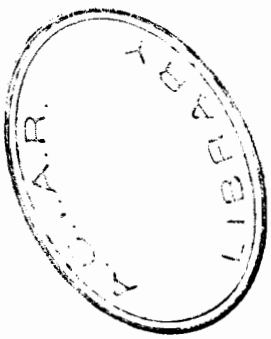
Protected Area Assessment and Establishment in Vanuatu



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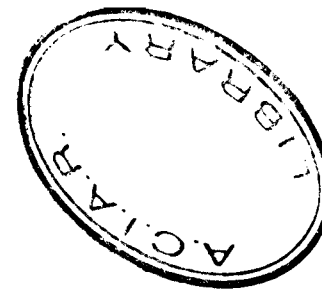
Protected Area Assessment and Establishment in Vanuatu:

a Socioeconomic Approach

Editors: Luca Tacconi and Jeff Bennett



ACIAR

Canberra 1997

Foreword

In recent years, the focus of agricultural research and development targeted at improving poverty alleviation and food security has gradually broadened to also include concerns for conservation of natural resources, efficiency in resource use, and inter and intragenerational equity. However, no single theoretical framework is currently available that can be used to fully address all these objectives simultaneously and at the same time ensure that the research carried out is both relevant and has an impact on the decision-making process—a process which is particularly difficult in the presence of imperfect or inadequate information.

ACIAR is supporting a number of research activities to help partner countries address their priority agricultural use and management problems while also promoting the development of theoretically sound and policy-relevant practical economic frameworks to achieve management goals of resource sustainability, efficiency in resource use and inter and intragenerational equity. A recently completed ACIAR project, *The socioeconomic assessment of native forest use in Vanuatu*, is one such research activity, the results of which are reported in this book

The project helped local communities, and provincial and national governments, to establish forest and coastal conservation areas on Erromango and Malekula islands in Vanuatu. The researchers adopted a participatory-action approach stimulating local communities and other stakeholders to identify their own needs and wants, and to work closely with each other to design a system of protected areas to suit their respective views regarding forest conservation and management. In such an approach, a policy researcher largely functions as a facilitator and 'transdisciplinary' analyst drawing on a range of science and social science disciplinary-based expertise and using an evaluation framework broader than traditional neoclassical cost–benefit analysis.

The book makes a significant contribution to the development of the emerging ecological-economics paradigm and its application to resource use and allocation problems in the presence of inadequate ecological and economic information and evolving institutional structures. It also demonstrates the need for adopting participatory approach to ensure agricultural research is, on the one hand, relevant to the needs and aspirations of local communities and other stakeholders and, on the other, ensures the development of government policies which are likely to be effective in increasing sustainability, and intra and intergenerational equity in the long term.

Padma Lal
ACIAR 1997

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Preface

The methods of economic analysis of environmental issues have improved significantly during recent years, and are evolving continuously. In this context, the economic valuation of resources and ecosystems is an area that has received particular attention. Economic valuation studies normally focus on the values (expressed in monetary form) of the environment. This monograph goes beyond the area normally covered in valuation studies. The work presented here considers ethical issues as they relate to the (economic) management of ecosystems, details the institutional features that influence ecosystem management and attempts to assess the value of ecosystems. Moreover, the research presented here was designed so as to maximise the likelihood of implementation of research results. To achieve this objective, the research work was carried out in close consultation with the various stakeholders.

This collaborative approach is in line with the emphasis that the Australian Centre for International Agricultural Research (ACIAR) puts on collaboration between stakeholders in developed countries and those in developing countries. To foster this collaboration, ACIAR funded the research project on which this monograph is based. The project 'The socioeconomic assessment of native forest preservation proposals in Vanuatu: implications for forest management' (ACIAR Project No. 9020) was carried out during the period July 1992–June 1996. The University College, University of New South Wales was the commissioned organisation. The partner organisation in Vanuatu was the Department of Forests.

This monograph is an edited collection of some of the research reports published as part of ACIAR Project No. 9020 by the School of Economics and Management, University College, The University of New South Wales, Canberra, ACT 2600, Australia.

Luca Tacconi, Jeff Bennett
Canberra

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Several staff members of the School of Economics and Management, University College, The University of New South Wales, provided useful comments during seminars. Professor Jordan Louviere, University of Sydney, Dr Joffre Swait, University of Florida, and staff of REARK Research provided advice and assistance in conducting the analysis reported in Chapter 10. We would also like to thank Dr Padma Lal, Coordinator of the Agricultural and Natural Resource Economics program at ACIAR for her valuable comments in the final revision of the manuscript for this monograph.

Part I

Background

1 Introduction

Jeff Bennett
Luca Tacconi

1.1 Forests and Biodiversity

The existence of humans and all other species depends on the maintenance of ecological processes that provide life-support systems. Ecosystems influence climatic conditions and the hydrological cycle, generate and sustain soils on which waste assimilation and nutrient-cycling functions depend and maintain the gene pool needed to ensure the continued evolution of life. These processes are fundamental to the existence of human and non-human life.

Humans have aims that extend beyond survival. The improvement of well-being, whether at the personal or family level, or at higher aggregational levels is a common human concern. The economic process contributes in many different ways to human well-being. For example, it facilitates the production of goods and services that people want to consume. Ecosystems provide services that enter the economic process as inputs, such as timber, and genetic material used to increase crops resistance to pests. They also supply resources that are consumed directly, such as food.

Forests exemplify the multiplicity of services provided by ecosystems. They provide genetic material useful in many different ways; regulate water run-off and soil erosion; temper the climate; are a source of timber and non-timber forest products; are the home of people, fauna and flora; are objects of religious values; and are a medium for recreation, education and research (Jacobs 1988).

One important aspect of the ability of forests to provide this array of benefits is their capacity to maintain biodiversity. The term biodiversity is used here to refer to the diversity of genes, species and ecosystems. Biodiversity also comprises the linkages between these different levels of the biological hierarchy; i.e. biodiversity tends to imply complex rather than simple biological systems, or ecosystems.

Genetic diversity can be considered at different levels (e.g. population, species) and provides the basis for speciation. The productivity and resilience of populations may be related to their genetic composition. *Species diversity* refers to the variety of species within a specified area. The existence of populations of a species in geographically and environmentally distinct areas is considered important in order to maintain diversity in the gene pool and to protect the species against events such as epidemics of disease or outbreaks of predators that could exterminate some populations (Norton 1987). *Ecosystem diversity* refers to the variety of biotic communities and habitats, and to the diversity within ecosystems. Ecosystem diversity is normally considered at the landscape and regional level. At the landscape level, diversity includes a variety of ecosystems and is important due to the biogeographical characteristics (e.g. patterns, juxtapositions and interconnectedness) that allow for the free movement of individuals and for the maintenance of the shifting patterns of ecosystems (Noss and Harris 1986).

International concern for biodiversity loss culminated in the ratification of the *Convention on Biodiversity* at the United Nations Conference on Environment and Development (UNCED) in June 1992. The objectives of the convention are the conservation of biodiversity, its sustainable use for the benefit of both current and future generations, and the equitable sharing between countries of the products derived from genestocks. Three principles adopted in the final declaration of the conference (Rio Declaration on Environment and Development) make explicit the preferred underlying approach to biodiversity policies. These principles state that: a) the right to development should be achieved by equitably meeting the developmental and environmental needs of the current and future generations; b) environmental protection shall constitute an integral part of the development process so that sustainability may be achieved; and c) the precautionary approach should be widely adopted to protect the environment.

The critical importance of maintaining biodiversity for the viability of ecological and economic systems has also been recognised and described in the *Global Biodiversity Strategy* (WRI et al. 1992), an approach developed through a worldwide consultation process with experts and government and non-government organisations.

While there has been a growing recognition of the importance of biodiversity and of forests acting a source of biodiversity, forests have been in decline. This has been largely the result of growing exploitative demands on forest ecosystems for items such as timber and through clearing land for agriculture. Pressures on the supply of forests are particularly apparent in tropical areas.

With demands for both the conservation and the exploitation of forest ecosystems growing, and the supply of this resource shrinking, decisions regarding the use of what remains are increasingly difficult to make and more hotly contested.

1.2 A Role for Governments

Decision-making regarding the use of the world's remaining forests is invariably a complex issue. Leaving choices to individuals in markets will not necessarily result in an allocation of forest ecosystems that serves society best. While extractive, commercial uses of forests are well represented in a market-based allocation, the non-extractive, non-commercial uses by both current and future generations are largely unrepresented. The result is over-exploitation.

There is thus a potential role for national governments and international agencies to play in determining the appropriate allocation and distribution of the forest resource. But what precisely that role should involve is not readily generalised. Certainly, it would appear, prima facie, that some action to conserve forest resources is in order.

