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Socioeconomic study of the Crab Bay villages of Central Malekula, Vanuatu, Volume 1: Overview

By the Vanuatu Environment Unit

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Abbreviations

CARMAP	Community Area Resource Map and Action Plan prepared at Limap by the Land Use Planning Project in 1996.
CEA	Census Enumeration Area
IWPDP	International Waters Project Demonstration Project (Vanuatu)
PSA	Participatory Situation Analysis conducted by the IWP project in 2004.
PWMU	Presbyterian Women's Missionary Union
SDA	Seventh Day Adventist Church

1 Introduction

The Vanuatu International Waters Project Demonstration Project (IWPDP) is working in partnership with the people of eleven villages in the Crab Bay area of Central Malekula to address the management of coastal resources. The primary focus is on the *Cardiosoma hirtipes* crabs from which the Bay derives its name. The Project requested a short plain English report to consolidate socio-economic information from secondary sources and project work and to identify issues of particular relevance to the on-going work of the IWP Vanuatu project.

Principal sources[1] drawn upon were:

- survey of 132 households in the Crab Bay project area (Vanuatu IWPDP, 2005a);
- survey of Cardiosoma vendors at the Malampa Market (Vanuatu IWPDP, 2005e);
- survey of the mangrove use of households in the Crab Bay project area (Vanuatu IWPDP, 2005b);
- survey of coastal fisheries practices in the Crab Bay project area (Vanuatu IWPDP, 2005d);
- survey of retail fish outlets in the Norsup – Lakatoro area (Vanuatu IWPDP, 2005c);
- 1999 national census (Statistics Office, 2003);
- participatory situation analysis of villages in the IWPDP area (Bakeo, 2004; Vanuatu IWPDP, 2004);
- participatory resource management and planning exercise conducted at Limap in 1996 (Land Use Planning Office, 1996); and
- surveys of the economic value of the Port Stanley and Crab Bay mangroves conducted by Lal and Esrom and Esrom and Vanu (Esrom and Vanu, 1997).

This overview is presented in 4 sections:

- Chapter 2: Social information held about the Crab Bay villages
- Chapter 3: Economic information held about the Crab Bay villages
- Chapter 4: Socio-economic information held about the Crab Bay villages

Given the size limit assigned to the report it is not possible to present all information. More detailed information is available in the source documents. A broad focus is taken to ensure the project has a good understanding of the context in which it operates.

Presentation of the information is followed in Chapter 5 by a discussion of the relevance of this information for the IWP demonstration project and identification of the information and knowledge gaps that remain.

1.1 Key definitions

Socioeconomic is a frequently-used term that is not always well understood. Confusion often arises over the nature of socioeconomic information, and potential overlap with information from social and economic disciplines.

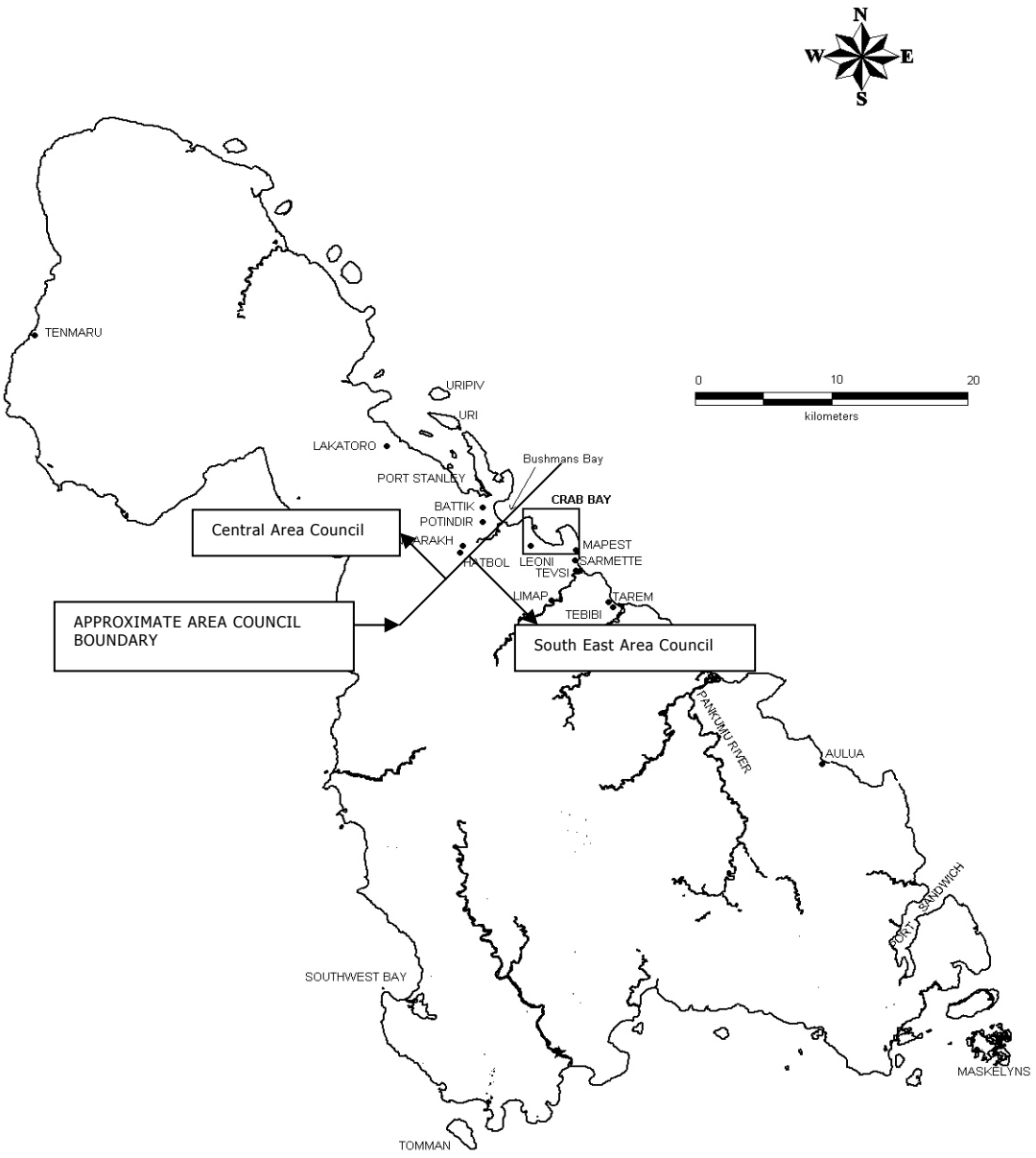
[1] Editor's note: much of the background information has been published in the International Waters Project Technical Report no. 47 (Socioeconomic study of the Crab Bay villages of Central Malekula, Vanuatu, Volume 1: Detailed findings). See VEU 2007.

