIY = No Donor Identified Yet.

3.0 Waste Management Sector

Waste management concepts have been around for a very long time. Household cleanliness is an important duty. There is always someone available to see that waste (household garbage and faeces) are disposed of appropriately. Traditional practices included clear guidelines for methods to dispose of waste so that both the environment and our neighbors were respected. For example, in Central Pentecost, if one is maintaining a footpath, debris are not left in the path for others to step on, less it harbors thorns and negative evil doings that may be placed there by another person to hurt someone else. Many of these traditional approaches are no longer relevant as new types of wastes have been introduced that need new guidelines for disposal. These wastes include solid wastes (bottles, plastics, aluminium cans, glass and rubber); liquid wastes (mass and concentrated faeces disposal in the urban centers and human related waste such as dirty laundry and bathing water); they also include toxic and hazardous waste (including chemicals, batteries, clinical, quarantine and industrial wastes).

This section outlines the key waste management issues and outlines the key environmental management tools (e.g. legislation, policies, etc) threats, vulnerabilities and opportunities for the sector.

Waste management is coming to be a serious environmental problem in Vanuatu. Consultations during development of a National Waste Policy showed recognition that waste was a problem on most islands in Vanuatu. Particular problems arise with waste disposal in the two main urban centers of Port Vila, and Luganville, and the six provincial centers of Vanuatu. Empty bottles, plastic bags, and containers, and all the other debris of modern society are littering formerly pristine waters, shorelines and land, threatening food and water supplies, public health, tourism industries and industries alike.

3.1 Solid Waste Management

Vanuatu's Waste Management Policy recognizes that solid waste management in Vanuatu is not just a matter of solving the problems of litter and solid waste disposal – a full solution has social, economic, environmental, health, education, and commercial and international relation dimensions. It also recognized that for Vanuatu, reduction of waste is probably the most practical option, and that this depends on public awareness and education. The hope is that as people became aware of the realities of the threat which solid waste poses to their environment, their health and economy, they will start taking action themselves to reduce waste.

A significant step in this direction was the 2002 Municipal By-Law No. 4 banning non-biodegradable plastic from the urban area. This By-Law, which came into effect in 2002, requires all commercial shops in Port Vila to use biodegradable plastic shopping bags. Though it has received a lot of criticism, the private sector is supportive of the By-Law. (Ata Tony and Dalesa Malcolm, Head and Assistant Environmental Health Officer, Port Vila Municipality, Pers. Com, December 2002).

Waste characterization is very important in giving reliable baseline data to guide targets for disposal, reduction, reuse and recycling, and to raise public awareness of the general public, the decision makers and the legislators. The only recent waste characterization

study has been of waste generated in the Port Vila urban area (Sinclair Knight Merz, 2000). The information presented below comes from this study.

In the one-week study an estimated 172 tonnes (900 cubic meters) was delivered to the landfill, the equivalent of 0.65kg/person/day. The composition of this waste is characterized in Table 3. From which it can be noted that:

- Biodegradable material is very high at 71% of waste by weight. Much of this could be composted and removed from the waste stream, extending the life of the present landfill site from 30 years to 100 years. This would be a considerable economic and environmental saving to Port Vila Municipal and its residents.
- Paper waste is also very high at 11.4% of waste by weight.
- Plastics are high at over 7% of waste by weight.
- Very few returnable bottles were reaching the landfill suggesting that in town bottle recycling is working.
- Some 60 tonnes of aluminum cans are reaching the tip each year, and this could potentially be recycled.
- Over 80% of waste going to landfill could be recycled or composted

Recommendations include that waste reduction activities are important to halt or slow down the increasing rate of waste generation per capita. This includes greater separation of wastes so that wastes that can be composted or recycled are not dumped into the landfill. It also includes education about waste management and legislation to guide the private sector, importers and consumers, possibly even placing legal responsibility on the importer to return some waste to their source.

The study also concluded that the Port Vila Municipal Council is under-funded and under-resourced as far as waste management is concerned. The operations of the Bouffa Sanitary landfill by the Port Vila Municipality are not conducted on the basis of recovering the full environmental costs of waste management.

Table 4: Waste classification Port Vila Municipal Tip, 2000.

Primary Waste Classification	Secondary Waste classification	Average Percent (% Weight)
Paper	Cardboard Boxes	4.1%
	Sanitary	1.7%
	Other – magazines, newspapers, office, tetrapak, packaging	5.6%
Plastic	Polyethylene terephthalate (PET) plastic	0.3%
	Rigid High Density Polyethylene (HDPE) Plastic	0.4%
	Flexible HDPE & other plastics	7.0%
Glass	All Glass	3.3%
Metals	Aluminium Cans	0.7%
	Other metals	2.9 %
Biodegradable	All organic	71%
Textiles	All textiles	1.6%
Potentially hazardous	All	0.7%
Construction & demolition	All	0.7%
Other	Including rubber & other	0%
TOTAL		100%

(Source: Sinclair Knight Merz, 2000).

3.2 Liquid waste management

There has been limited attention to liquid waste management outside of the Port Vila and major resort developments.

The feasibility study conducted to develop the Sanitation Master Plan for Port Vila project funded by ADB had three important objectives:

- To improve the standard of hospital sewerage treatment to an acceptable modern standard to cope with the current and future wastewater loads arising from a proposed 150-bed expansion of the hospital.
- To improve the health and well being of the residents Seaside by providing reticulated sewage system to convey their wastewater off-site.

- To halt the disposal of treated sewage effluent to the Ekasuvat lagoon by disposal of the disinfected hospital sewage effluent by sprinkler irrigation on hospital and nearby Municipal land.

However it is important to note that funding for the implementation of the plan is slow to materialize. The most recent Sanitation Master Plan for Port Vila is probably the sixth time a feasibility study has been done for Port Vila. The two urban centres rely on conventional on-site storage septic tanks for their liquid waste management. Most of these are in poor order and lack proper operation and maintenance. This continues to pose a serious threat to the coastal marine waters and freshwater resources in marine areas close to Port Vila. There has never been any detailed study on sanitation in Luganville and other provincial centres.

Major resorts are required to have on-site mini sewerage treatment plants. However, these are not monitored and breakdowns are often reported. Requiring the resorts to dispose of their treated effluent on site (e.g. sprinkling onto gardens and golf-courses) would be preferable to the present policy of discharge to sea.

There is provision for storage of septic tank effluent in Oxidation Ponds at the Bouffa Sanitary Landfill. However at times management of this facility has been questioned as wastes oils from garages and other hazardous liquid wastes are continuously being emptied into the ponds that were designated for sewage. This poor management makes the oxidation pond ineffective as chemicals disposed off in the ponds kill the biological organisms that are supposed to breakdown the sludge.

3.3 Toxic and hazardous waste disposal

The introduction of “persistent toxic substances” (PTS) into the environment and resulting effects is a major issue that gives rise to concerns at local, national, regional and global scales. Many of the substances of greatest concern are organic compounds characterized by persistence in the environment, resistance to degradation, and acute and chronic toxicity. The chemical natures of these substances causes them to accumulate in the tissues of living organisms leading to body burdens that pose potential risks of adverse health effects. There is a need for a scientifically based assessment of the nature and scale of the threats to the environment and its resources posed by persistent toxic substances that will provide guidance to the government and the communities concerning the priorities for future remedial and preventive action (Vari, 2002).

Present issues identified include:

- Chemicals used in timber treatment. While operating sites should be managed in accord with forestry guidelines, there is limited monitoring to ensure this is the case. Reports of contaminated ground from present and old treatment sites have been made, and there are concerns that these could enter the human food chain through inhalation of dust or absorption into food crops. These chemicals are also a threat to marine organisms should incorrect disposal occur.

- Potentially contaminated world war two sites on Santo and to a lesser extent Efate.
- Insecticides used many years ago for mosquito control.

Vanuatu has recently become a signatory to the POPs convention, and enabling funds have been requested that will enable Vanuatu's PTS problems to be better documented and appropriate strategic responses developed. Vanuatu Quarantine and Inspection Service (VQIS) will be the lead agency for this work.

3.4 Special wastes

Quarantine Waste

Vanuatu Quarantine and Inspection Service (VQIS) is responsible for management of quarantine wastes that are collected from ports and airports. These wastes are burned at a designated trench at the Bouffa Landfill. An incinerator at Port Vila Wharf (funded by NZODA) is no longer functioning.

Clinical Wastes

Most clinical wastes except at the Vila Central Hospital and Luganville Hospital are being dealt with using drums or open burning or indiscriminate disposal as in Lolowai. This is a serious concern, that the World Health Organisation is trying to address in a region wide project (Pakoa Rarua, Senior Environmental Health Officer, Ministry of Health, Vanuatu Representative to the Regional Healthcare Waste Workshop, Nadi, 1-5 December 2002, Pers. com). The use of incinerators as in Port Vila and Luganville Hospitals may not necessarily be suitable for other settings throughout Vanuatu given the financial investments needed and the overall skills and capacity needed for their operation and management at the community level.

Healthcare waste could be addressed by IWP as a pilot project that if proven successful could be transferred to other island communities. It should be noted that the Vila Central Hospital Incinerator continuously breaks down which means that clinical wastes need to be transferred to the designated trench at the Bouffa Landfill for burning often with minimal supervision because of ill preparation by the waste handlers e.g. for foul smell.

Industrial wastes

The industrial waste generated in Vanuatu is limited due to the small size of the industrial sector and the nature of industries that operate in Vanuatu particularly in the two urban centers. As such industrial waste generated in Vanuatu can be classified into the following broad categories:

- Solvents as from paint manufacturing and fiberglass
- Used oils or lubricants
- Used car batteries
- Antifouling paints from slipways

- Organic materials from beef and beverage production

3.5 Oil pollution

Vanuatu is also signatory to the OILPOL convention on discharges of oil from ships at sea. The requirements of the OILPOL have been incorporated into law under the Maritime regulations. However, Vanuatu has yet to ratify the international convention on non-oil marine pollution and the London Convention on hazardous goods at sea.

The National Oil Spills Contingency Plan (NATPLAN) provides the overall framework for oil spill responses throughout Vanuatu (Ms. Astrid Boulekone, Assistant Administrator/ Environment Officer, Vanuatu Maritime Authority, Pers. Com, December 2002). The plan is before the Development Committee of Officials (DCO) for endorsement and approval.

The Aim of the NATPLAN for Vanuatu is:

- To plan and provide for an appropriate response capability to prevent/minimise damage to marine and coastal environments and resources from marine pollution events.

The Objectives of NATPLAN are:

- Provide the basis of planning for marine pollution and other maritime emergencies at a National level.
- To provide the organisational structure and procedures for the coordinated, timely and effective response to maritime spills of oil and other noxious and hazardous substances.
- To provide systems for the detection and reporting of marine spills within the area covered by the plan, including communications networks.
- To outline the counter-measures available to restrict the spread of a spill and minimise the environmental, economic and social impacts of a spill.
- To facilitate the implementation of the SPREP Pollution Protocol and OPRC 90 in Vanuatu.

It should be noted that the Vanuatu Maritime Authority lacks the necessary capacity both in terms of finance and materials or equipment to implement the plan. The recent amendment of the Maritime Act could further worsen the situation.

3.6 Existing framework for Waste Management

Currently there is no agency or department with the overall responsibility for waste management. The National Waste Policy as endorsed in March 2001 has the Environment Unit as the Waste Coordinating Agency but very little has been done and there is no technical expertise within the office (Vari, M, 2000). Nonetheless a number of government and local government councils play some participatory role through the management of urban solid waste management landfills.