1.3 Protected Areas

Initiatives by governments to establish *protected areas* (PAs) fulfill the requirement for increased forest conservation. PAs are an important means of conserving forest biodiversity, but they will not, on their own, ensure this happens. PA establishment must be complemented by other policies such as changes in legislation and conservation measures outside reserves. PAs alone can help in conserving only a portion of the existing species. For example, Reid and Miller (1989) have estimated the

contribution of PAs to species conservation in tropical forests in the event that all tropical forests were to be cleared with the exception of those in legally protected areas. The following percentage of species would survive: Africa 37–65%; Asia and Pacific 44–71%; and Latin America 28–58%.

Currently, PAs cover just over 5% of the earth's land area[1] (WCMC 1992). The International Union for the Conservation of Nature (IUCN) categorises PAs on the basis of their conservation objectives. A PA usually has multiple conservation objectives, such as the conservation of genetic resources, the control of erosion and sedimentation, the maintenance of indigenous use and the provision of recreation and tourism opportunities. They may be established in relatively unmodified habitats or in areas highly influenced by human intervention, such as the protected landscapes found in Europe.

In the past, the conservation of biodiversity was an objective of minor importance in the establishment of PAs. The choice of PA sites was often based on their recreational and tourist potential or because they could not accommodate other land uses (e.g. Hall 1989). Now, however, biodiversity conservation has become an increasingly important goal in the establishment of PAs (e.g. Braatz et al. 1992; Nilsson and Götmark 1992; HRSCERA 1993).

Acknowledging the importance of biodiversity and recognising a role for governments in the establishment of PAs are the first steps. The next step is to assemble a framework that will guide the development and implementation of policy. Such a framework is not easily put together. Its key elements must not only guide the determination of the nature and extent of PAs to be established, but also set out the institutional structures needed to ensure that the whole process is effective. These are difficult tasks, not least because the establishment of PAs is not necessarily an option free of cost. PAs can have adverse effects on people who have relied on an area's resources as a source of wealth. Furthermore, the requisite framework is difficult to generalise across the wide geographic array of areas that deserve attention.

1.4 A Protected Area Socioeconomic Framework

This monograph presents a socioeconomic framework for the assessment and establishment of PAs. Cost–benefit analysis, with its fundamental notion of trading-off the costs of alternative resource allocations against their benefits, underpins the efficiency considerations of the framework. The presumption is that a policy should aim to increase the net wealth of society, noting of course that wealth is defined in its broadest sense to encompass monetary and non-monetary assets. The framework, however, goes beyond efficiency concerns. Equity considerations are incorporated at two levels. At the intragenerational level, the framework stresses the requirement for forest conservation policies to ensure that those who bear the costs of forest conservation—notably the local landowners who give up potential wealth from commercial extractive forest ecosystem uses—are not made worse off. At the intergenerational level, it is argued that a minimum degree of equity would be afforded by the establishment of PAs of forest that maintain essential levels of natural capital on which the world depends for survival.

1. This figure refers to only the first five categories of the IUCN classification system: scientific reserve (I), national park (II), natural monument (III), managed natural reserve (IV) and protected landscape (V).

A methodologically pragmatic approach has been taken in the development of the framework. Where a technique has shown merit in application it has been employed. The traditional boundaries of 'neo-classical' and 'institutional' economics have been ignored. Furthermore, the approach taken has been strongly orientated to action and outcomes. This has required close collaboration with stakeholders.

To make the monograph readable to a wider audience, theoretical arguments have been kept to a minimum where possible. Those readers interested in more theoretical issues may consult Tacconi (1995c).

1.5 Applying the Framework

The framework established is independent of geographic location, although it is primarily aimed at developing countries. Indeed, the application of the framework focuses on the forests of the Republic of Vanuatu. The Vanuatu experience is a case study of a wider international situation. While it is generally recognised that levels of environmental degradation and depletion are currently low in Vanuatu, the issue of forest, and hence biodiversity, loss is of concern. The traditional owners of the forest have been subjected to increasing pressure from overseas interests to sell the rights to log their forests. The Vanuatu Department of Forests, which has the responsibility for approving licences to log, has come under similar pressure. At the same time, however, landowners have become increasingly concerned about the environmental impacts of logging and the world community has been exerting pressure for forest conservation on the Government of Vanuatu at numerous international meetings.

Two case studies are detailed, each involving a very different approach to forest conservation policy. The first entails the establishment of the Erromango Kauri Protected Area. In this case, government involvement is direct, at both national and international levels. The area has been secured for conservation through the establishment of a lease between local landowners and the Vanuatu Department of Forests. The lease payments are designed to compensate the landowners for the royalties that they could otherwise have earned from allowing their forests to be logged. Funding for the lease payments for the first five years has been provided by an aid grant from the European Union. In this way, the international demand for forest conservation has been mobilised to compensate the local people.

The second case details a number of PAs identified and assessed on the island of Malekula. Here, no compensation payments would be required to see the PAs set up, because the local people have decided that the benefits they enjoy from conserving the forests are greater than those they could earn from logging royalties. The role of government in this case is simply to establish the appropriate legal institution—a local government council by-law—to give force to the decisions made by the local people.

The approach recommended on the basis of these two studies is for governments, in the first instance to encourage landowners to consider the option of the by-law approach to set up 'voluntary' PAs. Once this avenue has been exhausted, and if there are areas of unprotected forest remaining that can be regarded as critical natural capital, then the compensation approach could be used to secure these areas for conservation.

The pursuit of the compensatory approach relies on the mobilisation of international demand for tropical forest conservation in money terms. Funds must be raised to pay compensation. The final part of this monograph considers this issue. Two studies are reported which demonstrate that Australians who visit Vanuatu, and even those who have never been there, value the conservation of the forests. That information is useful to those seeking funds for Vanuatu forest conservation. The Government of Vanuatu may use it to design a scheme to raise funds for conservation from tourists. Overseas aid agencies may use it to justify aid payments for forest conservation, similar to the European Union grant for the Erromango Kauri Protected Area. Non-government organisations may use the information in fund-raising campaigns.

2 Forests and Biodiversity in Vanuatu

Luca Tacconi
Jeff Bennett

2.1 Introduction

An extensive knowledge of the natural environment is held within ni-Vanuatu[1] society. Additional information about the functions of forest ecosystems and biodiversity, their distribution and availability, their current uses and the rules regulating their use may be integrated with local knowledge. This provides base of knowledge for the development of responses to increasing demands put on these ecosystems. This chapter summarises the information available.

First, the physical and population geography of the country are briefly described. Qualitative and quantitative aspects of forest ecosystems are then described. This information is derived to a large extent from the database of the Vanuatu Resource Information System (VANRIS) (Bellamy 1993). A summary of the information available on biodiversity is then presented, before proceeding to an overview of some studies about forest use by local people. This is followed by an outline of land tenure legislation in Vanuatu.

2.2 Geography

The Republic of Vanuatu is located in the western Pacific Ocean (Figure 2.1). It is a 'Y'-shaped archipelago comprising more than one hundred islands and islets which extend about 800 km north to south. The total land area is about 12270 km^2.

The climate gradually changes from tropical in the north of the country to sub-tropical in the south. Mean annual rainfall is normally greater than 2000 mm for all islands, with the northern islands reporting a higher annual rainfall than those in the south. Most islands receive more annual rainfall on the windward—eastern and southeastern—sides. On the leeward sides, total annual rainfalls of less than 1800 mm and greater seasonality in rainfall are recorded. At Port Vila, the national capital situated on the central island of Efate, the average humidity is about 80% and average yearly rainfall is about 2300 mm. During summer, from December to April, all islands of the archipelago may experience cyclones.