- ***Social information*** describes how people live together and organise themselves within their communities.
- ***Economic information*** describes how people organise, produce and distribute goods and services to achieve material well being.
- ***Socioeconomic*** information refers to information that incorporates both social and economic dimensions. It typically addresses such issues as the access to and use of social, economic and environmental resources and the relationships of authority and subordination within a society that often influence resource use practices.

1.2 The Vanuatu IWPDP Site

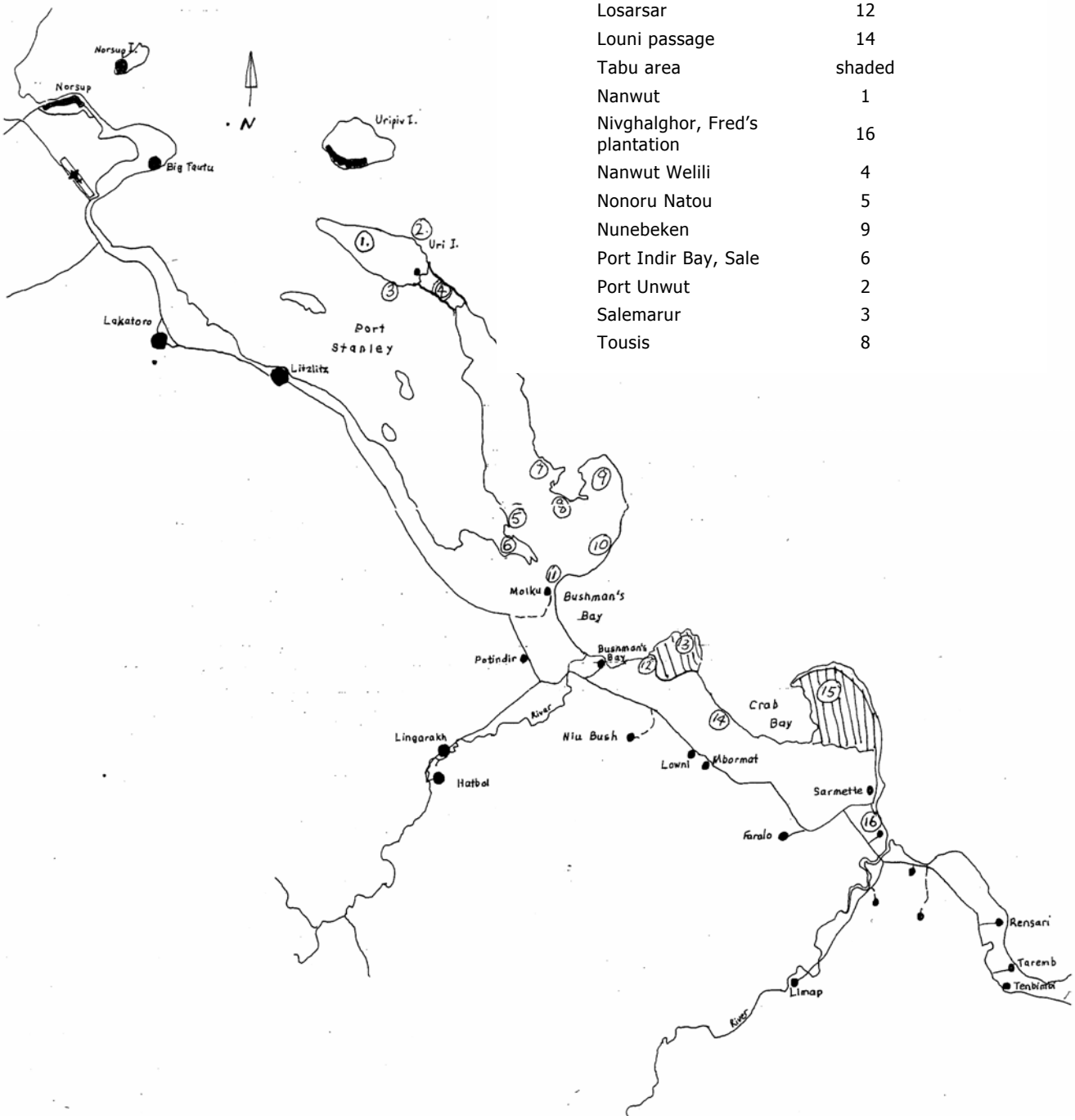
Crab Bay is on the east Coast of Malekula Island (Maps 1 and 2). It falls partly within the Central Malekula Council area and partly within the South East Malekula Area Council area. Scattered around Crab Bay and the nearby hinterland are 11 main villages and a number of associated hamlets.

Map 1: Location of Crab Bay project area



Map 2: Detail of the Crab Bay project communities

Site Name	Number
Amal, Amal point	13
Bare area	7
Ginenarong	11
Loloburbur	10
Losarsar	12
Louni passage	14
Tabu area	shaded
Nanwut	1
Nivghalghor, Fred's plantation	16
Nanwut Welili	4
Nonoru Natou	5
Nunebeken	9
Port Indir Bay, Sale	6
Port Unwut	2
Salemarur	3
Tousis	8



2 Crab Bay villages: social information

Social information describes how people live together and organise themselves within their communities.

2.1 General demographic information

General demographic information from the Crab Bay villages is summarised in Table 1.

The villages of the IWPDP area have a combined population of over 1,500 people (Statistics Office 2003). Barrick, Bushman's Bay, Louni, and New Bush are small villages with less than a hundred villagers each. Portindir, Mapbest/Trevaliaut, Limap, Hatbol and Lingarakh have populations between 100 and 200 people. Only Uripiv Island has a population over 500 people.

Over the previous decade the area has experienced rapid population growth of approximately 3% per annum (ibid.), and this trend has continued (IWPDP 2004). There is a high dependency ratio (the ratio of adults to dependents), with young people under 17 years of age forming over half the population of Uripiv, Barrick, and Bushman's Bay (Statistics Office 2003; IWPDP 2004), and over 30% of most villages.

2.2 Evolving social structures

Several large plantations in Central and South East Malekula have attracted a low skilled agriculture workforce from elsewhere in Malekula and from other islands.