The Port Vila sanitary landfill that in its design stage was regarded as one of the best in the Pacific Region is now facing some serious problems. Some of the problems include incompleteness of leachate collection systems, breakdown of leachate circulation plant, lack of technical expertise and the total lack of operation and maintenance plan (Vari, M.2000). These problems contribute to the poor state of the landfill.

The Ministry of Health retains an important responsibility for many waste management activities. The Ministry acknowledges the need for minimum standards in the areas of Environmental Health: clinical waste, food, water, solid waste management, housing, pollution, and sanitation and port health (Vari M. 2000). The Ministry recognizes that there are special stresses/ problems faced by the urban environment including: collection and disposal of large quantities of rubbish, sub-standard housing, water quality, water supply not keeping up with population growth, unhygienic conditions of food for sale, industrial pollution, and lack of proper drainage system.

The Ministry of Health further recognizes that inter-sectoral collaboration is essential in the implementation of environmental health programs (Ministry of Health, 2002).

The overall goal of the national waste policy is “to prevent, protect and control the adverse effects of waste on human health, environment and the economy of the country.”

The objectives of the policy are:

- (i) To minimize and ensure proper waste management through ways that:
 - Protects the environment by reducing adverse impacts;
 - Promotes human health;
 - Facilitate socio-economic developments; and
 - Is acceptable to the people of Vanuatu.
- (ii) To increase public knowledge and understanding on Waste Minimization and Management issues to ensure their active participation in programmes and initiatives developed to achieve the above goal.

The National Waste Policy endorsed by the Council of Ministers in March of 2001 seeks to address these specific waste management issues.

- Lack of Education and Awareness of the population on waste (management) issues both at the Municipality and Provincial level;
- Lack of proper management of waste at both the Municipality and Provincial level;
- Inadequate waste minimization initiatives such as recycling, reuse and reduction programmes or activities in Vanuatu;
- Absence/Lack of a government focal coordinating agency/unit for waste issues in Vanuatu. Responsibility is often scattered and fragmented between a number of different government department/agencies;

- Lack of training and support to local authority personnel handling/ dealing with waste;
- Lack of access to proper facilities and equipment to facilitate proper storage, collection, transportation, and disposal/treatment at both Municipality and Provincial level;
- Lack of a comprehensive National Waste Management Act/Legislation and appropriate regulations to regulate waste in Vanuatu.

With respect to the IWP focal area of community waste reduction, this could be an appropriate framework from which to work as there was wide consultation throughout Vanuatu especially in the provincial centers.

3.7 Regulatory Framework for Waste Management in Vanuatu

A legislative framework addressing waste as an environmental issue is undeveloped although there are a number of pieces of legislation that have implications on solid waste management. At the national level waste management is addressed through the:

- Public Health Act No. 22 (1994) - controls disposal of waste in public places and littering;
- Environment Management and Conservation Act (2002) - provision for waste management, pollution and hazardous substances or materials such as Ozone Depleting Substances;
- Water Resources Act (2002) - provision of pollution control and protection of water catchment;
- Pesticide Registration Act (1994); and
- Draft Occupational Health and Safety Act.

A Draft Waste Management Act for the Republic of Vanuatu was prepared in 1993 in conjunction with the World Conservation Union Environmental Law Centre. It was intended that this provided a comprehensive approach to waste management. The Act has never been adopted.

Local by-laws that deal with solid waste management issues in the Municipal councils of Port Vila and Luganville include:

- Prohibition of Disposal of Litter and Rubbish By-law No.3 (1992);
- Cleaning of Premises, By-law No.5 (1992);
- Public Cleansing and Prevention of Nuisance, By-law No.1 (1994); and
- Litter By-law (1997).

All above by-laws try to address littering or illegal waste disposal in public areas or unoccupied and occupied land, and cleanliness of properties to reduce the breeding sites

of vectors. They have a maximum penalty and offence of vt20, 000 and/or imprisonment of 6-12 months. There is negligible enforcement of these by-laws.

3.8 Vulnerabilities, weaknesses and problems

One of the major weaknesses in the waste sector relates to the distribution of components of waste management activities between the Health Department, Public Works, Environment Unit and Municipal Councils. However, none of these agencies take a coordinating responsibility and so work tends to be fragmented and poorly coordinated. Although the Environment Unit was endorsed as National waste Coordinating Agency through the Waste Policy, this function is not being performed.

Secondly very little is known about waste generated outside Port Vila, and this is a real obstacle to creating appropriate waste management and minimization plans. For instance during consultations in year 2000 several provinces expressed concern about waste management at the Provincial Headquarters, and the need to create sanitary landfills. However they lack capacity to select suitable sites, negotiate with landholders and to dispose of rubbish in any other than the most rudimentary ways. There has been very little change in this situation over the past 3 years. Waste disposal outside of Port Vila and Luganville remains problematic.

Thirdly sanitation in the Black Sands area on the outskirts of Port Vila is very poor. Most people do not have access to a safe and potable water supply, rely on pit latrines, rely on rainwater and dispose of waste indiscriminately into the river.

The management of wastes from Vila Central Hospital, including liquid wastes, sewerage, and clinical wastes has been a long-standing concern too. IWP could potentially work closely with the Health Department to help move the hospital toward best practice, and from this build capacity of other hospitals throughout the islands. There is extremely limited capacity for clinical waste management at Provincial hospitals.

Most people in the two urban areas are aware that waste is a problem, but have not moved to change their waste management and disposal practices. There is a need to better understand how to motivate change in behaviour, not just create awareness, and put in place the infrastructure and legislation that would enable people to move to better waste management practices.

There is inadequate environmental monitoring especially of leachates, at the Port Vila Bouffa Landfill and other established waste disposal sites. In Bouffa Landfill the monitoring boreholes that were installed have since been destroyed and formal requests for the boreholes to be reconstructed through the government investment programme have not been successful. Similarly there is limited capacity to monitor wastes produced by industry, business houses and agriculture. Management of waste oils and petroleum products, chemical residues, chemicals used in printing and film developing and other commercial and industrial wastes needs to be improved.

Lastly, Vanuatu has very little data or information on persistent toxic substances, potentially hazardous chemical or materials, including persistent organic pollutants (POPs). These may fall under the following categories: agricultural chemical, wood preservation chemical, industrial effluents, (heavy metal residues, oil, ink acids and

alkaline, solvents, etc) and substances used in medical treatment and clinical waste, and explosives.

3.9 Opportunities

The opportunities that exist for IWP in waste management are discussed below.

- W1. An extremely detailed survey of knowledge, attitudes and practices toward waste management was undertaken as part of the Solid Waste Management and Minimisation Project (2000). This data has not been analysed. It would be very useful in informing urban waste awareness, education and management decisions. The cost of analysing this information has been estimated at only 300,000VT. Should IWP choose to address waste related issues in either of Vanuatu's urban areas analysis of this data should be a high priority.
- W2. Waste characterization studies have not been undertaken in the past decade outside of Port Vila. These are important in informing any decisions about waste management and minimisation in Luganville and the 6 Provinces. Should IWP choose to address waste management issues they will be an important first step in any work.
- W3. Removal of compostable and recyclable wastes from the waste stream of Port Vila or Luganville. Significant financial and environmental benefits through extending the life of land fill sites. Opportunities to engage the private sector in waste management and to see full cost recovery through marketing waste products.
- W4. Another opportunity for environmental protection lies in the possible strengthening of institutions with direct responsibilities for waste management. There is currently no single authority responsible for waste management in Vanuatu, with various agencies exercising limited responsibility with inadequate coordination. There is potential for the IWP to take a capacity building approach to addressing waste management at a national level, putting in place appropriate legislation, guidelines and frameworks through which different agencies can collaborate more effectively, and strengthening the capacity of both Port Vila and Luganville Municipalities to manage and minimise solid wastes.
- W5. As part of the Solid Waste Management and Minimisation project the provinces developed waste management plans. There is opportunity to work with the Provinces to begin to implement these plans and build capacity for more effective waste management.
- W6. DGMWR are currently doing a biannual Coastal Water Monitoring of the Port Vila Harbor and Luganville. Although this is not a remedial action, it is an environmental monitoring activity that would benefit from the support of land-based responses such as desludging of septic tanks along the harbor, and other regulatory activities of the Public Health Act and Municipal Bye-laws enforcement. This needs to be seen as a starting point as it identifies environmental indicators such as faecal coliforms, nutrients (nitrates and

phosphates etc) and other physical parameters in both freshwater and coastal marine environment.

W7. The NATPLAN is presently before the Council of Ministers. Strengthening the capacity of the Vanuatu Maritime Authority to implement the NATPLAN is a necessary first step to being able to prevent and contain marine and port pollution.

W8. Demonstrating best practice for management of health care wastes in urban and provincial hospitals.

4.0 Agriculture and Livestock

4.1 Introduction

About 41% of land is cultivable with good quality soils and favorable agro-climatic conditions. Vanuatu is also free from most major plant and livestock diseases and pests. This is a decided advantage for the growth of agricultural exports (ADB, 2002).

Agriculture, fisheries and forestry combined account for 23% of the GDP (ADB, 2002). Agriculture accounted for 16% of total GDP in 1999. Self-sufficiency agriculture (subsistence agriculture) made up 51% of the total contribution of agriculture to the GDP. The main agricultural commodities are mainly copra, beef, cocoa and kava. Other minor commodity exports are timber and shells.

Over 78% of Ni-Vanuatu live in rural areas and are engaged in agricultural production and are the main producers of agricultural crop commodities. Agriculture provides a large percentage of the population with their basic needs for food and shelter while sales of surplus commodities generate the cash income necessary to obtain daily essentials such as sugar, salt, matches, kerosene etc. and to pay for education and other services.

4.2 Existing framework for the agricultural sector

The agriculture sector is driven by market prices and material wants. Production patterns increase substantially when a commodity price increases. This trend has been witnessed since the inception of commercial plantings from cotton production to coffee production and copra production the early 1900s to cocoa, spice production in 1980s and kava production in the late 1990s. When commodity price increases, farming communities would like to get the maximum production to get maximum income thus putting new land areas under production. This was experienced between 1998- 2000 when kava prices were high. On Pentecost, land put under kava was increased to a level where production of the normal staple crop of taro declined.

4.2.1 Corporate plans and strategies

The government through the Department of Agriculture and the Vanuatu Quarantine and Inspection Services acknowledges the need for an efficient and effective Extension Services to provide farming communities with the following:

- An increase in rural income;
- Enhanced food security through improved and sustainable cropping and animal husbandry systems with particular emphasis to areas with high population pressure, soil degradation and other factors;
- Opportunity for research and development through the consultative research between the researcher and farmers in setting research priorities into identification of improved planting materials and the need for the diversification of income sources;

- To protect Vanuatu from the introduction of animal and plant diseases through developing import protocols;
- To enhance market access for Vanuatu agricultural products through a better developed surveillance system to define the health status of Vanuatu's animals and plants;
- To have in place a quality systems for inspection services etc; and
- To safeguard public health by inspection of food at food production, processing and retailing premises to ensure compliance with relevant legislation (Ministry of Agriculture, Livestock, Forestry and Fisheries Corporate Plan (2001)).

4.2.2 Legislation and regulations

Important legislation and regulations that are in place are:

- The Constitution which favors Ni-Vanuatu to own land on traditional guidance, gives provision of land use by foreigners and the acquisition of land by the Government for the purpose of public interest;
- Land Lease Act of 1984, which regulates the land use by outsiders;
- Pesticides Act of 1994, which regulates the registration and use of pesticides.

4.3 Vulnerabilities, weaknesses and problems

Coconut plantations for copra production are important, but they have taken up virtually all the arable land found along the coasts and flood plains and are increasing taking up plateau areas as well as hillsides. Though quite important, economically, environmentally this is unfriendly. It has reduced the diversity of species in coastal areas. It is a common belief among rural communities that food crops cannot be grown under coconuts. For this reason, new areas are cleared annually for food production as well as for growing other cash crops such as kava, cocoa and other crops species. Thus there is an increased conversion of natural habitats to agricultural uses (both subsistence and commercial).