Approximately half of the islands and islets of Vanuatu are inhabited. The most recent national census (1989) recorded the total population at 142944 (Government of Vanuatu 1991). Contact with Europeans in the 19th century resulted in a decline in total population because of the introduction of exotic diseases and 'black-birding' whereby local people were 'recruited' to work in sugar and cotton plantations in Queensland, Fiji and New Caledonia. It is very difficult to give even

1. A ni-Vanuatu is an indigenous person of Vanuatu.

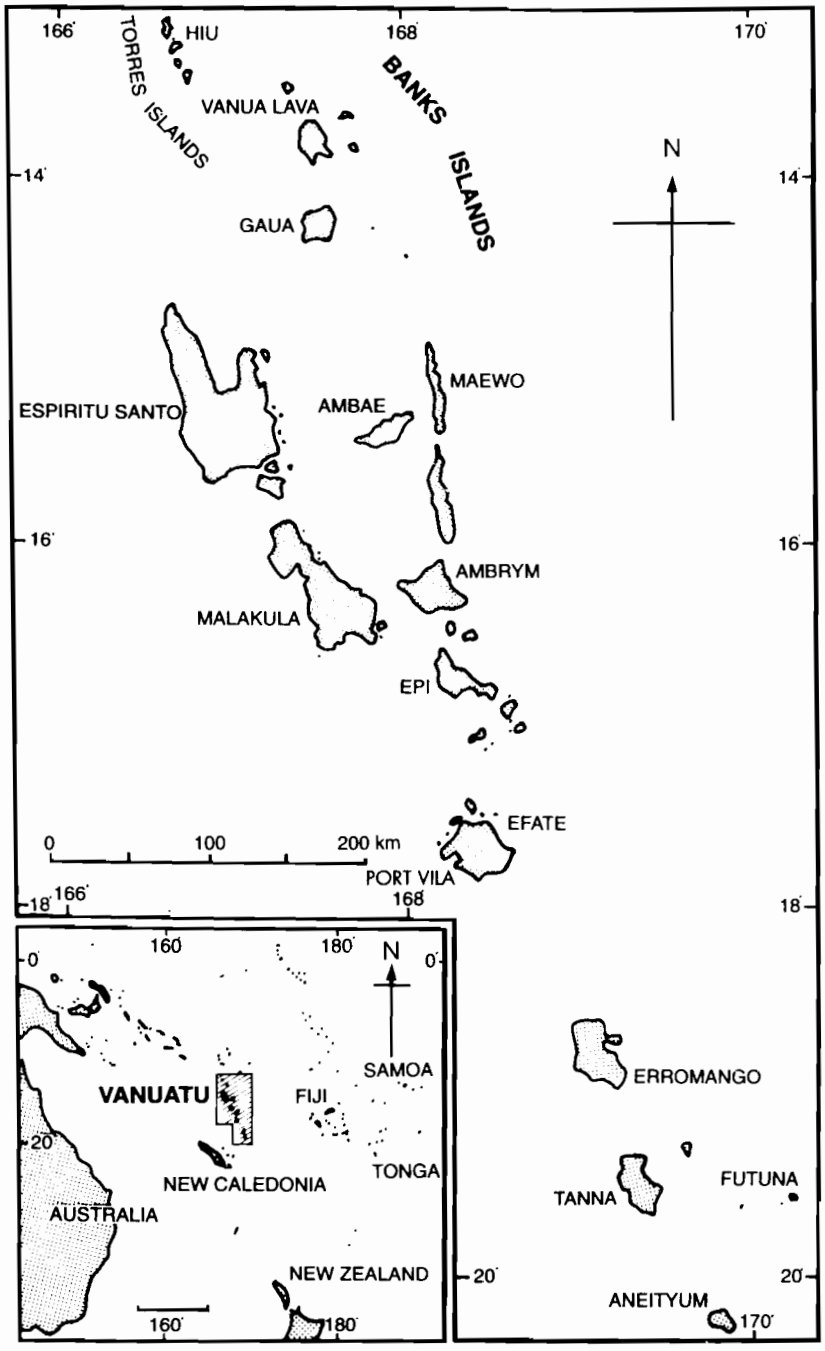

Figure 2.1 Map of the Republic of Vanuatu.

an approximate estimate of the pre-European-contact population in Pacific countries (Scarr 1990). However, it is thought that the pre-contact population was considerable greater than current levels.

Total population doubled between 1967, when the first full census was conducted (77,988 inhabitants), and 1989. Despite the high population growth rate—2.4% per annum between 1979 and 1989—the population density is still relatively low (11.6 inhabitants per km^2). The population is, however, distributed unevenly across the country, with some small islands having a population density of more than 100 inhabitants per km^2.

The population is mainly concentrated along the coastline (see CSIRO and DPI 1993). This is partly due to the strong migration flows from inland areas to coastal areas, a phenomenon which begin with the arrival of the Europeans in the 19th century. Ni-Vanuatu were attracted to the coastal areas by the presence of missions, health facilities, schools and trade posts.

Vanuatu is one of the most culturally diverse countries in the world, with more than one hundred languages spoken. The cultural diversity is often associated with a variety of different systems of land tenure. French and English are both spoken widely across the country, and Bislama (Vanuatu pidgin English) is the *lingua franca*.

Land tenure arrangements vary across the country. In relation to the inheritance of land rights, both matrilineal and patrilineal systems are found. Land property rights are normally held by individuals or families. This system of land rights differs from that of Papua New Guinea where land rights are often held by clans, which are groups relatively larger than family groups in Vanuatu.

2.3 Qualitative and Quantitative Features of Forest Ecosystems

Because of the geological youth of the country and its isolation, forest ecosystems[2] in Vanuatu are not as diverse as those found in Southeast Asian countries, Papua New Guinea, Solomon Islands and New Caledonia. In general, they present a relatively low rate of endemism (Schmid 1978). The vegetation structure has been extensively influenced by volcanic activity, cyclones and centuries of human inteaction with the environment, and by rainfall, altitude and soils.[3]

The vegetation types of Vanuatu and their areas are presented in Table 2.1. This table shows that just over one third of the country is forested, with thicket formations approximately matching the forest cover in area.[4] The forests of Vanuatu

2. The definition of forest ecosystem used here is that given in the Vanuatu Resource Information System database (VANRIS): ecosystems where vegetation cover is primarily composed of trees more than 10 m tall.

3. Secondary forests and thicket formations which cover extensive tracts of depopulated inland areas are partly due to the shifting cultivation activities of the pre-contact population.

4. The VANRIS inventory of forest resources (completed in 1993) is based on aerial photographs taken during 1984-86. Thus, forested land area and the extension of the various forest types are overestimated, given that the deforestation caused by logging and agricultural activities carried out during 1984-86 to 1993 are not accounted for.

are not as tall as those of Southeast Asia, Papua New Guinea and Solomon Islands. They rarely exceed 30 m in height. Forests with trees more than 20 m tall (hereafter called 'midheight forests') occupy less than 17% of the total land area; a further 19% of the land area is covered by low forests (trees 10–20 m tall).

Table 2.1 Vegetation cover of Vanuatu.

Vegetation type	Area (ha)	Percentage of land area
Midheight forest (20–30 m)	205307	16.73
Low forest (10–20 m)	234089	19.08
Woodland (<10 m)	386	0.03
Thickets (3–8 mm)	433941	35.37
Scrub (<3 m)	45018	3.67
Grassland	51128	4.17
Swamp communities	2261	0.18
Mangroves	2519	0.21
Other [a]	252256	20.56
Land Area	1 226 905	100.00

[a] Bare ground, or agricultural and inhabited land.

Vanuatu forest types have been described by several authors (Schmid 1978; Dahl 1980; Barrance 1988) and may be broadly summarised as follows:

(a) Lowland rainforest —
  (1) climax closed-canopy high forest, which is found mainly on windward wetter slopes, and
  (2) cyclone-perpetuated two-storeyed closed-canopy high forest, such as the kauri (*Agathis macrophylla*) forest on Erromango;

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

(c) altitude-influenced forest (montane and cloud forests) — found for instance on Santo and Tanna;

(d) riverine and swamp forest; and

(e) mangrove forest.[5]

VANRIS provides a more detailed classification of forest types. This is given in Table 2.2 along with their locations and associated climatic types and annual rainfall. The forest cover by region is presented in Table 2.3. The areas of forest on terrain with a slope of less than 30° and areas of forest defined as technically loggable are also reported.

In Vanuatu, the code of conduct for logging, enforced by the Vanuatu Department of Forests, does not permit logging on terrain with a slope greater than 30°. 'Loggability' is defined by a combination of parameters describing slope, landform and soil erodibility. For instance, a forest on a slope of 20–30° in a dissected landform has a loggability between 20 and 40%, depending on soil erodibility.

5. This vegetation type is not classified as forest in VANRIS because mangrove trees are normally less than 10 metres in height.

Table 2.2 Vanuatu forest types, areas, locations, and local climate and rainfall.