The villagers of Barrick, Lingarakh, Hatbol, Port Nabe, Taremb, Tenbimbi, Uri and Uripiv Islands are primarily from Malekula (IWPDP 2004a), although 24% of Hatbol's population and 12% of Lingarakh population were classified as temporary residents (as distinct from permanent local residents; IWPDP 2004). People from Malekula form the largest portion of the population in Louni, Limap, Portindir, Jinenarong and New Bush, but these villages include a scattering of people from Pentecost, Ambrym, Malo, Efate, Paama and other islands (IWPDP 2004a). Bushman's Bay, Tevaliaut and MapBest accommodate plantation workers, mainly from Paama Island (IWPDP, 2004a).

Even at a micro-scale there have been significant social changes. These have been documented for Limap (Land Use Planning Office 1996; Bakeo 2004). Over the past century Limap village has shifted location (from a position on the coast at the start of the 20th century to its present location) in response to disease, traditional fears and changing land use needs. While Limap villagers remain traditional landholders of parts of Crab Bay, the villagers have interests that reflect the current inland position of the village.

With the adoption of permanent building materials the position of villages has stabilised in recent decades. New villages have formed as growing communities fragment; causal factors include a desire to return to traditional lands, to be closer to gardens, or internal disagreements.

3 Economic information about the Crab Bay villages

Economic information describes how people organise, produce and distribute goods and services to achieve material well-being.

3.1 Economic infrastructure

East Malekula lies on the shipping and air route between Santo and Efate. It has daily air passenger services and regular freight and passenger shipping services. A road runs north–south along the coast from Lakatoro to Lamap, although river crossings can be impassable

after heavy rain.

Central Malekula Area Council includes the most developed areas of Malampa Province: the provincial administrative centre at Lakatoro, a commercial centre, the Norsup and Malampa markets, the provincial hospital at Norsup, Norsup airport and LitzLitz wharf. The Malampa Province offices of the Departments of Education, Health, Forestry, Fisheries, Agriculture and Public Works are all within Central Malekula Council Area. Both the Island Court and the Magistrates Court sit at Lakatoro. As a result, the number of salary and wage earners is well above the rural average. There is a high proportion of permanent housing, household electricity connection, and household water reticulation at Lakatoro and Norsup (Statistics Office 2003).

South East Malekula Area Council lies immediately to the south of Central Malekula Area Council and is more typical of rural Malekula. Rensarie (just to the south of Taremb/Tenbimbi) is a government service point. Rensarie Junior Secondary School is a major bilingual secondary boarding school that draws students from throughout the province. Rensarie has a high proportion of permanent houses, improved toilet facilities and good access to water.

The IWPDP falls partly within each of these Area Councils, but lacks much of the economic infrastructure present in the service points. Many of the IWPDP villages have largely traditional housing, pit toilets, use water directly from natural sources and have no electricity (Statistics Office 2003). The villages of Uripiv, Bushman's Bay, Lingarakh, Freddy's Corner, and Tenbimbi fall in between these two extremes with a mix of housing and utility services.

3.2 Subsistence economic activity

All households in the IWPDP area grow food in gardens for subsistence consumption, but subsistence fishing throughout the area was variable. At Bushman's Bay and Uripiv, over 80% of households fished for domestic consumption, in Portindor, Lingarakh, and Tenbimbi 50–80% of households fished for domestic consumption, while in other villages less than 50% of the population conducted subsistence fishing (Statistics Office, 2003).

Communities also gather a wide range of wild and semi-cultivated foods from the nearby environment. These include shellfish, octopus, flying fox, wild pigs, pigeons, eels, crustaceans (IWPDP 2005a) as well as fruits, wild yams, leafy vegetables and nuts.

3.3 Participation in paid employment

Participation in paid employment varies throughout the IWP Project area. In the Freddy's Corner Census Enumeration Area (CEA) over 40% of men and 30% of women have paid employment. In Uripiv Island, Bushman's Bay, and Rensarie 25% to 40% of men receive salary or wage income. In Portindir, Lingarakh and Tenbimbi few men over 15 years receive wages or salary. Women's participation in paid work was lower than of men in all communities. A significant proportion of women at Lingarakh engaged in work for no pay, but the census did not detail the nature of this work. In other villages few people worked for no pay. In Tenbimbi CEA a significant proportion of both men and women were looking for work. This was not the case in other villages (Statistics Office 2003).

3.4 Other sources of income

IWPDP (2005a) asked 132 people about the generation of household income; 28 income generating sources were mentioned (Table 2). Participation in these sources/occupations is presented in Table 3. The IWP household survey produced consistently higher participation rates than did the 1989 census.

Table 1: Demographic overview of the villages in the Crab Bay project area

Village/hamlet	**Uri/Uripiv**	**Portindir**	**Barrick.**	**Mapbest/ Trevaliaut**	**Limap**	**Louni**	**Niu Bush/ Namburakai**	**Bushman's Bay**	**Hatbol**	**Lingarakh**	**Tarem/ Tenbimbi**
No of households (IWP, 2004)	119	35	11	Not available	25	15	5	5	35	31	Not available
Village population (IWP, 2004)	542	153	64	172	167	69	17	25	149	172	Not available
Population 1989 (Statistics Office)	370	63	31	25	77	38	24		114	149	143
Pop'n growth 1989 - 2004	46%	143%	106%	562%	117%	82%	-29%		31%	45%	
Pop'n <= 17 years (2004)	304 (56%)	68 (44%)	34 (53%)			27 (39%)	2 (11%)	13 (52%)	43 (29%)	80 (47%)	
Pop'n >= 18 years<=55 yrs (2004)	191*	72	29			42	15	12	94	72	
Population > 55 years	47	13	1			0	0	0	12	6	
Male : female		84 : 69	27 : 37	93 : 79	97 : 70		8 : 9	9 : 16	88 : 61	93:79	

Table 2: Income sources recorded by IWPDP Household Survey (IWPDP 2005a)