Commercial livestock production is likely to continue to be dominated by foreign investors as Ni-Vanuatu lack management skills, lack the capital start up necessary for mass production and because the land tenure system favors full family consensus on land use. Lease agreement is much more favorable.

Vanuatu's dependence on a few commodity exports renders the country highly vulnerable to shifts in world commodity prices.

Table 5 Priority environment issues identified by the NBSAP for the Agriculture sector by Provinces (1999)

Province	Problems
TORBA	Expansion of commercial agricultural activities such as coconut, cattle, pepper and kava plantations that cause increasing conversion of forest to agricultural land.
SANMA	Expansion of commercial agricultural activities such as coconut, cattle, pepper and kava plantations that cause increasing conversion of forest to agricultural land.
MALAMPA	Clearing of bush for subsistence and commercial agriculture. Expansion of commercial agricultural activities such as coconut, cattle, pepper and kava plantations that cause increasing conversion of forest to agricultural land. Impact of soil erosion on Paama. Impacts of introduced species including African Snails.
SHEFA	Clearing of primary forests for subsistence and commercial agriculture or by logging. Expansion of commercial agricultural activities such as coconut, cattle, pepper and kava plantations that cause increasing conversion of forest to agricultural land. Impacts of unfenced or escaped domesticated cattle and pigs. Use of riparian areas for gardening and grazing.
TAFEA	Impacts of introduced species including elephant grass (<i>Panicum purpureum</i>) and agriculture rope (<i>Glycine sp.</i>). Use of riparian areas for gardening and grazing. Expansion of commercial agricultural activities such as coconut, cattle, pepper and kava plantations that cause increasing conversion of forest to agricultural land. Impact of soil erosion on denuded areas of Aneityum.

Nimoho et al. (1998) while carrying out a survey on freshwater biodiversity on Epi in the vicinity of the Petaview stream and the swampy lakes found that expansion of cattle and coconut plantations may pose potential threats on the natural forest. They went on to say that continual animal waste droppings would encourage high growth of green algae that will increase water turbidity. This algae formation is quite apparent in the Jordan river on Santo and Mbule river on Pentecost where these rivers pass through tracts of cattle grazing land.

Malosu and Bule (2002) supported this when they noted that poor management of domesticated animals such as cattle cause these animals to break fences and escape in pursuit of richer pastures or water. In the water catchments areas of Tanna, it was observed that stock muddy water, and can foul and pollute streams to the extent where it is unfit for human use and unable to support some freshwater plants and animals.

4.4 Opportunities

A number of opportunities in this sector are discussed below.

- A1. There is a need to identify through research the best farming alternatives for both subsistence and commercial production that cater for sustainable farming without the need for clearing new areas that displace natural resources. Where relevant information is already available, then its dissemination to rural communities and the commercial sector should be given a high priority by the Agriculture Department. Establishment of demonstration plots would be recommended to show the benefits of planting crops under coconuts using improved methods.
- A2. Secondly there is a need to establish guidelines or laws for subsistence and commercial agricultural production to ensure that water catchments are not disturbed through land clearance or conversion. While the Department of Forests has had the Code of Logging Practices (COLP) enacted, the Agriculture Department has not gone ahead to legalize the land clearing criteria that were identified under the Livestock Pasture Improvement Project, which give very concise instructions on bush clearance for agricultural production. This inconsistency becomes a problem especially when loggers are restricted from logging certain areas such as along river creeks, but garden clearing can take place quite legally.
- A3. Fauna laws controlling harvesting needs to be revisited to ensure that there is a mechanism in place for the monitoring of harvests that are for home consumption. It has been commented that home consumption has impacted on juveniles of many species, for example the coconut crab, where commercial harvesting would be illegal.
- A4. There also is a need to revise the land Lease Act to enable Ni-Vanuatu to have favorable land leases, which are not too expensive for the purpose of commercial production. Land area should be flexible to cater for applicants' technical, experience and capability to manage commercial livestock farming. With the current law administrative costs are high because they are based on how much land is involved. Amendment might enable more indigenous Ni-Vanuatu to increase their participation in commercial production including livestock production that is currently dominated by foreign investors and naturalized citizens. Finally more emphasis should be given for capacity building on commercial production especially livestock production. Better management of livestock including fencing and pastures ensure that cattle have sufficient food and water and reduces the need to break fences.

5.0 Forests

The National Forestry Inventory took place in 1993 to identify the forest resources of Vanuatu and the results are summarized in Table 6 below. This information has not been updated and changes are likely to have occurred as a result of gardening, agriculture and forestry activities.

Table 6: Vegetation Cover of Vanuatu

Vegetation type	Area	% Of land area
Mid height (20 –30 m)	205,307	16.73
Low forest (10-20 m)	234,089	19.08
Woodland (less than 10m)	386	0.03
Thickets (3-8m)	433,941	35.37
Scrub (less than 3m)	45,018	3.67
Grassland	51,128	0.04
Swamp communities	2,261	0.18
Mangroves	2,261	0.21
Bare ground/ man made	252,256	20.56
Total land area	1,226,905	100

Source: Vanuatu National Resource Inventory System (VANRIS, 1993)

5.1 Forest Use

5.1.1 Subsistence use

Rural communities have been using their forests from time immemorial to obtain food, fuel wood, building materials, medicinal treatment remedies and cultural materials. The forest was often part of the power of the traditional chiefs. On Pentecost, for example, one criteria for identifying a high ranking paramount chief was his knowledge of forest resources and their uses and how best these resources can be used to accumulate power to himself (including the power to communicate with the spirits in the forest to forecast events, cast spells and cure all kinds of diseases etc.).

5.1.2 Logging

Some 36% of the total land area of Vanuatu is forested. However, only 20% of forest is commercially available due to steep slopes, dissected landforms, poor quality timber, low saw log volumes and cultural reasons. Even so commercial forestry remains economically important for the country. It contributes to 13% of total merchandise exports earnings (ADB, 2002)

Logging using heavy machinery is mainly taking place on Santo and Efate where infrastructure is comparatively well developed compared with the other islands in the country. Some logging is also taking place on Malakula, Pentecost and Erromango. This type of logging is capable of indiscriminate destruction of forest with other negative

impacts such as soil erosion, river pollutions and general water catchments degradations. The COLP is a legally enforceable mechanism to prevent such impact.

The use of portable sawmill is increasing. Even with this technology it is important to ensure that the forest is sustainably logged and minimize the negative impacts of logging.

Forestry Department has set the annual sustainable yields for various islands as shown in Table 7.

Table 7: Sustainable Yield of Timber by Islands and Maximum Annual Cuts for Mobile Mills in cubic meters per year.

Island	Sustainable yield in cubic meter per year	Max. Annual cuts for mobile mills in cubic meters per year
Banks/Torres	9,700	1,500
Santo/Malo	30,000	5,000
Ambae/ Maewo	3,500	1,700
Pentecost	1,800	1,800
Malekula	6,500	1,500
Ambrym	1,000	1,000
Epi	1,000	1,000
Efate	6,500	1,500
Tanna/Aneityum	2,000	2,000
Erromango	6,000	2,000
Vanuatu	68,000	19,000

Source: Department of Forests: National Forest Policy Statement (1997).

5.1.3 Plantations

Due to the recognition of failures to regenerate forest on land that has been logged or otherwise cleared, 2002 was made the Year of Forest Planting. However, the impact of this initiative will only be known in the next few decades.

From the late 1970s to present, the Department of Forests, in an attempt to increase the timber quality of the forests had established the local supply plantations on the islands of Vanua Lava, Santo, Malakula, Ambae, Maewo, Pentecost and Efate. A total of 11,160 hectares were planted with the main tree species used being Cordia (*Cordia alliodora*). Cordia was introduced from South America and was thought to have good market potential. This has not been the case. The species is quite vulnerable to cyclone damage and fungus attacks, and has low market value. Over time it has shown a negative environment impact that was not initially known to foresters or the rural communities. The remaining plantations have become invasive thickets. Cordia regenerates very

quickly and competes effectively for space, water and light, and spreads easily into adjacent areas cleared for gardens and agricultural plantations. The microclimate in these plantations is becoming drier, which will further displace both the plant and animal species that existed.

Other plantations established include:

- Aneityum Pine Plantation with 890 hectares;
- Ipota Industrial Plantation with 260 hectares;
- Santo Industrial Forest Plantation and Research with 350 hectares;
- Melcoffee white wood plantation with 250 hectares.

5.2 National Forest policy

The objectives of the Department of Forest Policy statements of 1997 are outlined below:

1 Forest management

- Manage the nation's resources sustainably as a renewable asset.
- Identify forest land best suited for timber production, conservation and conversion.
- Improve the knowledge of timber resources and other values.
- Utilize natural forest in a manner which causes the least disturbance to the environment and conserves ecosystems.
- Improve the management of sandalwood and encourage the development of sandalwood industries.

2. Environment and conservation

- Protect and conserve biological, germ-plasm, cultural, historical and other NTF values for the current and future generations.
- Establish and manage conservation areas with landowners' participation.
- Identify potential environmental impacts before new licenses are issued.
- Encourage communities to minimize soil erosion and to rehabilitate existing eroded areas.
- Conserve mangrove ecosystems and restrict any non sustainable uses of them.

3. Landowner and communities

- Improve knowledge and awareness of environment values and sustainable forest management.
- Encourage the recording of indigenous knowledge of forest resources.
- Encourage increased Ni-Vanuatu participation in the forestry sector.

- Foster rural development and self reliance through community forestry.
- Protect the rights of landowners regarding the use and protection of their forest resources.

4. Forest Industries

- Increase timber processing to meet local demands and to increase value added processing.
- Utilize the nation's forest resources to provide economic and employment growth.
- Develop efficient and internationally competitive forest industries.
- Increase employment opportunities and develop highly skilled Ni-Vanuatu work force for the forestry sector.
- Expand export capacity for value added timber products.
- Control and support the development of mobile saw mill.

5. Forestation and the Extension Activities

- Promote private sector led establishment of plantations of commercial timber species.
- Establish at least 20,000 hectares of commercial plantations to give a sustainable yield of 160,000 cubic meters of timber per year.
- Utilize local supply plantations with the assistance of local communities or return land to landowners.
- Promote the development of agro-forestry systems.
- Promote advice and awareness to landowners about the importance and uses of trees.

6. Forest Administration

- Establish effective laws for sustainable management of forests and the development of forest sector.
- Strengthen the Department of Forest to ensure that forestry administration is efficiently carried out.
- Establish mechanisms to provide sound advice to government on forest policy.

(Department of Forests: National Forest Policy Statement (1997).)

It is interesting to note that the Department of Forests does not have a specific objective relating to the regeneration of natural forests.

5.3 Legislation and regulations

An important legislation currently in use is the Code of Logging Practices Act (1998). Though COLP has been in place for some years, it has had a phased introduction. The Department of Forest initially focused on raising awareness about the law and training of sawmill and logging operators in the correct methods of logging, milling, putting in roads and other areas to ensure least damage to the resource species and the ecosystems. The Act comes into full effect in 2003.

Additionally the Forestry Act (1982) places the political and regulatory responsibility with the Minister for Agriculture, Forestry and Fisheries. The Act governs the harvesting of logs for any purpose, under license, relations with custom owners, environmental damage including pollution, reforestations charges, royalty payments, annual reporting of logging operations and work plans for the subsequent year of operation. One of the other provisions of the Act is the establishment of Local Supply Stations whereby local farmers are encouraged to afforest their land through a complex system of Forest Plantations Agreements.