Vegetation type[a]	Area (ha)	Island	Climate types	Annual rainfall (mm)
Fme	64964	Gaua, Vanuau Lava Santo, Maewo, Pentecost, Efate	Perhumid, wet	> 2000
FmeAgcl	12894	Erromango, Aneityum	Intermediate, wet	1800–2500
FmeCl	7886	Erromango	Wet	2000–2500
FmeClAg	10571	Erromango	Intermediate, wet	1800–2500
FmKh	5848	Malakula,	Dry, intermediate	1500–2000
Fmm	7786	Efate	Wet	2000–2500
Fmm1, Fmm2, Fmm3	1881	Efate	Wet	2000–2500
Fmo	71815	Several islands	Dry to perhumid	> 1500
Fmo1, Fmo2, Fmo3	11161	Santo, Efate	Dry to perhumid	> 1500
Fms	2592	Efate	Wet	2000–2500
FmW	457	Tanna	Wet	2000–2500
Fl	23052	Malakula, Santo, Paama	Intermediate, dry, wet	1500–3000
FlAs	10251	Santo, Efate	Dry	1500–1800
FlBa	1828	Torres islands	Perhumid	> 3000
FlCe	2427	Rowa, Santo, Erromango, Aniwa	Perhumid, wet	> 2000
FlCl	9593	Erromango	Intermediate, wet	1800–2500
FlM	6970	Epi, Pentecost	Dry, wet	1500–200
FlMW	5721	Erromango	Intermediate, wet	1800–2500
FlMx	11183	Epi, Erromango	Wet	2000–3000
Fld	21676	Santo,Malakula	Dry, intermediate	1500–2000
Fle	28035	Malakula, Ambrym	Dry to wet	1500–3000
FlKh	186	Malakula	Intermediate	1800–2000
Flm	978	Malakula	Wet	2000–2500
Flme	11255	Tanna	Dry to wet	1500–2500
Flo	9410	Merig, Santo	Perhumid, wet	> 2500
Flo2	4411	Santo	Wet	2500–3000
FloAs	10900	Erromango	Dry to intermediate	1500–2000
Fls	72734	Several islands	Wet, perhumid	> 2000
Flsw	2391	Santo	Wet	2500–3000

[a] Forest types are described in Appendix 1.

These parameters are defined for Vanuatu by Baldwin et al. (1993). Table 2.3 gives a first approximation of the area of forest potentially available for logging.

Midheight forests on slopes less than 30° cover about 11% of the land area. A similar area is covered by low forests. The loggable forest area is about 27% of the total forest area. It should be noted that if all the forest area defined as loggable were to be exploited, the percentage of forest area disturbed by logging activities would be greater than that defined as loggable, because of the impacts of associated activities such as construction of logging roads.

Table 2.3 Area (ha) of forests of Vanuatu, by region.

Region	Land	Forest	Forest with slope < 30°			Loggable forest[a]
			Midheight	Low	Total	
	(a)	(b)	(c)	(d)	(e) = (c + d)	(f)
Banks/Torres	88666	43232	20032	7763	27795	13800
Santo/Malo	42645	162320	47282	44853	92135	31700
Ambae/Maewo	70956	18018	13436	442	13878	9000
Pentecost	49490	10204	2377	5656	8033	100
Malakula	206756	75306	10853	32330	43183	20200
Ambrym	67264	6042	0	4851	4851	2900
Paama	5982	53	0	0	0	0
Epi	44693	10858	0	9272	9272	0
Shepherds	8631	132	0	132	132	0
Efate	97004	22950	17345	2596	19941	14300
Tafea	162818	89184	26676	28874	55550	24640
Vanuatu	1226905	438299	138001	136769	274770	116640

[a] Derived from Baldwin et al. (1993)

Closed-canopy forests are important both for conservation and for commercial exploitation. Table 2.4 presents data on the extent of this forest type. The area of 'accessible' (to logging operations) closed-canopy forest is derived by subtracting the area of closed-canopy forest on slopes more than 30° plus the area of closed-canopy forest on slopes greater than 20° in deeply dissected landforms, from the total area of closed-canopy forest. Closed-canopy forests are found on only 9 of more than 100 islands which form the archipelago of Vanuatu. Closed-canopy forests are absent from islands with high population density (e.g. Tanna) and from those with active volcanoes (e.g. Ambrym). They cover about 9% of the total land area of Vanuatu.

Of these forests, about 65,000 ha of closed-canopy forest appear to be technically inaccessible. According to these data, if logging activities were to be carried out in all technically accessible closed-canopy forest, some islands, for instance Malekula and Efate, could almost completely lose all their closed-canopy forest. Indeed, between 1984–86 (when the aerial photographs where taken) and 1993, many hectares of closed canopy forest on Efate have been logged.

Baldwin et al. (1993) estimate the areas of loggable forest found in Vanuatu, the total standing volume of timber and recommend a maximum allowable cut as a contribution to the achievement of sustainable timber yield.[6] The parameters adopted were chosen by surveying officers of the Department of Forests, logging operators and experts associated with the project that carried out the forest resource inventory. It may be stressed that the adoption of specific parameters is always subject to debate, and Baldwin et al. (1993) themselves suggest that further analysis should be carried out in order to improve their estimates. Incoll (1994) made another assessment of the sustainable yield for Vanuatu forests. The findings of the two assessments are summarised in Table 2.5. Incoll (1994) suggests a much higher sustainable yield (52700 m^3 that the 22800 m^3 in duties by Baldwin et al. (1993).

Table 2.4 Area (ha) of midheight closed canopy forests (CCF).[a]

Island	Land area	CCF		CCF inaccessible[b]	
		Area	Percentage of land area	Area	Percentage of total CCF
	(a)	(b)	(c)	(d)	(e)
Gaua	32996	1975	5.99	897	45.42
Vanua Lava	33669	13082	38.85	5259	40.20
Santo	395120	38953	9.86	34385	88.27
Maewo	30390	7136	23.48	4009	56.18
Pentecost	49490	3442	6.95	2586	75.13
Malakula	207756	5848	2.81	58	0.99
Efate	97004	8141	8.39	965	11.85
Erromango	88874	25342	28.51	11744	46.34
Aneityum	16179	6009	37.14	5049	84.02
Vanuatu	1226905	109928	8.96	64952	59.09

a Forest types: Fme, FmeAgCl, FmeCl, FmeClAg, FmKh, Fmm (see Appendix 1).

b (d) = (b) – CCF on slopes > 30° – CCF on slopes between 20–30° and deeply dissected landforms, i.e. landform class 3 in Baldwin et al. (1993).

2.4 Forest Ecosystems and Biodiversity

Whilst the forest ecosystems in Vanuatu are not as diverse as those of Southeast Asia, Papua New Guinea, Solomon Islands and New Caledonia, they are not necessarily of lower conservation value. Dahl (1986) found that, from an ecological standpoint, several islands of the archipelago — Santo, Tanna, Vanua Lava, Aneityum, Erromango, Efate, Malekula and Pentecost — are of conservation importance for Oceania as a region. Additionally, Dahl (1986) notes that ecological factors (e.g. species rarity) are not the only ones that should be considered when assessing the

6. Volume of timber that a forest is capable of producing continuously.

conservation significance of certain species or ecosystems. Social, cultural and economic factors are also potentially relevant. Socioeconomic factors are important elements in the process of assessment and establishment of PAs. They are considered in detail in the chapters presenting the case studies.

There is a dearth of information on the ecological characteristics of forest ecosystems in Vanuatu. What follows is a brief summary of the zoological and botanical information on the variety of species that *may* be supported, directly or indirectly, by the nation's forest ecosystems. This is no more than a very partial list of species inhabiting Vanuatu, because new species are constantly being discovered as taxonomic research proceeds. Because of lack of knowledge on species present and ecosystem functions in Vanuatu, it is not known what impact a change in the forest ecosystem structure or extent may have on the animal and plant species of the country.

Table 2.5 Estimated sustainable yields for the forests of Vanuatu ('000 m^3).

	Baldwin et al. (1993)	Incoll (1994)			
	Pacmerch[a] species	Vanmerch[b] species		Pacmerch species	
Total volume	12120	9351		12883	
Volume on slopes < 30°	7210	6454		8851	
Minimum economic timber yield	15 m^3/ha	10 m^3/ha	15 m^3/ha	10 m^3/ha	15 m^3/ha
Merchantable volume	1139	1921	1887	2638	2585
Annual sustainable yield	22.8	38.4	37.7	52.7	51.7

a Pacmerch species include the species currently throughout the Pacific.

b Vanmerch species include only the species currently harvested in Vanuatu.

A list of species—derived from Chambers and Bani (1988), Bregulla (1992) and Darby (1992)—which may be supported by the forest ecosystems includes:

- 12 species of bats, 1 endemic;
- 121 species of birds, 7 endemic;
- 21 species of reptiles, 3 endemic;
- 80 species of butterflies, 3 endemic;
- 22 species of earthworms, 11 endemic;
- 12 species of ants and termites, 5 endemic;
- 73 land snails, 60 endemic;
- 700 species of mosses;
- 900 species of plants, 135 endemic.