Village	Sources of income mentioned
Barrick	Copra, cocoa, pigs, chicken, timber
Bushman's Bay	Copra, cocoa, pigs, fish
Jinenarong	Copra, food crops, cocoa, pigs, *Cardiosoma* crabs, fish, shell fish
Hatbol	Copra. Cocoa, pigs, chickens, timber, pandanus handicrafts, bread & gateau, natangura thatch panels
Limap	Copra. Cocoa, pigs, chickens, shell fish, timber, kava, pandanus handicrafts
Lingarakh	Copra, cocoa, chicken, timber, pandanus handicrafts, bread
Louni	Copra, food crops, cocoa, *Cardiosoma* crabs, pigs, fish
Mapbest	Copra, cocoa, pigs
New Bush	Copra, food crops, cocoa, chickens
Port Nabe	Copra, food crops, pigs, chickens, *Cardiosoma* crabs, fish, shell fish, pandanus handicrafts, octopus
Portindir	Copra, food crops, cocoa, pigs, chickens, *Cardiosoma* crabs, fish, trochus, shell fish
Robako	Copra, cocoa, food crops
Taremb	Copra, cocoa, food crops, pandanus handicrafts, firewood
Tenbibi	Copra, food crops, cocoa, pandanus handicrafts, firewood
Tevaliaut	Copra, cocoa, food crops, pigs, chickens, fish, vanilla, beef
Tevri	Copra, food crops, pigs, chickens, *Cardiosoma* crabs, fish, trochus, shell fish, pandanus handicrafts, firewood, octopus, rolls of pandanus leaves
Uri island	Copra, food crops, cocoa, chickens, *Cardiosoma* crabs, fish, trochus, shellfish, mangrove, oyster, octopus, clam shell
Vilavi	Copra, trochus, pandanus handicrafts

The mean number of household income sources was four, and the maximum eight (IWPDP 2005a). The amount of income derived from each source tended to be less than USD 100. Only copra and cocoa provided a consistent source of income over USD 100. No income source was reported to generate more than USD 500 per household. Information on total household incomes was not obtained.

Table 3: Production and sale of commercial produce

Product	IWP Household survey	1989 national census
Copra	97% of households sell copra	< 80% of households produce copra : Freddy's Corner
		> 80% of households produce kava : all other villages
Cocoa	74% of households sell cocoa	50 to 80% of households produce cocoa. Lower levels on Uripiv Island.
Garden produce	56% of households sell garden produce	> 20% of households: Uripiv, Portindir
		< 20% : Bushman's Bay, Tenbimbi, Lingarakh, CEA 283
		None : Sopor, Freddy's Corner
Chickens	43% of households sell chickens	
Pigs	41% of households sell pigs	
Cardiosoma crabs	36% of households sell crabs	
Fishing	35% of households sell fish	> 19% of households: Uripiv, Portindir, Bushman's Bay
		1–19% of households: CEA283, Freddy's Corner, Tenbimbi
		None: Sopor, Lingarakh
Beef	1 household at Tevaliaut reported sales of beef	Cattle ownership at rural Vanuatu average: Bushman's Bay.
		Low level of cattle ownership: Portindir, CEA 283.
		Very low level of cattle ownership: all other villages
Kava	1 household at Limap reported sales of kava	< 10% of households produce kava – Uripiv, Portindir
		10 – 30% of households produce kava : Sopor, Bushman's Bay, Lingarakh, EA 283, Tenbimbi, Freddy's Corner

Sale of *Cardiosoma* was the sixth most common income source, with a similar level of participation to fishing (IWPDP 2005a). The monetary income reported from crabs was consistent throughout the year.

The 1999 census allowed a comparison of economic activity in the Crab Bay area with the Vanuatu rural average (Statistics Office 2003).

- The proportion of households in the IWPDP area owning cattle is below the average for Vanuatu rural areas. Cattle ownership only reached the Vanuatu rural average at Bushman's Bay.
- The proportion of households in the IWPDP area commercially producing kava is lower than the Vanuatu rural average.
- The proportion of households in the IWPDP area commercially producing cocoa and copra is higher than the Vanuatu rural average.

3.5 Household items and household services

The 1999 census documented household ownership of material goods and capital items, which are indicators of material wealth (Statistics Office 2003).

Housing	Most housing is a mix of modern and traditional materials. Only in the Sopor and Portindir CEAs was there minimal use of modern materials.
Access to water	Vilavi, Sopor and Portindir used primarily natural water sources. Lingarakh, Freddy's Corner and Tenbimbi had tanks and wells and a few houses with access to piped water. At Bushman's Bay and Tenbimbi over 50% of households had piped water supply.
Toilet facilities	At Portindir, Bushman's Bay, Lingarakh and CEA 283 most households use pit latrines or have no toilet facility. However Uripiv, Lingarakh, Tenbimbi there is a low proportion of pit latrines and improved toilet types are more common.
Lighting	Kerosene is the main fuel used for lighting in all villages.
Boats	Uripiv, Uri Island and Bushman's Bay had high levels of boat and canoe ownership. Engagement in fishing paralleled boat/canoe ownership.
Vehicles	Ownership of a private or shared vehicle was low. Only in Bushman's Bay and CEA 283 did over 5% of households have a private or shared vehicle.
Phones	Phone access was low. There were no private or shared phones in Portindir and Lingarakh.

3.5 Land use

The coastal areas of the Central and Southeast Malekula Area Councils have high land-use intensity (VANRIS). Coastal plains have largely been converted to coconut plantations. PRV, Mapbest and Savoie plantations are typical "cattle under coconut" plantations on leased land that have diversified into cocoa, pepper, and vanilla.

Commercial and subsistence agriculture generate 55% of Malampa's gross domestic product. In comparison fisheries and forestry contributes only 1% of GDP (Malampa Province, undated).

3.6 Economic value of selected coastal resources

3.6.1 Economic value of the Crab Bay mangroves

Within the IWPDP area mangrove wood is used as a cooking fuel and for house and fence posts. Mangrove wood's clean burning properties make it suitable for cooking in wet weather, and its rot resistance gives it high value in house construction. Whether mangrove wood is used or not is influenced by the availability of alternatives and the preferred cooking method[2] (Esrom and Vanu 1997).

Villages within the mangroves, such as Uri Island, depend almost entirely on the mangroves for fuelwood and posts. However, for most landward villages mangroves provide less than a third of their fuel wood requirements (Lal and Esrom 1990, as cited in Esrom and Vanu 1997). Villages further inland use mainly inland wood.

Table 4 estimates the *economic use value* of mangrove resources. Mangroves also have value for their environmental functions. Lal (2003) estimated that the economic value of environmental services provided by mangroves (erosion control, nutrient filtering, carbon sequestration, storm abatement and biodiversity) are typically one or two orders of magnitude greater than economic use values. Consequently, the estimated economic use value of 14.3 million vatu per year under-estimates the full economic value of the Crab Bay coastal resources.