The New Forestry Law funded by FAO in 2000 though yet to be submitted to Parliament has the features shown in Table 8 below.

Table 8: Features of the Draft Forestry Law

Main feature	Aim
New Forestry Lease	Set up a new forestry lease system to encourage reforestation
Financial Impact	Increase government revenue through higher forest management charges
Reforestation Incentives	Provides forest management charges rebates for firms establishing plantations of regenerating natural forest
New Forestry Board	Establish a new Forestry Board including national and local government representatives to approve Timber Rights Agreements between logging companies and landowners
Forest Sector Plan	Set out a clear new system for planning in the forest sector
Broader Range	Cover a broad range of issue than the previous Forestry Act
Better system	Assist developers through system for reducing disputes between landowners and developers
Special Licenses	Provide special licenses for the sale of non-wood forest products such as seeds, oils, tam-tam, etc
Exports of plant material	Establish controls on exports of planting materials to protect ni-Vanuatu intellectual property rights
Site protection	Enhance environmental and cultural site protection

Source: ADB (2002 Vanuatu: Agriculture and Fisheries Sector Review 2000. Pacific Studies Series. ADB, Manila, Philippines.

5.4 Vulnerabilities, weaknesses and problems

According to the Environment Unit (1989) logging for commercial timbers and agricultural production have had huge impacts on the environment. They have:

- Opened up areas allowing entry of invasive pests;
- Compacted soil surfaces;
- Changes species diversity; and
- Opened up areas vulnerable to soil erosion, sedimentated rivers and reefs

However, due to COLP controls on impacts and the fact that commercial timber is becoming scarce, few large millers are currently in operation. Many have scaled down. For example, the one on Pentecost has pulled out and Efate's operation level has dropped and the level of income from forestry activities has dropped (William Bani, Principal Forest Utilisation Officer, Pers. Com, January 2003). There is a need to look at alternative sustainable source of income and tap on them even before logging can be advised.

Cordia alliodora that was previously encouraged as a timber species is now considered an invasive pest due to its fast re-growth displaces natural biodiversity.

The COLP has been slow in its implementation, not so much due to the incapacity of the staff of the Department, but due to the fact that loggers are ignorant of the requirements set by the law. They are being trained. It is now a requirement that licenses are only permitted after such training. Due to limited budget constraints it seems to be that monitoring of the COLP is done largely through sieving through questionnaires on logging that had been done sometime ago. That is, the staff seems to rely on forms that had been dished out. Though, there is no proof, some loggers may record something to please the Department, but act differently.

The level of soil exposure due to logging is at this stage minimum (Environment Unit, 1989), however, land conversion activities have had impacts on soil erosion for example coral bleaching around the Hide Away Island Resort caused by soils and debris deposited on the reef by the Mele River. This is an issue that the IWP is recommended to consider especially where there is high land conversion taking place.

Table 9 below summarizes priority environment management issues identified by the NBSAP for the Forestry sector by Provinces in 1999.

Table 9: Environment management issues for the Forestry sector.

Province	Problems
TORBA	<ul style="list-style-type: none">• Cordia plantation on West Vanua Lava dominates native plant species
SANMA	<ul style="list-style-type: none">• Impacts of logging on natural ecosystems and wild life
PENAMA	<ul style="list-style-type: none">• Cordia plantations on Pentecost, Maewo and Ambae
MALAMPA	<ul style="list-style-type: none">• Establishment of commercial timber plantations (Cordia)
SHEFA	<ul style="list-style-type: none">• Clearing of primary forests during logging operations• Impacts of logging on wildlife and the forest ecosystem
TAFEA	<ul style="list-style-type: none">• Impacts of introduced species including cordia on biodiversity

5.5 Opportunities

There are numerous opportunities for the forestry sector, although many will be addressed in the newly drafted Forestry Act. This Act will greatly strengthen the capacity of the resource users and managers with respect to logging practices throughout Vanuatu.

1. There is opportunity for an independent report in collaboration with the Department of Forests to determine the extent of the impact Cordia is having on local resource species. This assessment should also attempt to determine what actions could be taken to address Cordia as it is currently reducing the species richness of areas affected.
2. The Agriculture Department needs to develop, enact and promote appropriate land practice criteria or a code of practice for subsistence resource use perhaps similar to those previously developed under the Vanuatu Livestock Pasture Improvement Project so that there is more consistent management of the environment and reduced impacts on freshwater and coastal marine environments.
3. Appropriate research should be taken to determine the impacts of high forest conversion rates so that appropriate measures could be taken to alleviate or manage these activities.
4. The Forestry Department needs to work closely with local communities so that they could be responsible for monitoring logging operations in their village areas.

6.0 Biodiversity Conservation

6.1 Vanuatu's biodiversity

According to the Vanuatu National Conservation Strategy (Environment Unit, 1993) Vanuatu's islands are young in geological terms, small and highly disturbed as a result of cyclone, seismic and volcanic activity. As a direct result of that the biodiversity found in Vanuatu is less rich than that found in the neighboring countries of New Caledonia and Solomon Islands.

However, work undertaken under the National Biodiversity Strategy Action Plan project (NBSAP) (Environment Unit, 1999) proves that the biodiversity in Vanuatu is more valuable than previously estimated and is important in the following ways:

- In situ genetic conservation of agriculture crops, fruits and nut species;
- Because of the dependence on locally cultivated and wild and biological resources by rural communities for food, firewood, medicine, construction materials, fodder for domestic animals etc;
- Because of the restricted range of many species and significant level of endemism;
- Because of the use of cultivated and wild biological resources for commercial purposes;
- Because of the local customary importance of particular species and places;
- Because outsiders will pay to see it as tourists;
- For environmental maintenance services; e.g. trees reducing erosion and increasing water infiltration.

The NBSAP project has also recorded threats that are impacting upon the status of terrestrial biodiversity in Vanuatu through:

- Over-exploitation of many plants and animal resources causing a decline in the abundance and distribution of many species;
- Degradation of ecosystems due to development practices;
- Declining respect for traditional resource management systems and authority structure; and
- Invasive species.

With respect to freshwater biodiversity the NBSAP (Environment Unit, 1999) assessment of freshwater ecosystems in Vanuatu noted that although information is very limited, the biodiversity of freshwater is of high social and economic importance on several islands (e.g. Aneityum and Erromango) while freshwater is scarce on others. Some islands have relatively healthy freshwater resources such as on the interior of Aneityum and Erromango.

According to NBSAP (Environment Unit, 1999) freshwater habitats have been degraded and diversity is much reduced as a result of the following:

- Clearing of vegetation and agricultural activities in the riparian zone;
- Failure to manage use of key catchment areas such as springs and headwaters of rivers;
- The clearing and subsequent heavy use of land within catchments for commercial or subsistence agriculture, leading to decline in water quality and reduced dry season water flows;
- Over extraction of water, primarily for taro irrigation;
- Wild and domestic fouling of rivers, streams and springs;
- The impact of introduced species, and Tilapia and Gampusia in particular, on the distribution and abundance of native fauna.

As far as coastal and marine biodiversity is concerned the NBSAP project identified over-harvesting of resources as the key management issue around population centers, although there are areas and islands with relatively little human impact. This is mainly because of the following:

- Introduction of new technologies such as finer fishing nets and night time spear fishing;
- Increased population in coastal areas creating additional demand or pressure for marine resources;
- Declining respect for traditional resource management systems and authority structures; and
- Disregard for the resource conservation control brought under the fisheries legislation.

References by Tapisuwe suggest that over a fifty year period natural resources have declined from a once abundant state to quite a scarce level, almost to the extent of local extinction of some species of commercial and home consumption values (Tapisuwe et al. (1998) and Tapisuwe (2001-2002). The major contributing factors to this decline in abundance of these natural resources are:

- Increased population in coastal areas of Vanuatu;
- Negative attitudes towards wild life;
- Improved technology/method of production or harvesting;
- Increased commercial economic activity in coastal areas (forestry, fishing, agriculture, tourism, mining etc) activity;

- Increased perceived wants of material goods; and
- Lack of industries and businesses that promote sustainable natural resource management.

6.2 Types of conservation initiatives

Documentation about traditional resource management systems in Vanuatu is quite fragmented and limited. Three studies on traditional resource management systems that were carried out by Naupa (2001) on Gaua, Santo, and Tanna (Tapisuwe and Ngari, 1998; and Tapisuwe, 2002) on Pentecost and elsewhere in Vanuatu identified the traditional resource management systems listed in Table 9.

From studies made by Tapisuwe (2001) on conservation areas, traditional resource management systems for conservation makes up approximately 97% of all conservation areas in Vanuatu.

The other types of resource management tools currently in use are:

- Lease hold agreements e.g. Erromango Kauri Reserve;
- Legal backing such as the use of lawyers e.g. Aneityum, the restriction on harvesting species and Code of Logging Practices Act; and
- Financial backing by international communities e.g. Vathe and Loru Protected Area.

Tapisuwe (2002) noted that the main initiators of conservation areas are:

- Entire communities as part of customary practices;
- An executive committee of a community;
- Communities or individuals who may need to emphasize their land rights;
- Government and NGOs who sees the need to conserve endemic, rare, endangered and vulnerable species;
- External friends and institutions who have a direct interest to conserve an area with specific resource species;
- A chief whose endorsement carries more weight in the affected communities.

Table 10: Traditional Resource Management Systems in Vanuatu

TRM Purpose	Who establishes it	Resources affected	Methods used/Marker leaves
Tabu area following rank taking ceremonies	Chief taking the rank ceremonies	Certain flora and fauna of high value	Placed around the boundary of the restricted area
Family clans	Family clans	Resources believed by clans to be their origin	Restricted from total consumption
Conservation area	High ranking chiefs	Certain flora and fauna of high value	Fauna killed and leaves placed around the area
Ensure fruits have sufficient time to ripen or to deter someone using a resource e.g. bambu	Chiefs and or individuals depending on value of resources used	Certain flora and fauna of high value	Leaves tied to fruit trees or the restricted resource
In memory of a chief's death	High ranking chief	Certain flora and fauna of high value	Fauna killed and leaves placed around the area
Kinship access to certain land areas	Family land holding groups	Decision taken by the group	Declaration to the public
Males may not eat female animals	Tradition belief passed from generation to generation	Traditional belief	Traditional restriction
Females may not eat certain plants and animals during pregnancies and menstruations	Traditional belief passed from generation to generation	Traditional belief	Restricted consumption of the said resource species
Exclusive access rights	Sorcerers	Sorcerers declaration	Traditional rights
Sacred areas good for certain activities e.g. area good for food production	Chiefs emphasizing the importance	Traditional belief	Traditional belief
Magical stones with special powers for good food production harvests	Stone owners	Special stones	Traditional belief
Specified resource use by chiefly ranks who have bought the access rights	Chief having the access rights sells the right to another chief during rank taking ceremonies	Certain flora and fauna of high value	Traditional practice

Tapisuwe (2002) identified the reasons for communities to establish non traditional conservation areas as:

- Due to depleting resources;
- Having the interest to maintain wild life;
- Need to control indiscriminant destruction of resources;
- Need to maintain traditional management practices;
- Need for the generation of income through ecotourism;
- Need to retain land rights formerly under dispute or alienation;
- Conservation of resources believed to have traditional ties with families;
- Ensuring the maintenance of well being;
- Establishing a center for environment studies and research.

Tapisuwe et al. (1998) while gathering information for a Vanuatu Benefit Generating Activities and Sustainable Use Directory on Santo, Malakula, Tanna and Efate, identified that there is limited knowledge of all but a few commercial flora and fauna species. Therefore authorities cannot guide communities towards sustainable harvesting systems or advise them on the sustainable management of the most heavily used or displaced species such as ferns and bread fruit trees on Ambrym.