At the ecosystem level, a list of the various biomes is provided by Dahl (1980). This comprises 37 biomes, of which 8 are forest types.

2.5 Forest Ecosystems and Rural People

The Government of Vanuatu (1991) reports that about 80% of the population lives in rural areas. The agricultural sector and related activities account for about 73% of the total work force.[7] As typical of most developing countries, rural populations rely to a great extent on the resources provided by their surrounding environment for the satisfaction of a wide range of needs.

Food, firewood, medicines and building material for boats, houses and handicraft are some of the products derived by ni-Vanuatu from their environment (Walter and Sam 1991; Olsson 1991a,b; Lillesø et al. 1992; Wheatley 1993; Thistlethwaite n.d.). Some of these products are referred to in the literature as non-timber forest products (NTFPs). For research and forest management purposes, care needs to be taken in defining forests and NTFPs.

NTFPs are all biological materials, other than timber, obtained from natural forests (de Beer and McDermott 1989). Forest areas may be under some form of management in order to maintain the natural production of NTFPs, but these products are not cultivated. A strict definition of NTFPs would exclude timber used locally for building purposes. Several studies have pointed out that, in general, NTFPs may yield sizeable economic benefits to the people living in or close to forest areas (de Beer and McDermott 1989; Myers 1990). The economic exploitation of these products is regarded as a possible alternative to the logging of forests. The stock of NTFPs available in Vanuatu and the dependence of ni-Vanuatu on these resources are little known.

Baldwin et al. (1993) report on bamboo, rattan and black palm. Bamboo usually occurs in drier areas and is not normally found in commercially exploitable forests. It is used for traditional construction. Rattan is widespread throughout the country, but is most common on the Banks islands of Pentecost and Maewo. Apparently, it is not of great importance for traditional uses. Whether local rattan species are suitable for the production of furniture has yet to be established. The black palm is used for traditional carvings and is widespread throughout the archipelago.

Olsson (1991a,b) believes that a decrease in the availability of NTFPs following logging would have a substantially negative effect on the livelihood of ni-Vanuatu. She contends further that the poor, the old and the women, would be the most severely disadvantaged as they depend most heavily on NTFPs. However, Olsson's claims require further assessment because of three shortcomings evident in her studies. Firstly, agricultural crops such as coconut (*Cocos nucifera*), and fruit trees such as breadfruit (*Artocarpus altilis*) that are predominantly planted and cultivated, have been included among NTFPs.[8] Secondly, it is not specified where NTFPs are actually collected. If they are collected from gardens around the villages, or in thicket areas,[9] logging operations would probably have limited impact on the

7. Government of Vanuatu (1991) classifies 59% of the agricultural workforce as subsistence farmers. However, most of these farmers are involved to a certain degree in the cash economy (Statistics Office 1991a).

8. Copra has been for many years Vanuatu's most important export commodity. Coconut plantations have also replaced lowlands rainforest ecosystems.

9. Garden refers to areas cultivated under a shifting cultivation system. Thicket formations are often secondary growth found in fallow areas.

current availability of these products. Thirdly, no information is presented by Olsson on the pattern of collection. A detailed study of *who* collects NTFPs, and *who* relies on them would be required to assess the distribution across the local community of potential negative impacts arising from a decrease in the availability of NTFPs.

Community uses and preferences of wood for house construction and fuel were surveyed by Lillesø et al. (1992)[10] and were among the factors considered in a rapid rural appraisal study carried out on Espiritu Santo (Thistlethwaite, n.d.). The former study found that most of the most preferred species are derived from secondary forests, with only a few species being collected in primary forests. The Thistlethwaite study, which is more specific about vegetation types, reports that the bulk of wood used by the surveyed communities comes from garden areas (currently cultivated or under fallow) which are classified mainly as thickets. Thistlethwaite (n.d.) also remarks that wood is generally collected in an area within 30–60 minutes walking distance from the village and the species used are mainly non-commercial ones. The results of this study are influenced by the fact that only two of the six villages included in the sample had significant forest resources within 3 km of the village. Thistlethwaite's findings appear, however, to be supported by the results of a government survey of smallholders (Statistics Office 1991b). The results of the survey note that, at a country level, the major sources of firewood were: (i) wood derived from garden clearing for 40% of households; (ii) dead wood from the bush[11] for 38% of the households; and (iii) trees cut specifically for burning (location not specified) for 22% of the households.

2.6 Institutions and Natural Resource Management

The institutional setting determines *how* resource use is distributed across the individuals and groups, and thus *who* has the right to control and/or use the resources available in the area. A knowledge of these features is needed to understand the ways in which forest ecosystems are allocated between potential uses such as logging and conservation.

Chapter 12 of the Constitution of the Republic of Vanuatu, adopted at Independence in 1980, deals with land. The first three sections of that chapter state the fundamental principles guiding the post-independence land-tenure system. They affirm that: (i) all land belongs to the indigenous custom owners and their descendants (section 71); (ii) custom rules are the basis for the ownership and use of land (section 72); and (iii) only indigenous citizens,[12] who have acquired land in accordance with custom rules, can have perpetual ownership of the land (section 73). Customary ownership of the land in Vanuatu is normally entrusted to individual landowners or to the members of a family (e.g. father and son, cousins). Customary ownership should therefore not be confused with common property. The land-tenure system of Vanuatu differs substantially from that of Papua New Guinea and

10. This study covers the whole country. Questions about the local uses of plants for house construction and firewood were asked in the course of the National Agricultural Survey in 1990.
11. In Bislama, bush often refers to the garden and thicket areas, i.e. secondary vegetation. Forested areas are often referred to as 'dark bush'.
12. An indigenous citizen is a person having four ni-Vanuatu grandparents. See Narokobi (1981).

Solomon Islands, where the land is owned by clans usually under a common property regime (Rodman 1987). This has important implications for the management of natural resources, and for the eventual form of economic incentive to be provided to the local people in order to establish PAs.

A *Land Acquisition Act* was passed by the Parliament of Vanuatu in 1992. This gives government the power to declare any area in the country public land, if the land is recognised to be of public importance. In theory, this legislation could be used by the government to acquire land to be used for specific purposes, including conservation, provided that appropriate compensation were given to the rightful landowners. However, it is likely that the government would stimulate political opposition if it enforced the legislation. Landowners throughout Vanuatu tend to have a strong attachment to their land.

Under the land-tenure system of Vanuatu, landowners have the power to control the use of their resources. For instance, the final decision on whether to allow logging rests with the landowners themselves. Contracts between logging contractors and landowners have to be approved by the Department of Forests, which has the power to refuse the authorisation on the basis of specific technical issues. It does not, however, have the power to authorise logging operations without the consent of the rightful landowner. It may be noted, before concluding, that the landowners' decisions are influenced by the information available to them about the various aspects of logging, and the Department of Forests and other organisations clearly have an influence over the type of information reaching local people.

2.7 Conclusion

Over thousands of years, the natural vegetation cover of Vanuatu has been modified by a continuing interaction between it and human activities. The introduction of new economic enterprises, such as commercial logging, cash crop plantations and cattle grazing is changing the environment more rapidly than in the past.

The social and economic changes occurring in Vanuatu require new approaches to the conservation of ecosystems. Traditionally, specific ecosystems were protected through the declaration of taboo areas, according to customary rules. However, while taboos remain in force they appear to be insufficient by themselves to rebut the new pressures placed on forest ecosystems. Some supplementation, with formally dedicated protected areas, appears necessary.

This chapter provides the information required to put into context the case studies presented in Part III. In the two chapters that follow, the socioeconomic framework developed and applied in the case studies is presented.

Part II

Theoretical Aspects

3 Building a Socioeconomic Approach to Protected Area Assessment and Establishment

Luca Tacconi
Jeff Bennett

3.1 Introduction

This chapter presents some of the components that form the foundation of the socioeconomic framework developed and applied in Vanuatu for the process of assessment and establishment of PAs aimed at conserving forests and biodiversity.

It is argued that a mainstream neoclassical economic approach cannot address all the questions encountered in assessing and establishing PAs. A socioeconomic framework designed for this task should attempt to incorporate elements from the institutional school of thought, and the 'people-centred approach' to development, together with elements of the neoclassical school.

Broadening the framework of analysis is particularly important because the conservation of forests and biodiversity has implications both for the intergenerational and intragenerational distribution of resources. These distributional issues are not handled well by mainstream neoclassical economics.

It is argued in Chapter Four that the establishment of PAs may contribute to the achievement of intergenerational equity; in fact, they may protect part of the critical natural capital that provides irreplaceable life-support functions. However, the economic impact of the establishment of PAs on the people currently living in them or nearby should not be overlooked. A satisfactory solution to the intragenerational distribution of resources is a prerequisite for the successful implementation of biodiversity conservation projects. Successful biodiversity conservation projects will also need to take into account the enabling and disabling characteristics of institutions.