Table 4: Economic use value of resources from the Crab Bay mangroves

Resource use	**2004 no. of households [1]**	**Estimated price/unit**	**Usage Value**
Mangrove firewood			
Coastal villages - 8 bundles of wood per household per month (Lal and Esrom, 1990) (160 kgs per year)	Portindir 35 Metaven 11 Bushman's Bay 5 Lowni 15	200 VUV per bundle	1,267,200 per year
Other villages close to the mangroves –2 bundles of wood per month (Lal and Esrom, 1990).	Namburakai 5 Lingarakh 31 Hatbol 35 Sarmette 12	200 VUV per bundle	254,400 per year
Mangrove posts			
Esrom and Vanu (1997) 20 poles per building, 3 buildings per household.	Portindir 35 Metaven 11 Bushman's Bay 5 Lowni 15	300 VUV per pole	1,188,000 VUV (over 10 years)
Natangura thatch			
A typical traditional house uses 150 racks of natangura (Lal and Esrom, 1990). Census details of traditional housing.	Portindir – 81% trad'l Metaven - 81% trad'l Bushman's Bay - 15% trad'l Lowni - 15% trad'l	100 VUV per rack	558,900 VUV (over 10 years)
Food items			
C. hirtipes subsistence consumption. Assume two bundles per week per	66 households	200 VUV per bundle	1,372,800 VUV per yr

[2] Some woods are preferred for heating stones for baking, while other woods are better suited to boiling or flame grilling.

Resource use	2004 no. of households [1]	Estimated price/unit	Usage Value
house (IWPDP, 2005a).			
C. hirtipes commercial - 18 women sell an average of 9 bundles of 10 crabs in the Saturday Norsup market (Esrom & Vanu, 1997). Malampa market 3,770 crabs offered for sale over a 10 day period.	Assume 135 bundles of crabs sold weekly at Norsup market. Assume 260 bundles are sold weekly at Malampa market	200 VUV per bundle	1,404,000 VUV per yr 2,704,000 VUV per yr
Fin Fish –assume 1 fish meal per week per house (IWPDP, 2005a).	66 households	200 VUV per fish	686,400 VUV per yr
Shellfish. Assume one basket per week per house (IWPDP, 2005a).	66 households	100 VUV	343,200 VUV per yr
Shell fish Commercial - 0ver a month 20 women sell 57 baskets of shells in the Saturday Norsup market (Esrom & Vanu, 1997). Assume equivalent sales at the Malampa market.		100 VUV	1,368,000 VUV per yr 1,368,000 VUV per yr
Gastropods subsistence consumption – no estimate available. Assume one basket per week per house.	66 households	100	343,200 VUV per yr
Gastropods Commercial - Over a month 15 women sell 41 baskets of gastropods in the Saturday Norsup market (Esrom & Vanu, 1997). Assume equivalent sales at the Malampa market.		100 VUV	738,000 VUV per yr 738,000 VUV per yr
Estimated use value per year			14,334,100 VUV

[1] Household numbers identified in the 2004 PSA are used where available. Otherwise numbers are taken from the 1999 census with an annual 3% growth rate to give a 2004 estimate.

3.6.2 Community ranking of coastal resources

IWPDP (2004) asked villagers to rank the coastal resources they used; resources ranked between 1 and 5 are listed in Table 5. *Cardiosoma* (crabs) were ranked highly by 9 villages. Lobster, mullet, green snail and freshwater prawns were ranked as highly but by a smaller number of villages. Reef fish and mangroves were ranked by 8 and 7 villages respectively but with a lower rank.

Table 5: Marine resources prioritised in the IWPDP Participatory Situation Analysis

Resource	# of villages ranking the resource from 1 to 5	Composite score	Average score	Habitat
Cardiosoma Crab	9	39	4.1	Mangroves/coastal swamps
Reef fish	8	28	3.5	Coral reef
Mangroves	7	20	2.9	Mangroves
Trochus	6	10	1.66	Coral reef
Serwok/banu (Black mangrove shell)	6	10	1.66	Mangroves
Black Crab	5	18	3.6	Mangroves
Shellfish/kokias	4	10	2.5	Reef flat
Freshwater prawns	3	12	4	Rivers
Giant clams	3	6	2	Outer reef
Mud Crab	3	5	1.7	Mangroves & estuaries
Mullet	2	9	4.5	

Resource	# of villages ranking the resource from 1 to 5	Composite score	Average score	Habitat
Lobster	2	9	4.5	Outer reef
Strong Back	2	4	2	Reef
Green Snail	1	4	4	
Freshwater eels	1	2	2	River
Turtle	1	1	1	Reef, sea grass
Hermit Crabs	1	1	1	Coastal areas

3.6.3 Lakatoro-Norsup retail fish trade

Retail outlets in Lakatoro buy fish from villagers in the IWPDP project area (IWPDP 2005c). The four most significant commercial fish by weight, income to fishers and income to retailers are piko, mullet, snapper and poulet. Most retail outlets traded less than 20 kg per week of each fish and the net earnings to retailers from fish were modest (less than USD 40). The exception was the LTC store which estimated net weekly earnings from fish of USD 200. At times LTC buys up to 120 kg of snapper, tuna and poulet a week. Mud crabs, freshwater prawns and freshwater fish, coconut crabs and lobsters are sold when available but are not actively marketed. Retailers believed that the fish that sold most readily did so because customers prefer their taste. Minor reasons included ease of catch, price, availability and safety (from fish poisoning).

3.6.4 Sales of Cardiosoma

Cardiosoma are a convenient opportunistic source of income, and provide women an opportunity to earn money (IWDP 2005a). However, greater household income comes from copra and cocoa sales.

Cardiosoma are presented for sale in bundles of 10 crabs for 200 VUV (IWPDP 2005e). Information on commercial crab harvesting and vending is summarised in Table 6. Vendors voiced concerns about the difficulty in selling all their produce. Unsold goods are taken home, shared with relatives and families or swapped with other market women.

Table 6: Information on commercial crab harvesting and vending

Question	Survey of 27 market vendors (IWPDP 2005e)	Survey of 132 households (IWPDP 2005a)
Which villages sell *Cardiosoma* ?	Portindir (13), Louni (8), Barrick (4) , Pinalum (1) , and Tevaliaut (1)	Barrick, Jinenarong, Louni, Port Nabe, Portindir, Tembibi, Uri Island and Uripiv Island. Greatest volume reported from Portindir with 2 households reporting sales of over 300 crabs per week.
How often do they sell *Cardiosoma* ?	80% of vendors attended the market 1 or 2 times a week.	40% of households collected crabs for sale. Of these, 40% do so a few times a month. A further 40% collect crabs more than 5 times a month.
How many vendors at the market?	Most days 6 or less. On the government pay day 16 vendors.	
How many *Cardiosoma* are sold?	On average vendors offer 100 crabs each[1]. The minimum number offered for sale was 50 and the maximum 1,634 crabs on a government pay day. Portindir offered 1,790 crabs over the 10 day period. More than Louni 968	Most households sold less than 100 crabs per week. Households that sold more than 100 crabs were from Jinenarong, Port Nabe, Portindir, and Uri and Uripiv Islands.