6.3 National Biodiversity Conservation Strategy

The mission statement for the NBSAP sets out the national goals for biodiversity conservation in Vanuatu. These are:

- To manage and safeguard biological resources through government, provinces and local communities so as to maintain fully our natural and cultural heritage for ni-Vanuatu;
- Guide government, provinces local communities and landowners to sustainable management of Vanuatu's natural resources;
- Ensure that all ni-Vanuatu, including future generations are able to benefit from biodiversity and enjoy its use; and
- Protect the custom, intellectual and legal rights of ni-Vanuatu as resource custodians and users.

The NBSAP was adopted by the Council of Ministers in 2001 and remains the main policy for biodiversity conservation.

6.4 Legislation and regulations

Specific legislations for biodiversity conservation include the Fisheries Act (discussed in chapter 8), the Environment Management and Conservation Act (2002) and the Wild Bird Protection Regulation (1962).

The principal purpose of the newly enacted Environment Management and Conservation Act (EMC) (2002) is to provide for sustainable development in Vanuatu through sound environmental planning and management and the conservation, protection and environmentally sound management of all natural resources. Specifically, the legislation is intended to create a comprehensive legal and institutional framework for environmental impact assessment; disaster contingency planning; pollution control and waste management; the management of dangerous and hazardous substances; the management of natural resources and biodiversity conservation.

The Wild Bird Protection regulation (1962) makes it unlawful to kill, capture, wound, or take eggs of certain species of bird unless the Director of Agriculture, grants a permit to do so. The regulation also imposes closed seasons and ban limits for 11 bird species including the black duck and Megapode which maybe subject to additional regulations prohibiting the hunting of these species on certain islands “ to allow them to re-establish their populations.”

6.5 Vulnerabilities, weaknesses and problems

The major vulnerabilities, weakness and problems facing biodiversity conservation as outlined by Tapisuwe (2002) are as follows:

1. Effects of invasive pests:
 - Decreased dominance of native species;
 - Decreased overall species richness of native plants;
 - Decreased plants and animals that depend on lost species;
 - Fewer vertical tiers of plants (canopy, sub-canopy, etc);
 - Changes to processes such as water table levels, fire regimes, soil quality and nutrient cycling;
 - Decreased productivity;
 - Causing increased turbidity levels in lakes (Tilapia); and
 - Fresh water muddied, fouled, polluted and made unfit for human use and unable to support some freshwater plants and animals.
2. Types of biodiversity conservation initiated not meeting the needs of communities:
 - Benefits are not spread equally between the stakeholders;
 - Limited opportunities to meet perceived needs and wants;

- Lack information about alternative income opportunities; and
- Unsuitability of some income generating activities.

3. Commercial production factors

- Unequally distributed land resources causing declining fallow and greater pressure on resource use;
- There has not been any attempt to require commercial and subsistence activities to be conducted in an environmentally responsible manner;
- No control on use or management of chemical, hazardous substances or pollutants; and
- No laboratory capacity is available to conduct analysis of environmental impacts.

4. Activities that threaten forests

Bule, et al. (2002) during a consultation workshop and participatory vegetation mapping on Tanna noted that the following are threatening the forests:

- Bush fires intentionally fired on grassland areas and spreading into forests;
- Deliberate cutting down of trees without any reasons;
- Clearing of forest for planting of *Dioscorea alata*; and
- Animals especially cattle, goats and pigs grazing into existing forest.

5. Unplanned Land Use Initiatives

Often, the extension services of the Departments of Agriculture, Forestry and Fisheries give only the positive sides of programs that are project funded to ensure that these programs are carried out so that targets could be met and so that funding can be continued. The classical examples are:

- The planting of *Cordia* in the late 1970s that is now becoming a pest;
- The introduction of the *Egalandina* snails as predators of the Giant African Snails that in Tahiti have been responsible for the extinction of local snails (Tapisuwe, 2001).

Land use in the form of agricultural and forestry activities are unplanned. There is no effort to assist landowners and rural communities to make wise and viable decisions on how best they could use their land to ensure that there is a balanced growth between the social, economic and environmental development and optional land use. Communities are sometimes encouraged to undertake unsustainable agricultural practices in an effort to earn money quickly and foregoing the benefits of traditional agriculture.

6.6 Other factors:

There is no effective legislation for the control of subsistence production compared to commercial production as in logging. As such there is inconsistency in the legal and practical management of subsistence and commercial resource use. The ineffective monitoring of legislations covering natural resources due to limited personnel and funds and lack of cooperation between government agencies and between government agencies and non-government organizations should also be noted.

Table 11 summarizes priority environment management issues identified by the NBSAP for the Biodiversity sector by Provinces in 1999.

6.7 Opportunities

Opportunities in the biodiversity sector are briefly discussed below.

- B1. Many opportunities for better biodiversity management rest with the newly enacted Environment Management and Conservation Act (2002). There needs to be an effective monitoring mechanism put in place to effectively monitor natural resource harvesting and management. Rural communities are responsible for much resource harvesting; therefore, they must be involved in the monitoring process. The capacity in monitoring must be an important part of the process through a capacity building component of the activity.
- B2. Educate people to respect their environment through wide awareness programs such as through radio programs and the Wan Smol Bag Theatre (WSBT) and others established through the work of WSBT in consultation with the existing Conservation Areas established by rural communities.
- B3. Effective legislation against subsistence production and harvesting to ensure that resources are better managed. For example the agricultural land clearing that was made by the Pasture Improvement Project gives some guidelines to land clearing that could be applied both at subsistence and commercial production;
- B4. Assist landowners to make decisions that will cater for their needs, but does not directly affect natural species through encouraging locally appropriate natural resource management practices. Landowners need to be given effective advice including the pros and cons of income generation activities available so that the best utilization of resources including land and labor could be better utilized.
- B5. Actively promote value added products especially in non -timber forest products such as bamboo and rattan furniture making, jewelry and tourism activities. Similar activities could also be considered for marine and freshwater resources.

Table 11: Priority Biodiversity Management Issues by Provinces

Province	Problems
TORBA	<p>Increased pressure on natural resources as a result of increased human population.</p> <p>Failure to respect size limits, closed seasons and traditional tabus set to ensure resource use is sustainable.</p> <p>Lack of community cooperation to address environment management issues.</p> <p>Disrespect for local community leaders and their resource management decisions.</p> <p>Over-exploitation of resources due to the need for cash income.</p> <p>Deliberate lighting of bush fires with no valid reason.</p>
PENAMA	<p>Disrespect for local community leaders and their resource management decisions.</p> <p>Deliberate lighting of bush fires with no valid reason.</p> <p>Increased pressure on natural resources as a result of increased human population.</p> <p>Lack of technical knowledge about local environment and species.</p> <p>Children using sling shots to shoot birds and other wild life as sport.</p> <p>Environmental impacts of infrastructure development activities.</p> <p>Loss of habitat for wild life especially banyan trees.</p> <p>New techniques for harvesting flying foxes and birds.</p>
SANMA	<p>Disrespect for local community leaders and their resource management decisions.</p>
MALAMPA	<p>Shortage of water during dry seasons.</p> <p>Deliberate lighting of bush fires with no valid reason.</p> <p>Disrespect for local community leaders and their resource management decisions.</p> <p>Increased pressure on natural resources as a result of increased human population.</p> <p>Impacts of volcanic ash on natural vegetation associated with wild life on Ambrym.</p>
SHEFA	<p>Depletion of marine resources through indiscriminate use of newer fishing methods.</p> <p>Shortage of water during dry seasons.</p> <p>Increased pressure on natural resources as a result of increased human population.</p> <p>Deliberate lighting of bush fires with no valid reason.</p> <p>Disrespect for local community leaders and their resource management decisions.</p> <p>Impacts of feral animal such as cattle and pigs.</p>
TAFEA	<p>Deliberate lighting of bush fires with no valid reason.</p> <p>Shortage of water during extended dry seasons and decrease in ambient flows of rivers.</p> <p>Increased pressure on natural resources as a result of increased human population.</p> <p>Disrespect for local community leaders and their resource management decisions.</p> <p>Over-exploitation of resources due to the need for cash income.</p>

7.0 Water Resources Sector

In Vanuatu, both ground, surface and rainwater resources are utilized for domestic purposes. In urban areas, the main water resource is ground water whereas in rural areas various sources such as wells, springs, rivers and rainwater are used depending on which is readily available.

Most rural water supply systems are quite poor or do not exist. According to DGMWR (Richard MacEwen, Water Resources Advisor, Pers.Com, December 2002) an estimated 45% of ni-Vanuatu population in the rural areas are still without a potable water supply system. Often where systems are available there are often insufficient to meet some demands such as during droughts or prolonged period of dry season and subjected to bacterial contamination during wet the season.

7.1 Existing framework for Water Resource Management

The overall responsibilities for water resources management rest with the DGMWR under the Ministry of Lands and Natural Resources. There are approximately six programme areas within DGMWR as follows:

1. Corporate services
2. Minerals
3. Water Resource Assessment
4. Bore hole Drilling
5. Geo-hazard Mitigation and
6. Rural Water Supply.

The newly enacted Water Resources Act (2002)³ gives the Director of the DGMWR overall power to establish groundwater protection zones among other powers vested by the Act.

The rural water supply section (RWS) aims to increase rural water supply coverage in the rural population to ensure that communities have access to safe, potable water. It also emphasizes the need to involve communities in the early stage of project development of each water supply systems so as to foster a sense of ownership for the overall operation and maintenance of the system.

7.1.1 Corporate plans

The mission of the DGMWR is to develop and manage the nations' non-living natural resources, mitigate against potential impacts of geo-hazards (e.g. Volcanoes, earthquake, and sea-level rise), plan for safe environmental management of urban harbours and lagoons, as well as being responsible for the provision of water and geo-technical

³ The Water Resources Act was passed by Parliament in 2002 and has been signed by the President. However it will not come into effect until the next issue of the Government Gazette.

investigations for the social and economic well being of the people of Vanuatu (DGMWR, 2000).

7.1.2 Legislation and Regulations

With respect to legislation, the key laws relating to the water sector are the Water Resources Act and the Public Health Act.

The Water Resources Act (2002) defines the following aspects:

- The rights and general rules in respect to the utilization and prevention of water resources;
- Administrative aspects and the formation of a National Water Resources Advisory Committee;
- Water resources planning, management and development plans, designation of water protection zones;
- Access over adjoining lands;
- Water utilities (formation of water utility board to facilitate the management, control and regulation of water utilities involved in water supply services); and
- Water quality guidelines and criteria;

The Public Health Act No. 22 (1994) and Commencement Order No.10 (1995) the Ministry of Health but has just recently been gazette and enforced. With respect to the water sector there is a chapter for “ the Provision and Protection of water Supply.” Other aspects relating to the water sector as defined by the Act are as follows:

- The administrative powers of the Minister (of Health) of supervision and inspection over local authorities in all matters relating to maintenance and promotion of public health;
- Obligation of provision of proper and sufficient supply of wholesome water to all buildings and premises within the Municipal Council area and all inhabitants of the rural area within local government council;
- Powers of Environmental Health Officers to enter any premises and land at all times for the purpose of water sampling for examination of the source of water supply, and to inspect the appropriateness and adequacy of sanitation systems;
- Obligation for maintaining clean conditions and protection from contamination of any storage of water;
- Powers of local authorities to examine sanitation and water supply apparatus and facilities;
- The right of the Minister to make regulations prescribing all matters that by the Act are required or convenient to be prescribed for giving effect to the Act, as: the standard, quality and adequacy of water for domestic purposes” and as

“ for the control and maintenance of general Environmental Health quality in matters such as to prevent soil, water, noise and air pollution.”