The chapter first considers the approach to PAs assessment currently suggested by neoclassical economists. Outlines of the institutional economic school and the 'people-centred approach' to development are then presented. It is not intended in this chapter to discuss in depth the weaknesses and strengths of these three schools. However, because of the dominance of the neoclassical school in the study of the relationship between the environment and the economy, some of its weaknesses and strengths are outlined.

3.2 The Neoclassical Approach to Protected Area Assessment

Cost–benefit analysis (CBA) is the tool adopted by neoclassical economists for the assessment of PAs (see, for example, Dixon and Sherman 1990). The steps followed in this approach may be summarised as follows.

1. Estimate net present value of quantifiable benefits (NPVQB);

2. Determine non quantifiable benefits in qualitative terms (NQB);
3. Estimate net present value of quantifiable opportunity costs (NPVOC);
4. If NPVQB > NPVOC, establish the protected area;
5. If NPVOC > NPVQB, compare (NPVOC – NPVQB) to NQB; a political decision is required.

Before detailing some aspects of this approach, it may be noted that the advocates of CBA recommend that it be used on a site-by-site basis. Implicit in this approach is the assumption that each valuation may be considered as an independent endeavour. It does not recognise the specific social, institutional and ecological features which have shaped the use of ecosystems. CBA would be applied in the same way irrespective of whether a country already had an extensive PA system or had no PAs whatsoever. It would be applied in the same fashion to an area inhabited by people with acquired rights to the area or to an uninhabited area with ownership entrusted to the government (Tacconi 1995b).

CBA is a tool developed to apply the principles of welfare economics and is based on the tenets of the neoclassical school. This school seeks to apply positivist methodology to the study of economic matters; as such, some of its proponents claim it to be value-free. Methodological individualism is the guiding principle. In general, the individual is assumed to be a rational, self-interested, utility maximiser with set preferences. The goal of the philosophical school expressed in CBA is the maximisation of total utility. The potential compensation test is adopted in assessing Pareto efficiency.[1]

The strengths and weaknesses of the neoclassical approach are outlined in the sections to follow.

3.2.1 Weaknesses of the neoclassical approach

Positivist–Popperian methodology. Positivism[2] was introduced to economics by Hutchinson (1938). Despite the fact that positivism has been in decline within the philosophy of science during the past three decades, many economists still believe that economics can be a positive science,[3] and thus achieve the status of an objective and value-free discipline (Caldwell 1982). Despite the claim to be value-free, neoclassical economics is not, and cannot be, value-free. It is impossible to escape from value judgments, because a world view is needed to select the axioms of the theory by which the empirical data are organised. For instance, the basic non-satiation assumption of neoclassical consumer theory requires that more of each commodity be preferred to less.

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1. The summary presented above mirrors that of Gee (1991), a neoclassical economicst. The Pareto criterion of efficiency requires that no reallocation of resources be available that can make any person better off without making someone worse off.
2. Positivism holds that there is knowledge only from experience; it is implicit in this view that observation is independent of theory. Logical empiricism, unlike the earlier version of positivism known as logical positivism, accepted the existence of theoretical terms in scientific theories. The hallmark of scientific activity was considered to be the testing of hypothesis by confirmation. Popper (1959) criticised some aspects of logical empiricism and proposed that scientists should attempt to falsify their theories rather than to confirm them [for a detailed account, see Caldwell (1982)].
3. See, for example, the attempt made by Hennipman (1976) to provide an 'objective interpretation' of Pareto optimality.

Finally, it is important to note that the attempt to build a value-free science has led to the progressive separation of economics from ethics.

Methodological individualism. Methodological individualists subscribe to the view that explanation of all social phenomena may be formulated only in terms of individuals' goals and beliefs (Elster 1982). Decisions made at the society level are seen as the sum of decisions made by atomistic individuals. This overlooks the fact that individual action is influenced by social processes, and that decisions (for example, about resource use) are also made at aggregative levels higher than the individual. The explanation and understanding of these processes would provide a more complete picture of the decision-making process that determines resource use.

Rational utility maximiser and self-interested individual. Individuals are said to have rational preferences if these are complete and transitive[4]. Completeness requires that individuals be able to compare *all* options. However, the model of the rationally unbounded individual decision-maker has been strongly criticised (e.g. Simon 1957). If Simon's criticism is accepted, the whole neoclassical model is called into question, given that an attack on the concept of unbounded rationality has to be considered as an attack on the value of neoclassical equilibrium analysis (Tisdell 1976).

Self-interest is required in the theory of consumer choice. According to Hausman (1992), 'consumerism', which implies self-interest, describes options as commodity bundles and individual choice is based essentially on greed. Given that the model rules out interdependence of preferences of different individuals, consumer theory (unlike utility theory) is inconsistent with altruism. Although 'consumerism is not intended as the literal truth' (Hausman 1992, p. 32), it is questionable whether this model should be used for the analysis of choices that, unlike the choice of oranges vs ice cream, have implications that go far beyond the impact of the single individual. When considering issues that affect society as a whole, some argue that individuals tend to make choices on the basis of ideological and sentimental values and not on greed (e.g. Sagoff 1988). Furthermore, it has been argued that even when making choices in the commercial market place, individuals select means, not only ends, on the basis of other ethical values, and not just self-interest[5] (Etzioni 1988).

Total utility maximisation. The philosophical foundations of welfare economics, as applied in CBA, are often traced back to Bentham's utilitarianism.[6] Given that individual utility (pleasure) cannot be measured in a way that allows interpersonal comparison (e.g. Robbins 1935), the resource allocation option that maximises total utility cannot be pinpointed by CBA. What CBA indicates is simply the option that maximises the net present value in money terms, given that a dollar is worth the same to all individuals affected. The fine thread that links CBA to Bentham's utilitarianism must be the assumption that the level of total utility

4. Transitivity requires that if a person prefers good x to good y and good y to good z, then they will also prefer good x to good z.

5. Friedeman's (1973) view that the realism of assumptions is irrelevant has been rejected even by methodologists working within the neoclassical tradition. More realistic assumptions may be expected to lead to more accurate predictions (e.g. Hausman 1989).

6. Bentham believed that the pursuit of pleasure and the avoidance of pain are the primary human motivations (Randall 1986).

achieved by a certain policy corresponds exactly to the total monetary benefits provided by that policy.

It has to be remarked that the attempt to maximise total monetary benefits may result in inequitable policies. In fact, CBA 'is indifferent as to whether the gainers are those already well off and the losers already badly off, or vice versa' (Randall 1987, p. 42).

Pareto efficiency. Neoclassical economists concern themselves with the efficiency of allocation of resources. The application of the potential Pareto compensation test is seen as the instrument that allows economists to make recommendations regarding efficient resource use without passing value judgments (Kaldor 1939). The question of the distribution of resources is often avoided by neoclassical economists, as it is seen as requiring value judgments. Expressing value judgments is regarded as being outside the domain of scientific economics.

However, explicit or implicit value judgments are made when applying the potential compensation test. To apply this test, the economist has to assume that one dollar is of equal value to everyone (Cooter and Rappoport 1984); this is an explicit value judgement. The application of this test may result in the choice of options that are inequitable at the intragenerational and/or intergenerational level. The lack of consideration of these issues implies an implicit value judgment of the kind 'these issues are not important'.

3.2.2 Strengths of the neoclassical approach

CBA provides a logical structure for the systematic collection and presentation of information from the perspective of the trade-offs involved in decision-making.

The trade-offs that the decision-making process involves are explicitly recognised in the framework of CBA. The technique requires, as a starting point, a definition of all the benefits and costs that arise from each of the options available. This is in itself an important contribution, because it requires the careful consideration by the analyst, and then contemplation by the policymakers, of the full range of consequences of all the options. Because CBA offers this systematic framework, it avoids the adhockery and/or the single issue focus that can pervade decision-making, especially where complex consequences are involved.

CBA forces an active search for information

CBA begins by setting out the shell of a matrix of defined benefits and costs. The next step is to complete the matrix by assigning quantitative, monetary values to its cells. This is a process that focuses the mind of the economic analyst on a search for information.