Question	Survey of 27 market vendors (IWPDP 2005e)	Survey of 132 households (IWPDP 2005a)
	and Barrick 838 crabs.	
Other produce offered for sale?	Average of 5 commodities per vendor. *Cardiosoma* was the best selling commodity. Several women had success marketing corn, green coconuts and tomatoes.	
Economic value of commodities sold?	Mean value of goods offered by a vendor was 3,090 Vatu (USD$25). For 77% of vendors the value of crabs was over half the value of goods on sale. For 33% of vendors the value of crabs was over 75% of the value of goods on sale.	
Costs incurred in attending market?	Barrick and Portindir – 350 VUV Louni, Tevaliaut, Pinalum – 450 VUV Being return transport, and a market stall fee.	

1. Many vendors sell crabs on consignment for several women in addition to their own crabs. This reduces the need for all people who harvest crabs commercially to attend the market, freeing them to attend to other responsibilities and interests.

4 Crab Bay villages: socioeconomic information

Socioeconomic information incorporates both social and economic dimensions. It typically addresses such issues as the access to and use of social, economic and environmental resources and the relationships of authority and subordination within a society that often influence resource use practices.

4.1 Village institutions

Both the Vanuatu Land Use Planning Project (1996) and Bakeo et al (2004) describe village institutions in Limap. Both sources described the Presbyterian Church as the central institution (PWMU, Session, Sunday School, etc.) and accorded the Church greater influence than traditional institutions (e.g. the chief). However by 2004 a small SDA Church had been established in the village, so many Church based functions were divided, and the position of the Presbyterian Church diminished. Chiefs were a secondary institution to the Church whose role was to resolve community problems and disputes, and ensure unity of the village. In 1996 chiefs did not possess full support and cooperation from villagers. The chief's role was weakened, in part, by a decline in respect for and knowledge of traditional institutions. Poor cooperation resulted in part from overly frequent and onerous demands for community work, which prevented people from attending to personal and household economic activities.

Not all villages provided this level of detail on their village institutions. Information from Limap is consistent with the PSA observations from Louni, Barrick, and Uri Island (Bakeo et al 2004). In Portindir the chief was listed above the church in terms of influence, but there were 6 churches active in this small village. In Tarem and Tenbimbi chiefs were also listed as more influential than the Church. In New Bush, whose institutions were dominated by the SDA Church (Church, Dorcas, Pathfinders, etc.) chiefs were not discussed as an institution. Both religious and secular institutions were weakened by limited respect and cooperation.

4.2 Resource access

Since at least 1990, and probably longer,[3] there has been open access to the food resources of Crab Bay (Lal and Esrom 1990; Bakeo 2004). It is not clear whether this is a *de facto* right, a right bestowed by customary owners or a right that carries responsibilities and allegiances. Weaknesses typical of common property resources are observed in trend analyses presented in Vanuatu Land Use Planning (1997). These include issues such as limited personal economic benefit from management of harvesting; lack of clearly defined responsibility; and limited direct benefit from adherence to imposed management measures.[4]

4.3 Mangrove wood

Mangrove wood was collected by women, men, youth and children from Uripiv Island, Uri Island and Portindir, although men collected mangrove wood more frequently (IWPDP 2005b). These villages used mangrove wood regularly as firewood as well as for house poles and posts. Mangrove wood was collected by men and youth in Barrick, Limap, Lingarakh and Tevaliaut, where mangrove wood is mainly as house or fence posts.Use of mangrove wood was not reported by respondents from the villages of Bushman's Bay, New Bush and Tarem/Tembibi. Only one respondent from Lingarakh reported use of mangrove wood: green mangrove wood for fence posts.

Table 7: Locations where mangrove wood is collected.

Village	Harvesting sites
Uripiv	Uri Island, Nanwut, Port Unwut, Bare
Portindir	Sale, Portindir area, Jinenarong, Salamara
Louni	Louni area
Barrick, Hatbol, Limap, Tevaliaut	Amal Crab Bay area

Source: (IWPDP 2005b).

Common collecting sites are listed in Table 7. Only three respondents from Limap and one from Uripiv specifically mentioned that they harvested mangrove wood from within the Marine Protected Area (MPA).

4.3.1 Mangrove wood as a fuel

Mangrove wood is used for firewood at least once a week by 75% of people interviewed from Uri Island and 40% of people interviewed from Uripiv Island (IWPDP 2005b). Mangrove firewood was used once or twice a month by 75% of people interviewed at Barrik and Portindir Elsewhere it was used occasionally or not at all.

Mangrove firewood was typically gathered dry, and was gathered by both men and women. Six people interviewed used any kind of mangrove wood as firewood. People from Uripiv Island who used mangrove wood used a minimum of five different mangrove species.

The five most common alternate sources of fire wood were Namatal, Navenue, Burao, Kassis and Stinkwood. Most people interviewed used these woods between 1 and 5 times a week.

[3] Trend lines in Vanuatu Land Use Planning Project (1996) suggests the issue of "more and mixed people" started to affect resource management in the 1980s, and that "other" people have harvested the crab at significant levels since 1985.

[4] Common property resources are rare in Vanuatu, although shared or group title is common. Landownership implies resource ownership or stewardship rights. Stewardship responsibilities are often exercised as an integral component of custom or to confirm and assert ownership rights (Whyte et al 1998).

Table 8: Scientific names of listed tree species

Common name	Scientific name
Namatal	*Kleinhovia hospita*
Navenue	*Macaranga* spp.
Burao	*Hibiscus tileaceus*
Kassis	*Leucaeuna leucocephala*
Stink wood	*Dysoxylum* spp.
Mango	*Mangifera indica*
Namambe	*Inocarpus edulis*
Citrus trees	Various spp.
Natapoa	*Terminalia catappa*

4.3.2 Mangrove wood as house posts

All respondents from Uripiv and all but one respondent from each of Louni, Portindir, Tevaliaut and Uri Island reported using mangrove house posts (IWPDP 2005b). Thirty per cent of respondents from Limap reported using mangrove house posts. People interviewed from Bushman's Bay, Lingarakh, New Bush, and Tarem/Tenbimbi did not use mangroves for house posts.