7.2 Water quality

According to Aras (2002) water quality monitoring activities in Vanuatu are quite poor. This reflects water quality monitoring and surveillance capabilities of both the government and the private sectors involved in the water supply. Storm water often contributes to the pollution of rivers, streams and lakes causing water to be contaminated and unfit for human consumption. Consumption of contaminated water often results in intestinal infection and increased episodes of diarrheal diseases.

In the Port Vila the influx of people into the water catchment (Freswind Subdivision) is a major concern that government, UNELCO, and Non-governmental organizations working in the water sector needs to address. Although documented earlier by Depledge (1994), Hydroplan (1994), and Asian Development Bank (1998) no appropriate actions have been undertaken.

According to Williams (1997) five sites selected for sampling and analysis for faecal coliform, and E.Coli along the Tagabe River showed faecal counts in excess of 1000 per 100ml of water. The sites selected are the water source, Agriculture Station, Tagabe Bridge and Black Sands Bridge. These faecal counts are in excess of World Health Organisation Guidelines for bacteriological indicators of water. Although the samples were taken from the surface water it indicates the potential for infiltration into the Port Vila Water Supply system as the samples were taken during the El Nino event of 1997/98.

7.3 Water Supply Services

Responsibility for water supply services vary throughout Vanuatu. No provincial government is responsible for the operation and maintenance of rural water supply systems. In the two urban areas, the Port Vila water supply is managed and operated by a private company, UNELCO, through a concession agreement with the government while the Luganville supply is managed by the Department of Public Works in the Ministry of Infrastructure and Public Utilities.

The focus for the future according DGMWR is to ensure:

- Full coverage of water supply systems to cover everyone;
- Institutional strengthening and capacity building on the know how to manage and maintain water supply system;
- Public awareness on the hygienic uses of water supply; and
- To have in place technical expertise on water sampling, monitoring and surveillance to ensure all water supply systems are safe for human consumption.

In rural areas the Rural Water Supply Section of the DGMWR is encouraging the establishment of Village Water Committees to operate, manage and maintain the water

supply systems. Quality monitoring and surveillance according to Aras (2002) is quite poor in both urban and rural areas of Vanuatu and also there is very little level of public awareness on the safety and quality of water supplied to the communities.

7.4 Vulnerabilities, weaknesses and problems

Key issues in the water sector as highlighted NBSAP in 1999 by Provinces are shown in Table 12.

Table 12: Key Issues in the Water Sector by Provinces

Province	Problems
TORBA	Shortage of water during extended dry season
PENAMA	Reduced water flows in creeks and rivers Dumping of waste in lakes (Waimemea and Wilebutaga on Ambae and Taribal on Pentecost) Impacts of introduced freshwater species, <i>Gampusia sp. and Poecilia sp</i> on native freshwater fauna Impacts of development in the catchment of lakes above
MALAMPA	Shortage of water during extended dry season
SHEFA	Shortage of water during extended dry season Use of riparian areas for gardening and grazing Impacts of introduced freshwater species, <i>Gampusia sp. and Poecilia sp</i> on native freshwater fauna. Have become dominant fish fauna in Marona river on Efate
TAFEA	Shortage of water during extended dry season and decrease in ambient flows of rivers Use of riparian areas for gardening and grazing Impacts of introduced freshwater species, <i>Gampusia and Poecilia sp</i> on native freshwater fauna.

Nimoho et al. (2000) identified that riverine valleys provide important habitats for diverse terrestrial wild life including birds, invertebrates and reptiles. Soils in these areas are usually very fertile and are increasingly used for intensive agricultural production right to the banks of the lakes, streams and rivers. This agricultural development has an impact on freshwater and its resource mainly through displacements taking place: reduced water flow, lowered water table and losing of both flora and fauna species.

Water quality monitoring activities in Vanuatu are quite poor although the Water Resources Act should provide the necessary framework for this activity especially the establishment of a surveillance authority. This is compounded by the lack of water quality standards or guidelines and the overall lack of a surveillance authority. For instance, Port Vila is the only location throughout Vanuatu, where a periodic quality control and monitoring activity is performed. UNELCO, the private company that

operates and manages the system collects two samples weekly at 8 fixed sampling points throughout the system to measure total and faecal coliforms, pH, turbidity, conductivity and residual chlorine. Requirements for reporting are very unclear especially from UNELCO to appropriate authorities such as the DGMWR, Ministry of Health, and Port Vila Municipality. The public has to go UNELCO to know the quality of the water that they are consuming through newsletters that the company produces on a quarterly basis.

Monitoring in rural areas is on an ad hoc basis such as during communicable disease outbreak and natural disasters (e.g. volcanic eruptions and cyclones) and upon the request of Village Water Committees.

With respect to the quality of coastal waters as in Port Vila and Luganville there is an increased faecal pollution or contamination of Port Vila Harbour and the lagoons of Fatumaru, Eskasuvat, and Ponton Bay. These lagoons are continuously being used for shellfish harvesting which further increases the potential for food poisoning. The main contributing factors are the continued use of conventional on-site sewage storage such as septic tanks and poor operation and management of existing private sewage treatment plants of Irririki Island Resort, Crown Plaza, Le Meridien and the Vila Central Hospital.

Another very important area for any focus for IWP could be development of management capabilities in the area of water catchments in Vanuatu. Governments since 1980 and before that have been pushing for more rural water supply systems but have not embraced catchment management. This is a serious problem for Port Vila, Isangel or Lenakel, Lolowai and Luganville water supply sources where subdivisions are being granted into the Groundwater Protection Zone (GPZ). However this is also a problem for rural areas where water is a scarce resource such as Luli (Paama), Tekoa (Torres) and Panita (Tongoa) (Philips Brian, Assistant Project Coordinator, PICCAP, Pers.Com, December 2002).

The Port Vila GPZ for instance has been documented in previous reports such as the Depledge (1994), Hydroplan (1994) and ADB (1998) where a series of three zones have been designed to protect the water supply catchment from pollution. By-laws and physical plans have proposed controls to limit existing uses and prohibit any new construction or sewage discharge within this zone. This has not been complied with as the Port Vila Municipal Council and the Lands Department have granted approvals to a number of leases both agricultural and residential inside the GPZ (Stanley John, Town Planner, Port Vila Municipal Council, Pers. Com, December 2002). Another issue with the newly enacted Water Resources Act is that although the Act provides some measures for the utilization and management of water resources including the supply of drinking water and quality monitoring, there are no quality standards yet for Vanuatu. Furthermore, the management powers and responsibilities in the water sector are not clearly defined and there is no environmental health policy on the water sector.

Finally as a result of the CRP redundancy exercise in 1998, the Water Resources Section of the DGMWR has been reduced to 3 staff from the original 8. This is a major setback for water resource assessment throughout Vanuatu.

7.5 Opportunities

Wr1. While there are approximately three water quality laboratories established in Vanuatu, two operated by the government need to be upgraded to gather for the whole country. Although they require upgrading, they reflect government commitments to providing safe and potable water. The main areas of work that needs to be addressed is the consistency of water quality sampling and analyses, the analyses of bacteriological parameters of significant to public health such as *E. Coli* and *F. Streptococci* as a majority of the population rely on unprotected water sources for their domestic needs. A brief overview of the laboratories is given below.

DGMWR Water Laboratory

This laboratory funded by NZAID (formerly NZODA) is used for the analysis of raw waters and also drinking water samples from Port Vila and Luganville and rural areas. The laboratory is capable of conducting the following analyses: bacteriological (total coliform, *E. Coli*), chemical (ammonia, COD, CaCO₃, hardness, mg, nitrate, phosphorous and suspended solids) and physical (temperature, conductivity, dissolved oxygen, pH, salinity, TDS, turbidity and clarity).

All analyses are stored into a Microsoft Access database, including an inventory of the quality of all water resources throughout Vanuatu that are sampled and analysed to date.

UNELCO Water Quality Laboratory

This laboratory owned and operated by UNELCO is capable of analyzing bacteriological, chemical and physical analysis. However, most of the physical analyses (pH, turbidity, conductivity and residual chlorine) are done in the field using portable water testing kits. The laboratory also does analysis on request from private individuals and business houses such as hotels. A technician who also collects samples for analysis and records the data of analysed parameters onto a computer mans the laboratory.

Public Health Laboratory- Vila Central Hospital (VCH)

World Health Organisation funded this laboratory for the Ministry of Health Environmental Health Section. It is located at Vila Central Hospital and in poor condition. It is only capable of analyzing bacteriological parameters using Millipore field test method. The only other operational pieces of equipment are the incubator and a microscope.

The laboratory does not analyze water samples on a periodic basis and is more or less like the DGMWR Laboratory that receives samples only during natural disasters and disease out breaks or upon request. There is a laboratory technician who is also a medical laboratory technician at VCH. All data or results of analyses are presented to clients if private and recorded in laboratory notebooks.

- Wr2. There have been numerous water projects implemented in country from which lessons could be drawn for any activity targeting the freshwater quality or marine quality focus of IWP. One of these is the Catchment and Communities with financial support from UNESCO. The projects are implemented on Epule (Efate), Talise (Maewo) and Fanafo (Santo). The project would be implemented in two phases with Phase 1 being geared towards education and awareness with the assistance of Wan Smolbag Theatre. Phase II of the project would see the possible development of water quality and quantity monitoring in the three villages.
- Wr3. Finally should IWP consider Water Catchment Management, as a pilot project there is very high probability that the project could address at least two or more IWP focal areas such as freshwater/marine quality and community waste reductions.

8.0 Coastal Fisheries Sector

Vanuatu's Exclusive Economic Zone covers an area of the sea 60 times larger than the country's land area. Comprising inter-tidal mangrove communities, sea grasses, lagoons, coral reefs and Open Ocean, marine resources are among the most valuable to ni-Vanuatu. These resources are found within the following distinct marine ecosystems of Vanuatu, the Open Ocean-pelagic, the Open Ocean Bottom dwelling/Benthic, the Submarine Volcano-Sea mount/thermal and the near shore shallow waters.

The fisheries resources of Vanuatu are comprised of three main components. These include the various species of tuna, deepwater bottom fish generically referred to as "poulet," made primarily of snappers and related species, and the reef fish that inhabit the coastal waters inside the reefs (ADB, 2002).

Coral reefs and associated sea grass beds have traditionally provided a harvest of valuable protein for ni-Vanuatu population and have value as a tourist attraction. However as Done and Navin (1990) noted "the greatest financial value that a fringing coral reefs and sea grass beds provide to Vanuatu maybe that of the protection and stabilization of coastlines on which they occur. This physical protection is important as shorelines are long and heavily populated and any degradation of ecosystems could cause significant loss of land, or lead to costly engineering works to protect property and public utilities close to the shore."

The temperatures of the waters surrounding Vanuatu are cooler than those generally preferred by migrating tuna stock. This limits the overall population of tuna in Vanuatu waters. Irregular peaks and valleys characterize the bottom terrain around Vanuatu's islands. The Poulet are generally found clustered at the bottom of the deeper trenches and valleys (Crowley et al, 2001).

According to ADB (2002) reef fish on the other hand near the heavily populated areas of Efate, Espiritu Santo and Malekula tend to be over-fished, while the reef fish stocks elsewhere in the archipelago are generally under-exploited.

The tuna resource is most likely near to being fully exploited by long line and purse seine vessels operating under permit in Vanuatu waters. More intensive monitoring of these vessels is needed to determine exact catch volumes and to establish user fees accordingly (Department of Fisheries, 2000).