It must be recognised that this search is not limited to monetary values. In fact, before monetary values can be assigned to the cells of the matrix, it is often the case that physical impacts have to be determined. This is a process that involves the analyst in consultations with engineers, ecologists, agronomists and a range of other scientists and technologists. Hence, if in the first stage of a CBA it is assessed that one cost of setting aside an area of forest for conservation will be the surpluses that would otherwise have been enjoyed from logging activities, then the CBA practitioner would need to consult with foresters to determine the yield of timber that the

forest could provide, and over what time frame the harvesting activities could be sustained. It is only after this information has been gathered that a monetisation of the cost could be attempted. Hence, even where valuation in money terms is not undertaken, the CBA framework looks for the provision of 'hard' information to whatever extent is feasible. This is not to say that quantification is good simply for its own sake, but rather to stress the importance placed by CBA on information gathering. Neither is it to say that CBA applications will inevitably incorporate all relevant information. In the past, CBA studies routinely ignored information that is now considered essential and it may be that, in the future, current CBA studies will be criticised for taking too narrow a focus.

CBA increases the explicitness of government decision-making

Both of the previous strengths of CBA contribute to the third. Through its logical structure and its demands for an exhaustive provision of information, CBA provides outputs which make explicit the decisions taken by governments. Those directly and indirectly involved in either the decision-making process or the project proposal are able to see exactly what impacts the project is expected to have and are thus better able to assess the decision taken.

In a sense, when it is carried out as a public exercise, CBA is an aid to democratic processes. Not only does it stimulate public debate, but also it increases the potential contribution that can be made by public participation. This may require some additional effort on the part of those conducting the CBA, in that a degree of interpretation may be necessary, not only of results, but also of 'jargon' that can disguise salient issues from the general public. It may also require additional effort on the part of decision makers. The CBA process can develop into an interactive, participatory process whereby those affected by decisions assist in the definition of options available and their likely impacts, learn more of these impacts and others via an interpreted CBA study, and then perhaps join in the process again by, possibly, redefining options.

CBA enables early identification of unfavourable options

The deficiencies of CBA—reviewed in the previous section—often prevent the technique from achieving its ultimate goal of recommending a decision for policy-makers. Information inadequacies and the 'closeness' of the choice between alternatives, often restrict the usefulness of CBA in its final stage. On the other hand, a strength of CBA is its ability to identify unfavourable options in the early stages of analysis. This limits further analysis to options that pass the elementary CBA test and hence reduces the costs of the overall decision-making process.

CBA allows for some comparability between widely divergent projects and increases the likelihood of consistency across decisions

Where funds are being allocated across widely divergent projects—either in terms of geographical or resource-use divergences—decision makers may well be interested in ensuring consistency. It is important in that case for some comparability to be assured in the decision-making process. CBA can assist in this cause. At least where monetary valuations of benefits and costs can be obtained, comparability can be secured, even beyond national boundaries. For international aid agencies, this may be of great importance, given that priority rankings of projects

located in a variety of countries are often required. Even within a nation, governments are faced with a wide variety of potential projects, competing for both local funds and undirected aid. CBA can provide a degree of comparability.

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The strengths and weaknesses of the neoclassical approach—specifically CBA—illustrate the importance of developing a socioeconomic framework that can build on the strengths and avoid or minimise the impact of the weaknesses. The next section describes some aspects of the institutional school and the people-centred approach to development. The integration of various elements from all three approaches provides a useful basis for a socioeconomic framework for the analysis of protected area establishment.

3.3 Further Elements of a Socioeconomic Framework

In a socioeconomic framework for the assessment and establishment of PAs attention should be given not just to efficiency considerations, as is the case with the neoclassical approach, but also to ethical questions such as inter- and intragenerational equity and to practical concerns on the operational feasibility of the proposal. Using this approach, the choice of the tools adopted in the analysis of specific problems should not dictate the framing of the problem, as is the case when conventional tools of project appraisal are adopted (van Pelt et al. 1990).

A socioeconomic framework that includes elements of institutional economics and the people-centred approach to development, together with components of neoclassical economics, provides a basis for addressing conservation issues in terms of efficiency and distribution questions. It also facilitates the analysis of issues outside the constraints of established tools.

3.3.1 Institutional economics

The organisation and control of the economic system is seen as the main issue to be studied by institutional economists.[7] Important areas of research include: i) the role of institutions; ii) the relationship between the economic and the legal system; iii) the relationship between power and belief systems; and iv) the implications of technical change for the institutional structure.

Positivism is rejected as the methodological foundation of institutional economics. Institutionalists have adopted a form of holism that has engaged them in a 'systematic storytelling' approach (Wilber and Harrison 1978). Human action is explained by a pattern model, by placing agents in their social context. This differs from the predictive neoclassical model, which sets the assumptions about human behaviour and derives the implications from them (Dugger 1979).

Under the institutional economic paradigm, the first objective of empirical research is to gain a good initial understanding of the institutional structure and its development, and the influence of ethics, customs and power relations on the eco-

7. We rely on Foster (1991) for this summary of the tenets of institutionalism.

nomic system. The fact that economists make value judgments is accepted and an attempt is made to incorporate those values into economic analysis. Interviews and questionnaires are used to derive information on these issues.

Institutionalism focuses its attention on the study of institutions rather than on the individuals, unlike neoclassical economics. Institutions have been defined as 'a human mental construct for a coherent system of shared (enforced) norms that regulate individual interactions in recurrent situations' (Sjöstrand 1992); they also have an important role in social decision-making—they help in processing information and enable social groups to make decisions of a higher logical order than that achievable at the individual level.

Individuals are not seen as having given wants and tastes; they are formed through social interaction. They do not *always* act rationally as postulated by neoclassical economics. Rational behaviour is constrained by the limited power of the brain; also individuals make, at times, subconscious decisions. How wants and tastes are formed, and the processes of individual and institutional decision making, are investigated by institutional economists.

Research topics for an environmental economics program, using the institutional approach, are described by Jacobs (1994). Five elements of the research program are summarised as follows.

1. How do people actually value the environment? (Empirical research in the form of surveys should attempt to ascertain how people perceive and feel about environmental issues.)
2. How do institutions work and how should they work in making decisions on the environment?
3. How do firms and people actually behave in real markets?
4. How are tastes and demands formed?
5. How can the standard of living be defined and measured?

Institutions influence individual and collective behaviour, regulate the distribution of natural resources and, therefore, influence their allocation. The study of the institutional structure and of possible ways to strengthen or modify it is fundamental to a socioeconomic framework.

3.2.2 The people-centred approach to development

Major items on the agenda of the people-centred approach to development[8] are poverty alleviation, people's empowerment through active participation, gender issues and the importance of people's knowledge (Oakley et al. 1991; Scoones and Thompson 1993). Of particular relevance here is how this approach views the social environment, the roles of the researcher and the people, and the scientific stance adopted.

8. The 'people-centred approach' is used here to refer to that approach to rural development exemplified in the writings of authors such as Chambers (1983), Cernea (1991) and Uphoff (1992).

Agricultural research and development is seen as proceeding through four overlapping stages (Rhoades 1989; cited in Pretty and Chambers 1993):

1. production stage (1950–75)—supremacy of disciplines such as genetics, farmers are recipients of technology;
2. economic stage (1975–85)—dominated by economists and agronomists, farmers are sources of information;
3. ecological stage (1985–95)—anthropology, agroecology and geography dominate, farmers contribute their indigenous knowledge;
4. institutional stage (1995 onwards)—important professionals will be management specialists, psychologists, sociologists, political scientists, training specialists and educators, farmers will collaborate at all stages of research and extension.

These stages emphasise the shift that has occurred in agricultural research and development from a scientific paradigm dominated by 'hard' sciences to a social sciences dominated paradigm. This shift is occurring within the people-centred approach, and a positivist stance is being replaced by a 'post Newtonian' one. It is being realised that positive inquiry cannot be distinguished from normative inquiry, and the difference between objectivity (defined as a detachment between the observer and the observed) and subjectivity is diminishing. Once the belief in the value-free objective scientist has been abandoned,[9] then it can be accepted that the aim of the social scientist is not just *to explain*, but also *to open up* new avenues for the improvement of human welfare (Uphoff 1992).

Scoones and Thompson (1993) present a current view of the people-centred approach made up of the five aspects detailed below.

(i) Assumptions. Communities and rural people have differentiated interests, goals, power and access to resources.

(ii) Process. The learning process approach[10] is adopted; planning is carried out with dynamic and adaptive implementation of negotiated outcomes; collaboration requires negotiation and empowerment.

(iii) Role of the outsider. The outsider is a visible actor in process learning and action, and is a facilitator, initiator and catalyst.

(iv) Role of the insider. The insider is an active participant in the process and is a creative investigator and analyst.

(v) Scientific stance and style of investigation. A post-positivist stance is adopted. Participatory action research is favoured.