Mangrove house posts were an occasional need, sourced a few times a year or less, reflecting the durability of housing. More frequent use (more than once a month) was reported by over half the people interviewed from Uripiv and Uri Islands, Barrick and Louni.

Wood for house posts was commonly gathered by men (IWPDP, 2005b). Green wood from *Ceriops tagal* and *Rhizophora mucronata* were preferred. The most common alternate sources of house posts were Burao, Kasis, Namalaus, and Natora. Navenue and Burao blong Solwora (or Jeli) were reported from Uripiv Island.

4.3.3 Mangrove wood as fence posts

Mangrove fence posts were used by all respondents from Uripiv Island; all but one respondent from each of Louni, Portindir, and Uri Island; and two thirds of respondents from Tevaliaut. At Limap and Lingarakh only one respondent reported use of mangrove fence posts. Use of mangroves as fence posts was not reported from Bushman's Bay, Hatbol, New Bush and Tarem/Tenbimbi.

Eighteen respondents from Uripiv Island (90% of Uripiv respondents) reported monthly or weekly use of mangrove fence posts. Fifty per cent of respondents from Uri Island, 40% of respondents from Louni and 25% of respondents from Portindir used mangrove posts on a monthly basis. Green wood from *Ceriops tagal* and *Rhizophora mucronata* are preferred as fence posts.

4.3.4 Other uses of mangrove wood

Other uses of mangrove wood were limited. Reported uses included poles in gardens, place markers, bows, arrows and spears, an axe handle and house rafters.

4.4 *Cardiosoma* crabs

Cardiosoma crabs are a common meat of villagers within the project area. While most meats are eaten a few times a month, *Cardiosoma* are typically gathered 1 to 4 times a week by 95% of the local households. At times they are eaten daily (IWPDP 2005a). Harvesting levels were lower for Bushman's Bay and New Bush, and less frequent for more distant villages such as Taremb and Tenbimbi. The number of crabs eaten by a household at a single meal depended on the number of people present and the availability of crabs. Household consumption of up to 20 crabs a meal is common.

Villagers typically spend 3 to 5 hours to gather a rice bag of crabs (30 to 50 crabs). Over 90% of households gather crabs during the day time, while just under half of households also use a light to collect crabs at night; 20% also dig them from their holes. Baits are not common.

When crabs are less plentiful more time will be spent to collect a rice bag full of crabs, or fewer crabs might be collected.

Forty per cent of households sell some of the *Cardiosoma* they collect, and 40% of these households collect crabs for sale more than 5 times a month. A similar proportion collects crabs for sale 2 to 4 times per month.

Households also collect *Cardiosoma* to share or exchange with their relatives, or allow their relatives and friends to collect their own crabs, a few times a month.

The locations where each village collected *Cardiosoma* are listed in Table 9. *Cardiosoma* were collected from mangrove habitats (78% of people interviewed); from forest habitats (55% of people interviewed); from plantations (22% of people interviewed); and beaches (21% of people interviewed) (IWPDP 2005a). Some 70% of the *Cardiosoma* offered for sale during the survey period were collected from three locations: Nunebeken and nearby areas; Losarsar and nearby areas; and Louni (IWPDP 2005e).

In Barrick, Louni and Hatbol mainly women collected *Cardiosoma* (IWPDP 2005e). In all other villages both men and women harvested *Cardiosoma*. It is uncommon for children to harvest them.

Table 9: Crab harvesting areas by village

Village	No of people interviewed	Main Crab Harvesting Areas	Places mentioned by < 20% of respondents
Barrick	5	Crab Bay, Near Amal	Near MPA, MPA
Bushman Bay	3	Losarsar	
Jinenarong	5	Loloburbur	Nunebeken, Bushman's Bay, Jinenarong
Hatbol	13	Near MPA, Bushman's Bay	
Limap	10	Near MPA, Nivghalghor	MPA area
Lingarakh	13	Near MPA	
Louni	10	Louni, Louni Passage	Near MPA
Mapbest	1	Fred's Plantation	
New Bush	4	Louni	
Port Nabe	7	Bare, Nunebeken	Nanwut
Portindir	9	Nunebeken	Tasis, Portindir Bay, Sale Portindir area
Robako	2		
Taremb	9	MPA area	
Tembibi	10	MPA area	Near MPA, Bushman's Bay
Tevaliaut	14	Mapbest, Other	Near MPA, Louni, Other Crab Bay
Tevri	12	Nunebeken, Bare, Nanwut	
Uri Island	4	Bare area, Portindir Bay, Nonoru Natou, Nonwat Welele	
Vilavi	1	Bare area	

4.5 Reported decline in marine resources

Local observation suggested marine resources have declined in abundance since 1975 (Vanuatu Land Use Planning 1997; Bakeo et al 2004). This decline has been associated with both natural and human influences (Table 10).

Table 10: Factors associated with decline in marine resources

Natural factors affecting marine resource abundance	Human factors affecting marine resources abundance
A particularly dry season in the 1980s during which many crabs died.	Population increase in the Crab Bay area contributing to increased harvesting levels.
Damage to mangrove and coral habitats as a result of cyclones and coastal uplift.	New fishing techniques leading to increased catch rates and a less discriminating catch than traditional methods.
Damage as a result of flooding.	In-migration leading to not only more people living in the area, but a mix of cultural groups neither understanding nor bound to respect local custom.
	Resources gaining commercial markets as well as subsistence uses in the 1980s.
	Loss of mangrove habitats as a result of clearing and wood gathering.

4.6 Decline in traditional management structures

Vanuatu Land Use Planning Project (1996) reported that the ability of Limap's chiefs to impose tabus on the crab resource had already declined before 1980, but that since 1980 the rate of decline had increased. The changing social structure around Crab Bay was an important contributing factor: changes included a larger population; in-migrants not owing allegiance to local custom groups; and distance of the chiefs from the coast. Loss of customary values and respect for custom are contributing factors. Custom values have declined steadily since the conversion to Christianity, as early missionaries discouraged many custom practices. Much custom knowledge was lost when older villagers died.

Respect within and between communities was perceived to have declined, but to a lesser degree than custom. This reflected both the loss of customary values and the introduction of modern influences such as various forms of alcohol, kava, discos, religion, football, and videos that present or encourage alternative forms of behaviour.