There are currently no onshore tuna processing facilities in Vanuatu, although in mid-2001 a foreign investor was reportedly assessing the feasibility of reopening a dormant tuna loining factory in Santo. According to William Naviti (Fisheries Resource Manager, Pers. Com, December 2002) the China National Fishing Corporation (CNFC) is interested in establishing a Fishing Base in Port Vila that would be used for transshipment of tuna by vessels fishing in Vanuatu waters.

Coastal fish resources are widely utilized in rural areas by communities who fish by using outboard small fishing boats that are constructed by local boat builders. Rural communities consume catches locally with surplus catches sent to the urban centers for sales.

8.1 Existing framework for Fisheries Resource Management

The Fisheries Department under the Ministry of Agriculture, Livestock, and Forest is the overall agency for the management and development of Fisheries in Vanuatu through objectives, which promote the exploitation of marine resources to maximize socio-economic returns and other benefits to the Population of Vanuatu while ensuring the sustainability of these resources.

The United Nation Convention on Law of the Sea is the umbrella body for the existing fisheries acts, regulations and policies.

The principal national goal for the fishery sector is to ensure sustainable development, management and conservation of Vanuatu's fisheries resource in order to achieve maximum socio-economic benefits of current and future generations.

Table 13 below summarizes the national objectives as outlined by the Corporate Plan for 2000 – 2004 of the Ministry of Agriculture, Quarantine, Forestry & Fisheries:

The Maritime Zones Act (1981) establishes Vanuatu's international waters, archipelagic waters, territorial seas, contiguous zones, and an EEZ. The Fisheries Act (CAP 158) and associated Regulations (Order 49, 1983, and Order 30, 1986) are outdated (Crowley et al. 2001). Among other things the Fisheries Act provides that the Minister may declare "an area of Vanuatu waters and the sea bed underlying such to be marine reserve." Such an area can only be declared after consultation with the local government council and with local custom owners of adjoining land. Apparently the provision excludes the littoral zone abutting the waters themselves or any other contiguous zones. To date only one marine reserve has been established in Vanuatu- the popular dive site on the President Coolidge, a transport vessel sunk during WW II at Million Dollar Point on Santo.

Other relevant provisions include the protection of marine mammals and the prohibition of destructive fishing practices. Regulations promulgated in 1983 and 1986 supplement the Act with details of licensing requirements for various categories of fishing vessels, conditions for the operation of fish processing establishments, specific conservation measures for selected species (e.g. Turtles, coral, trochus, bech-de-mer, coconut crab and green snail) and the prohibition of destructive fishing practices. The only management plan currently in place is the Tuna Management Plan for Offshore Fishery (Department of Fisheries 2000).

Other legislation in the Marine sector include:

- Vanuatu Maritime Act No. 29 (1998) including amendments of 2002
- Shipping Act 1988 (CAP 53)
- SPC Draft Model Shipping and Maritime Bill

Table 13: National Fisheries Policy

Objectives	Strategies
Improve resource management and marine conservation	<ul style="list-style-type: none"> • Formulate sound integrated management and development policies. • Develop and facilitate marine environment and conservation plans.
Improve participatory and integrated policy development	<ul style="list-style-type: none"> • A more balanced approach to the social, economic and environmental aspects of the sub-sector and increasing harmonization between policies in these three areas. • Harmonization of integrated policy development process.
Facilitate development of fishery industries	<ul style="list-style-type: none"> • Encourage proper utilization of Vanuatu’s fish resources to provide employment opportunities and economic growth.
Increase quantity of landed fish and other marine products	<ul style="list-style-type: none"> • Facilitate the supply of improved inputs to development of cash income from fish resources. • Provide technical assistance and advice to small scale rural fishing projects. • Identify and promote appropriate fishing methods and technologies that will improve fishers fishing efficiency. • Train the Fisheries Extension Officers on skills and knowledge for the effective implementation of fisheries programs. • Identify and promote appropriate fish preservation methods for rural area. • Motivate full time and part time subsistence fishers by providing essential support services. • Facilitate combined efforts or programs with donor agencies and non-government organizations at raising rural prosperity. • Review rural fisheries development programs to address the basic needs of the fishermen. • Investigate potential fishing techniques and vessel for particular environment.
Increase rural income through commercial fishing and improve livelihood	<ul style="list-style-type: none"> • Promote self sustaining private- led fishing enterprise. • Identify and promote alternative marine resource initiatives disadvantaged rural population. • Identify and improve existing rural marketing system for marine products. • Enhance fishermen’s basic management skills so as to guarantee future re-investment. • Promote women’s participation in rural fishery.

Objectives	Strategies
Improve fisheries research development	<ul style="list-style-type: none"> • Conduct applied research to advance knowledge for sustainable utilization, management and conservation of Vanuatu' fish resources
Improve fisheries surveillance and enforcement	<ul style="list-style-type: none"> • Develop a surveillance mechanism for fishing vessel activities • Improve data collection from foreign and locally based fishing operators • Improve data collection from foreign and locally based fishing operators • Review current license fees and licensing system • Improve enforcement of fisheries legislation • Collaborate with existing private fishing companies or associations to monitor fishing activity of Vanuatu flagged vessels in the Pacific region to ensure compliance with UNCLOS
Improvement and strengthening of executive management	<ul style="list-style-type: none"> • Provide regular advice to the fishery sector • Improve Divisional and personnel management • Improve liaison with local, international and regional organizations with common interests to the Division • Maintain high level donor confidence and commitment of support • Develop staff training plans by seeking training opportunities and liaise with training providers
Develop effective standardized information technology and data communication systems	<ul style="list-style-type: none"> • Provide in house staff support including staff development and training • Design data standardization system • Provide information exchange (library and archiving) and development services • Assess and upgrade current computer hardware and software to ensure compliance with Y2K standards
Construct affordable seaworthy fishing vessels to facilitate the development of rural fishing sector	<ul style="list-style-type: none"> • Produce artisan fishing crafts • Production of other fishing accessories as required by fishers • Provide vessel repair services • Produce larger vessels • Design new vessels that would improve fishing effort
Generate sufficient revenue to fund the Division's program activities and provide surplus for general revenue	<ul style="list-style-type: none"> • Develop a Divisional local licensing policy • Develop an inspection policy • Design a foreign licensing policy • Develop a procedure for bilateral access agreements

Rural communities commonly use local traditional resource management tools available to manage their coastal fish resources. All of the systems outlined in Table 8 can be used in coastal areas with marker leaves placed on rocks, reefs and trees along the coast to mark areas under restriction. As on land, these areas are usually respected for the period they have been established for. In some areas such as along the east coast of Tanna, certain tapunis possess fish stones that they use to control the harvest of fish.

The Fisheries Act is currently being reviewed. The review will give more powers to the Director of Fisheries in dealing with overall fisheries resource management. The review, which is funded by the Forum Fisheries Agency, should be completed soon.

8.2 Vulnerabilities, weaknesses and problems

A key weakness in the fishery sector according to Crowley et al. (2001) is the lack of fisheries policy and a poorly developed and implemented regulatory framework. These are serious impediments to sustainable development, management and conservation of fisheries resources. The Decentralization and Local Government Act (1994) states that provincial councils can develop by-laws to manage marine resources. According to the Fisheries Department, this is a serious threat as provincial governments are also requesting that they be allowed to issue fishing licenses. They lack the necessary management skills to implement and monitor these licenses (William Naviti, Fisheries Resource Manager. Pers. Com, December 2002). Given improved direction provincial involvement in drawing up relevant, practical by-laws, would be very useful to the Department.

Due to market demands and other human demands, marine resources are rapidly depleting due to over exploitation. Resources affected include reef fish, poulet, trochus, green snails and shells that are commonly consumed under subsistence (Graham Nimoho, Fisheries Officer, Fisheries Department, Pers. Com, February 2003). Though the Fisheries Department is aware of this situation, information dissemination to rural communities is quite difficult due to lack of personnel, limited budget and the remoteness of the islands.

These limitations also affect the enforcement of regulations. Currently there is only one Fishery Enforcement Officer for the whole country. By involving the Provinces to develop and pass by-laws, the implementation and monitoring of national and provincial laws could be better managed by at least six law enforcers.

Land ownership disputes are numerous. Land ownership dispute can be a contributing factor to conservation initiatives failure established under traditional management systems that rely very much on respect and cooperation. While some people may try to manage marine resources, another person might dispute that and harvest everything as observed on Aneityum and on Lese conservation area on Pentecost (Tapisuwe et al. 1998).

Again due to limited funds, personnel and remoteness of some islands, the Department is unable to collect data for example on the harvest that is ongoing especially for commercial and subsistence consumption (Graham Nimoho, Fisheries Officer, Fisheries Department, Pers. Com, February 2003).

Due to a low level of cash flow in rural communities, conservation initiatives may fail at one stage or another because the owners are forced to harvest the managed resources in order to earn some money, as there are no other alternative sources of income. This is most common on small islands such as Mataso in the Shefa Province (Tapisuwe, 2002).

Table 14 summarizes priority environment management issues identified by the NBSAP for the Coastal fishery sector by Provinces in 1999.

Table 14: Coastal Fishery Sector Issues by Provinces

Province	Problems
TORBA	<ul style="list-style-type: none"> • Wide spread use of local fish poisons. • Depletion of marine resources through uncontrolled use of newer fishing methods (and technologies). • Influence of commercial harvesting of resources such as beche-de-mer by non local business men/women.
SANMA	<ul style="list-style-type: none"> • Impacts of quarrying for road constructions.
PENAMA	<ul style="list-style-type: none"> • Decline in populations of marine resources due to over harvesting. • Dumping of waste on coastal areas and lakes. • Depletion of marine resources through indiscriminate use of newer fishing methods. • Sand mining near Saratamata which is leading to saltwater intrusion.
MALAMPA	<ul style="list-style-type: none"> • Wide spread use of local fish poisons. • Depletion of marine resources through indiscriminate use of newer fishing methods. • Destruction of mangroves.
SHEFA	<ul style="list-style-type: none"> • Depletion of marine resources through indiscriminate use of newer fishing methods.
TAFEA	<ul style="list-style-type: none"> • Wide spread use of local fish poisons.

8.3 Opportunities

Fi1. Within the Fisheries Division three key sections that are of interest to IWP are the Resource Assessment, Management, Computer and Information Sections (RAMCIS); the Rural Fisheries Development Programme (RFDP); and law enforcement. RAMCIS has an overall objective to devise marine resource management schemes through stock assessment activities, effective collection of data, information dissemination and revenue generation. RFDP is focused on small-scale fisheries and aims to facilitate the sustainable development and management of Vanuatu rural-based small-scale fishing industry. This village-based initiative has received some assistance from the government through the provision of ice-making machines in islands such as Epi, Tanna, Aneityum, Malakula and Emae. The

activity also recognizes the contribution of tabus for the protection of marine resources such as trochus, fish, turtles, etc.

- Fi2. Law enforcement is also an opportunity that needs to be addressed, as there is only one Fisheries Law Enforcement Officer for whole of Vanuatu. This is serious as all the provincial centers have police posts that could easily be used for fisheries law enforcement.
- Fi3. The Department of Fisheries also supports an ACIAR funded Trochus Restocking programme. This has been around since 1994 and the Department is looking at mass production to restock various reef sites in Vanuatu with this valuable marine resource.
- Fi4. Another very promising programme that has been going on for approximately 5 years now is the Wan Smolbag Theatre Turtle Monitors Programme. This is a good information dissemination network in almost all the islands with over 100 Vanua-Tai Monitors (formerly turtle monitors) building on turtle awareness but other marine and terrestrial resources too.
- Fi5. A number of Marine Protected Areas (MPA) have been established in Vanuatu such as the Ring Te Su (Maskylines), Ponkivio (Epi) and Narong Marine Park in Malekula. While there are more than 30 MPA's in Vanuatu IWP may benefit from reviewing the important lessons learned from these established conservation areas. This information would be of use to any IWP activities targeting coastal fisheries, as information on the success or weakness of these ventures is limited.
- Fi6. A framework exist in the form of Rural Economic Development Initiative (REDI) at the provincial level for any work in the fishery sector. All provinces in Vanuatu have this framework in place and would be very useful if IWP are to implement projects at the community level. A summary of this is shown in Table 15.

Table 15: Key fishery sector issues shown in the Provincial REDIs Programs.

Objectives	Strategies
Establishment of a fish market centre	<ul style="list-style-type: none"> • Work with local authorities to identify suitable sites for the fish market centers. • Assist local authorities to establish cooperatives. • Installing ice making machines in the cooperatives. • Giving financial support ensure the market center is well established.
Establish rural markets	<ul style="list-style-type: none"> • Provide technical training on fish handling and preservation. • Work collaboratively with other departments, private sector and communities to set up an effective rural marketing network.
Improve fishing and other related skills	<ul style="list-style-type: none"> • Provide group training in fishing techniques, fish handling, fish processing and storage. • Provide training in business management.
Improve and increase fishing activities in rural areas	<ul style="list-style-type: none"> • Facilitate access to fishing gear and equipment. • Assisting in establishing fish gear shops.
Improve data collection and dissemination of information	<p>Establish data collection network with individuals in rural area.</p> <p>Improve fisheries computer data base program.</p> <p>Provide regular fishing information to fishers and other users.</p>

9 Recommendations and Conclusions

From the review of PEC this section of the report makes recommendations for consideration as pilot projects for the Vanuatu IWP. Priority recommendations were arrived at using the following criteria:

- The maximum number of people to benefit
- Benefit to Vanuatu IWP
- No. of sector opportunities addressed
- No. of IWP focal areas addressed
- Duplication of efforts
- Cost effectiveness
- Long term requirements from Government
- Likelihood of being sustained post IWP and
- Weaknesses

9.1 Priority Recommendations

9.1.1 Priority 1: Vanuatu Integrated Coastal Land Management Project

Resource use in the form of agricultural, forestry and fishing are for the most part unplanned. There is inadequate effort to assist landowners and rural communities to make wise and viable decisions on how best they could use their land and coastal resources to ensure that there is a balance between social, economic and environmental development.

Coconut and commercial plantations for instance are economically important, but they have taken up virtually all the arable land found along the coasts and flood plains and are increasing taking up plateau areas as well as hillsides.. It is a common belief among rural communities that food crops cannot be grown under coconuts. For this reason, new areas are cleared annually for food production as well as for growing other cash crops such as kava, cocoa and spies thus the increased level of displacements of resource species due to the destruction of habitats. Old coconut areas are grazed as pasture or not used. The latter leads to expansion of weed species. The result is low species diversity and under usage of important land resources.

Research work has already been done in the areas of intercropping and alley cropping at Monmatre, Tagabe, and Vanuatu Agriculture Research Training Center (VARTC) on Santo. This work could be collated to form a basis for the diffusion of site stable agricultural practices to rural communities and further research work including extension services.

Rural communities rely on the technical advice from the Government Extension Services and NGO's for resource management purposes. Very often, the advice they get is biased towards project or sectoral targets, which may not give an open overview of what is

involved and any constraints that may be met. It is important that they get a sound holistic advice on optimum livelihood income generating activities, best suited to their local situation to assist them to make decisions that will cater for their needs.

Along the coasts, it is important that there is better collaboration between the Agriculture, Forestry, Fisheries Departments and non-government organizations and concerned communities to identify best alternative resource management activities that meet their needs.

Most of these coastal plains once had pristine rivers, swamps and lakes. Due to the establishment of coconut plantations with cattle grazing and human settlements, habitat and community modification, unsustainable use of natural resources, coastal marine and freshwater quality are becoming important concerns as identified by both the recent IWP survey and the National Biodiversity Conservation Strategy.

Priority 2: Vanuatu Integrated Watershed Management Project

The management capability of the Vanuatu government in the area of water shed or catchment management is an area that IWP could seek to address as a pilot project. From the colonial years till now Governments have pushed for more rural water supply systems to be installed throughout Vanuatu. This is also reflected in the DGMWR mission to ensure that there is a full coverage of rural water supply systems in Vanuatu. However catchment and management of freshwater resources has been neglected. Almost all catchments that are tapped for water supplies do not have a management plan though efforts are ongoing to develop one for the Port Vila groundwater protection zone (GPZ).

IWP could consider assisting all stakeholders in the water sector through a pilot project that would develop best environmental practices for the sound management of water catchments. All the important lessons learnt from this pilot project could then be developed and if positive be adapted to other situations both in Vanuatu and in the region. Such a project would provide an opportunity to establish procedures for implementation of the resource management provisions of the Water Resources Act (2002).

As in priority 1 above, it is important that there is better collaboration between the DGMWR, Agriculture, Forestry Departments, the Environment Unit, non-government organizations and concerned communities to identify best alternative resource management activities that meet community needs.

It is important that affected rural communities are given sufficient support training and monitoring mechanism in the form of law that recognizes the chiefs role in the monitoring of the systems at local level.

Similar to priority 1 such a project provides a mechanism to intersectoral collaboration and demonstrate holistic approaches to resource management.

Priority 3: Capacity Building for Community Based Coastal Fishery Resource Management and Monitoring

Community based fisheries resource management is somewhat poor. Most communities rely on traditional resource management tools such as taboos to manage their resources. At the national level with respect to the enforcement of the Fisheries Act, there is only one law enforcement officer. Furthermore information dissemination about fishery resources is limited to areas that are accessible and only happen where there are funds available to the Department of Fisheries. Traditionally the Department has emphasized commercial fishing endeavors, with less than equal emphasis on subsistence harvesting. Though some attempt had been made to alleviate this, communities were not well prepared to manage assets after the programs have been exhausted.

One option is for IWP to implement a pilot project that has capacity building as its main aim and a community or a number of communities as the target, to develop best practices for sound management of fishery resources and mechanisms set in place at the community level to monitor and maintain.

If considered by IWP, such a project could include as sub-activities, the review and documentation of lessons from existing Marine Protected Areas and the Vanua-Tai Resource Monitors Network established by the popular Wan Smolbag Theatre. The review could form the basis of work for this pilot project where the important lessons learnt are tried elsewhere in Vanuatu and possibly in the region.

Priority 4: Waste Management Institutional Capacity Building

This project would center on the IWP focal area of community waste reduction. One of the major weaknesses for sound management of waste is that there is currently no single authority responsible for waste management in Vanuatu, with various agencies exercising limited responsibility with inadequate coordination. There is potential for the IWP to take a capacity building approach to addressing waste management at a national level, putting in place appropriate legislation, guidelines and frameworks through which different agencies can collaborate more effectively, and strengthening the capacity of both Port Vila and Luganville Municipalities, and Provinces to manage and minimise solid wastes.

Components of waste management relate to the work of the Health Department, Public Works, Environment Unit and Municipals. However, none of these agencies take a coordinating responsibility and so work tends to be fragmented and poorly coordinated.

Management of wastes from Port Vila Central Hospital, including liquid wastes, sewerage, and clinical wastes has been a long-standing concern. IWP could potentially work closely with the health department to help move the hospital toward best practice, and from this build capacity of other hospitals throughout the islands.

A sub activity under this pilot project could be the analysis of the detailed knowledge, attitudes and practices survey conducted in 2000, which has not been analyzed. It would be very useful in waste awareness, education and management decisions with an estimated cost for analyzing at 300,000VT. Should IWP choose to address waste related issues in either of Vanuatu's urban areas analysis of this data should be a high priority.

Another possible sub activity if IWP considers community waste reduction as a pilot project is the implementation of provincial waste management plans developed during consultations in year 2000. This is important as the provincial authorities lack capacity to select suitable sites, negotiate with landholders and to dispose of rubbish in any other than the most rudimentary ways. There has been very little change in this situation over the past 3 years. Waste disposal outside of Port Vila and Luganville remains problematic.

Priority 5: Water Quality Monitoring and Surveillance Capabilities in Vanuatu

Water quality monitoring and surveillance activities in Vanuatu are quite poor and are mostly done on an adhoc basis such as during natural disasters. Although there are existing infrastructure for water quality as the DGMWR and Public Health Laboratory, there is no consistent monitoring and surveillance of water supply systems throughout Vanuatu.

IWP could assist the DGMWR and the Ministry of Health in upgrading the existing laboratories to gather for the much needed analysis such as bacteriological (E. coli and F. streptococci), the best indicators of risk of diarrhoeal diseases from water supplies. If these capabilities are developed through a partnership between the DGMWR, Ministry of Health and IWP, then a majority of the water supplied to rural populations from unprotected sources could at least be sampled and analysed once every year and recorded in a database.

Other options that IWP could consider are the possible amalgamation of the two government laboratories, and their strengthening. This would be very beneficial and financially sustainable in the long run especially considering the cost of operating and maintaining a laboratory.

Another initiative that could be considered as the community component of this project is what could be called river watch. This is where communities are encouraged to participate in water quality monitoring. The initiative could draw on international experience with river watch programmes such as in Australia.

Priority 6: Development of a Cross Sectoral Code of Practices for Subsistence Resource Use

A cross sectoral code of practice for subsistence resource use would complement existing legal frameworks such as the COLP, and the various laws dealing with the commercial harvesting of both terrestrial and marine resources. This project would also allow the various government departments of Agriculture, Environment, Fisheries, Forestry and Lands to work more effectively together. Practices could be developed and tried in a pilot project with a small number of communities. From these lessons could be developed an appropriate code of practices for incorporation into legal resource management mechanisms.

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Table 16: List of people consulted

Person	Title	Organization	Month of contact
Hannington Tate	Principal Extension Officer	Forestry Dept	Dec. 2002
William Bani	Principal Forest Utilisation Officer	Forestry Dept	Jan 2003
Reuben Bakeo	Policy Planner	Forestry Dept	Dec. 2002
Steven Tahi	Director General	Min of Lands	Jan. 2003
Tony Tevi		Geology Dept	Jan 2003
Primrose		IWP	Jan 2003
Alicta Vuti	Land Use Planning Officer	Lands Dept	Jan 2003
Katherine Malosu	Assistant Project Officer, NBSAP	Environment Unit	Jan 2003
Leo Moli	Director	Energy Unit	Jan 2003
Brian Philips	Assistant Project Coordinator, PICCAP	Meteorology Dept	Jan 2003
Mercy Nalawas	Meteorology Officer	Meteorology Dept	Jan 2003
Pakoa Rarua	Senior Environmental Health Officer	Public Health Dept	Dec 2002
Shirley Laban	Assistant Environmental Health Officer	Public Health Dept	Dec 2002
Jonas Arugogona	Senior Health Planner	Ministry of Health	Dec 2002
Astride Boulekone	Assistant Administrator	Vanuatu Maritime Authority	Dec 2002
William Naviti	Fisheries Resource Manager	Fisheries Division	Dec 2002
Graham Nimoho	Principal Extension Officer	Fisheries Department	Feb. 2003
John Chaniel	Manager, Water Supply	UNELCO	Dec 2002
Stanley John	Senior Town Planner	Port Vila Municipality	Dec 2002

Tony Ata	Head, Environmental Health Officer	Port Vila Municipality	Dec 2002
Malcolm Dalesa	Environmental Health Officer	Port Vila Municipality	Dec 2002
Richard Mackewen	Water Resource Advisor	DGMWR	Dec 2002
Morris Malau Steven	Senior Water Technician	DGMWR	Dec 2002
Rex Willie	GIP Project Officer	DESD	Feb 2003