4.7 Resource management systems

A hybrid marine resource management system is in place in Crab Bay. This maintains some elements of traditional systems, while incorporating modern aspirations and methods. This includes use of modern fishing technology (e.g. nets, lines and hooks, spear guns, and outboard motors); changes to userfruct rights; changes in people's goals to include commercial activity as well as subsistence consumption and sharing; decline in the passage of traditional knowledge of the resource base; and new authorities and regulations imposed from outside (e.g. a national constitution and specific fisheries regulations). The Fisheries Department, in agreement with chiefs, has recommended a commercial catch limit of 50 crabs per woman, standard presentation of *Cardiosoma* in bundles of 10 crabs and standard pricing (P. Malosu, pers. comm.). As vendors sell on consignment from other women, it could not be confirmed that these limits were adhered to.

Traditional elements that have been retained include the rights of chiefs and landholders to close areas using tabus. The application of tabus to *Cardiosoma* was considered in IWPDP 2005a. While most respondents were aware of one or more resource management tabus, there was wide variation in their knowledge and understanding. In the case of the Crab Bay Protected Area, there was a diversity of opinions as to who established the area, who held responsibility and specifically what it protected.

Similarly, respondents held a diversity of opinions as to whether resource management tabus had been effective. Those believing resource management tabus were effective emphasised

three factors:

a) respect for the tabu/protected area itself. The concept of respect for the initiative was supported by comments about concern for the environment, concern about resource depletion, awareness of the situation and a desire for resources to be more plentiful;

b) respect for the chief/chiefs who initiated the tabu; and

c) fear of the penalties. Two respondents mentioned good enforcement in support of this aspect.

Those respondents who felt resource management tabus had been ineffective largely presented an opposite set of views:

a) people did not respect the tabu;

b) people, chiefs and other leaders did not cooperate well; and

c) Other claims (income, meat, rights) were thought to be more pressing than concerns about the penalties.

5 Discussion

This chapter presents information gaps and raises key issues for implementation of the IWPDP. The discussion recognises the subtle differences between social, economic and socioeconomic information.

5.1 Information gaps

The IWPDP has compiled primarily social and economic information. Key socioeconomic issues relating to the relationships of authority and subordination within villages and the use and control of social, economic and environmental resources have not yet been addressed. Information which the IWPDP will benefit from includes the following.

- Comparison of the roles, social and economic position of in-migrants, temporary workers and long term residents; their existing and emerging links with the land owners of the area; and their relative rights as resource users.
- The comparative wealth and comparative resource use patterns of villagers, to allow better targeting of project initiatives.
- Relationships of authority and leadership responsibilities within each of the villages, and within the area as a whole.
- Processes for the transfer of leadership and leadership succession.

There is also a lack of information about individuals' attitudes towards the conservation measures being discussed and implemented in the Crab Bay area, and the personal values which underpin these attitudes. Greater understanding of the prevailing values and attitudes will guide activities that seek to influence behavioural change. The surveys have only established that there is variable knowledge about the conservation initiatives and varying perspectives on the outcomes of local conservation measures.

Community participation is easiest to achieve where initiatives clearly address people's priorities. IWPDP needs to more broadly identify people's social and economic priorities, and place project activities within this context. IWPDP (2004) focused on coastal marine resources and so failed to establish the broader context of local needs, wants and aspirations.

Tabus and village by-laws have been in place since at least 1996 to protect portions of the mangroves and *Cardiosoma* crabs. However, IWPDP (2003) infers that the decline in resource

stocks and *Cardiosoma* crabs in particular continues. More work is required to understand factors contributing to this outcome. Questions include the following:

- Has there been insufficient time for stock replenishment?
- Is enforcement capacity inadequate or has there been insufficient management, in that important management needs have been neglected?
- Is there a lack of commitment among resource users, or is the Tabu Area of itself insufficient to arrest decline of the resource stocks? (If so extended or more diverse initiatives will be needed).

The IWPDP should explore the situation in more detail to avoid supporting a conservation initiative that is inherently unable to meet its goals.

5.2 Considerations for project implementation

1. The broad resource use and management strategies of the villages and of individuals within each village differ, especially in key areas of use and management of mangroves and *Cardiosoma* crabs. For example, only a few communities participate to any degree in commercial fishing. In some villages subsistence fishing is an everyday practice engaged in by most households, while in others less than half of the households fish regularly. In some villages both men and women collect dry mangrove wood while in others only men cut green mangrove wood. IWPDP project activities will benefit from carefully tailoring initiatives to the situation existing in each community, rather than adopting an overly generic approach.
2. Comparison of IWPDP (2004) with Land Use Planning Project (1996) suggests there has been limited progress in implementing the 1996 CARMAP for Limap village. Understanding the strengths and weaknesses of the CARMAP and its implementation strategy will help the IWPDP nurture more effective community planning and implementation strategies and avoid repetition of its weaknesses. Individual and group discussions with villagers and professionals with local experience may give broad historical insights. Possible weaknesses in the CARMAP include (i) the level of reliance on external organisations to directly implement action plan priorities; (ii) a largely unmet assumption that Provincial staff and public servants based on Malekula would provide on-going facilitation of the community implementation strategy; and (iii) the absence of an on-going process and adaptive management philosophy (i.e. a stakeholder enquiry to assess "that has not worked, why, what might we do now?").
3. Locally based resource management is more likely to be successful where there is an internal "locus of control".[5] Details within Land Use Planning Project (1996) and Tari (2004) suggests villagers in the Crab Bay area may tend toward an external locus of control. The IWPDP may benefit from activities that nurture local capacity and initiative, and build local responsibility. A participatory action and learning approach with gradual adaptation of management solutions may help achieve this outcome.
4. It is normal for government and NGO projects in Vanuatu to liaise with communities through the chiefs. The IWPDP needs to recognise that the chiefs in the Crab Bay area no longer receive full support and cooperation from villagers. The project may need to consider supplementary approaches to effectively reach and engage those people in each village that tend to not fully cooperate with the chief's requests.

[5] Locus of control is a term used by behavioral scientists. People with an internal locus of control perceive that they are in control of their own destiny and able to act to achieve desired outcomes. People with an external locus of control believe that they do not have this capacity, and either believe in pre-determined fate or that what eventuates is controlled by external influences, either powerful individuals, authorities or a deity.

5. Poor cooperation with chiefs is in part a consequence of onerous requests that are not adequately aligned with personal priorities. The IWPDP will need to be careful not to place too great an expectation or burden on villagers. Ideally project activities should complement household priorities. The IWP project might also benefit from identifying and engaging at an early stage natural leaders and champions for conservation within the eleven villagers.

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