It should also be noted that the people-centred approach, like the institutionalist school, places particular emphasis on the role of institutions, especially in relation to their role in rural development and research for development. The people-centred approach differs from the institutionalist school in defining the role

9. Relinquishing the idea that inquiry can be value-free and totally detached does not imply that 'professional standards' cannot be maintained.

10. The learning process approach 'presumes that neither the ends nor the means of social interventions can be fully known in advance, and that understanding and consensus on them must be built through practical experience' (Uphoff 1992, p. 12).

of the 'outsider' and the research approach adopted. The institutionalist researcher adopts the participant–observer method to understand and explain the issue of concern. In the people-centred approach the researcher carries out research in cooperation with the stakeholders, in order to understand and explain, and to act (impact) on the issues of concern.

3.4 Conclusion

No single approach to the study of environmental-economic issues can be defined. Different paradigms will adopt specific approaches. Different problems will require a range of approaches (see Funtowicz and Ravetz 1993), to be taken from within the same paradigm. A socioeconomic framework should draw on elements of the three schools of thought outlined in this chapter, depending on the issue under consideration.

For the assessment and establishment of PAs, three layers can be identified within the overall decision-making process. Economists can play a role in the analysis at international, national and local levels. Economists may contribute to this process by formulating, for instance, recommendations on questions of institutional structure (e.g. what are appropriate institutions to ensure widespread participation in the decision-making process?), intergenerational equity and efficiency.

At the international level, conventions are signed, and political and financial incentives are directed to individual countries.

The second layer of the decision-making process is concerned with setting the scale of resource use for PAs at the national level.

In the third layer of the decision-making process, economists may contribute with analyses concerning intragenerational equity, efficiency issues and the analysis of local institutions.

In practice, the three layers are not so neatly separated. Decisions made at the one layer will influence those taken at the other layers.

Participatory research is most relevant at the national and local decision-making layers. In both cases, research may take place in collaboration with, for example, government officers and the people in the areas of concern.

This chapter has suggested that a socioeconomic framework for assessment and establishment of PAs should bring together some of the elements of institutional economics, of neoclassical economics and of the people-centred approach. This approach differs from that promoted by Söderbaum (1992), who proposes institutional economics as a more fruitful approach than neoclassical economics for the analysis of environmental issues. The approach outlined here aligns more closely with the proposal of Grossack and Loescher (1980), who promote an integration of institutional and neoclassical economics. The integration proposed here is far from being fully achieved. Whether it will every be fully achieved is open to question. For instance, Hodgson (1992) criticises as non-viable the attempt made by Etzioni (1988) to introduce a 'moral component' into the neoclassical paradigm.

This chapter has presented some elements of the socioeconomic framework for protected areas assessment and establishment. The next chapter considers the

implications of intergenerational equity for biodiversity conservation policies. This is an issue that has received insufficient consideration by both neoclassical and institutional economists. That chapter concludes by summarising the proposed socioeconomic approach that has been applied to Vanuatu.

4 Intergenerational Equity and Protected Areas

Luca Tacconi
Jeff Bennett

4.1 Introduction

This chapter completes the development of the theoretical framework applied to Vanuatu. The chapter is rather technical. Those readers not versed, or interested, in the theoretical arguments discussed in the chapter may consider reading the concluding section for a summary of the socioeconomic approach adopted for the assessment and establishment of PAs.

The issue of efficient allocation of resources has been considered in the previous chapter. Efficiency is an important consideration in socioeconomic analyses, but certainly not the only one. Equity in resource distribution must also be addressed. Equity may be considered in relation to the distribution of resources within one generation or between generations. This chapter considers the latter question; that is, intergenerational equity in resource distribution. The focus will be on the implications of intergenerational equity for biodiversity conservation policies and for the assessment and establishment of PAs.

Article 7d of the Constitution of Vanuatu deals with the use of ecosystems. It states that every person in Vanuatu is obliged to protect Vanuatu and to safeguard the national wealth, resources and environment in the interest of the present and future generations. What does it imply in terms of biodiversity conservation, and for PAs in particular? How should article 7d be put into practice?

These questions are considered in this chapter. The chapter takes as given that future generations have rights. It expounds on the question of what constitutes intergenerational equity in natural resources use. The implications for the economic analysis of biodiversity and particularly for the assessment of PAs are presented.

The analysis is carried out by first delineating the economic facets of biodiversity. Biodiversity provides much of the resource base and the environmental services needed to support life on Earth and to maintain viable economic systems. Hence, the implications for biodiversity conservation policies of seeking to achieve intergenerational equity are analysed by addressing the wider issue of the use of natural capital (NC). After discussing the concept of NC, the ethical underpinnings of neoclassical economics and of the contractarian theory developed by Rawls (1972) are considered. Finally, implications for biodiversity conservation policies and for the economic analysis of PAs are drawn.

4.2 Economic Aspects of Biodiversity

Climate stabilisation, regulation of the hydrological cycle, generation and maintenance of soils, waste disposal, pest control and pollination are some of the ecosystem services utilised directly and indirectly by the economic system. For example, the annual worldwide expenditure on pesticides is about US$20 billion; parasites and predators existing in natural ecosystems provide five to ten times that value of pest control (Pimentel et al. 1992). Ecosystems also provide raw materials that are direct inputs to the economic process, and other resources such as food are directly consumed. Ecosystems also provide items that are more culturally orientated such as the fulfilment of demands for aesthetic services.[1]

In order to allocate resources in an efficient manner, part of the economic literature on biodiversity attempts to derive its economic value by estimating the value of species. What is actually measured in this framework is the value of the *biological resources* of a specific area, rather than the contribution of the *diversity* of those biological resources to the economic process. Thus, at a certain moment in time, the biological resources of two geographical areas could exhibit an equivalent value, but display very different degrees of diversity (e.g. an extensively monocropped landscape vs a patchy landscape). The contribution of biodiversity to the provision of biological resources might be better seen from a dynamic standpoint, e.g. by comparing the performance of diverse systems against that of non-diverse systems.

From a dynamic, evolutionary standpoint the assessment of allocative efficiency is not the main focus of the analysis. North (1990, p. 81) notes : 'In a world of uncertainty, no one knows the correct answer to the problems we confront ... The society that permits the maximum generation of trials will be most likely to solve problems through time'. There are two important messages here. First, in an environment characterised by uncertainty[2], flexibility may be maintained by keeping open a wide range of options. This enhances the probability that a system is sustained in the event of failure of one or more of its components (be they ecological or social). Second, diversity leads to different patterns of experimentation which may result in a further increase in diversity and new ways of solving problems. This is of particular relevance to the economic process. Marshall (1910; cited in Carlsson and Stankiewicz 1991) recognised that the variety of approaches taken by of individuals to variation is a major source of progress. The opportunity to innovate is supported by a high degree of diversity in the natural resources available. This can lead to a diversification of the goods and services produced, which is a major cause of economic change (Carlsson and Stankiewicz 1991).

Biodiversity is a prerequisite for economic adaptability and provides a diversity of options for economic development. On these propositions, it may be argued that the economic analysis of biodiversity should not underestimate the fact

1. WCMC (1992) and WRI et al. (1992) provide a wide range of examples of the economic values of biodiversity.
2. Wynne (1992) provides a four-tier classification of uncertainty: (a) risk; (b) Knightian uncertainty; (c) ignorance—e.g. it is not known what relevant facets of the issue are not known; (d) indeterminacy—e.g. appropriateness and sufficiency of scientific knowledge. The kind of uncertainty involved in the formulation of biodiversity policies is better characterised by points (b), (c) and (d).

that the diversity of natural resources *per se* contributes to the evolution of economic systems over time.

The above arguments suggest that biodiversity is an integral part of what is referred to in the recent economic literature as *natural capital* (NC). To assess in a holistic fashion the implications of biodiversity conservation for intergenerational equity, the issue is approached in the wider context of the distribution and use of NC. The concept of NC and the substitutability or complementarity between NC and manufactured capital (MC) are explored in the next section.

4.3 On the Concept of Natural Capital

The economic system can be described as being embedded in the ecological—social system (Figure 4.1). The ecological–social system is constituted by NC and human capital (HC). HC comprises the people living in the specific time and space with their culture, skills, knowledge and the institutions which regulate social and economic life. NC is described by Costanza and Daly (1992) as being composed of renewable natural capital (RNC) (e.g. trees, fish) and nonrenewable natural capital (NNC) (e.g. minerals). The structure and diversity of ecological systems are crucial attributes of RNC, since they contribute to maintaining functional ecosystems. The ecological system can exist independently of the social system, but the social system cannot exist without the ecological system. Nonetheless, there exists a co-evolutionary interdependence between RNC and HC. HC adapts to the existing RNC and to changes in it. RNC too changes subject to the influence of HC. The functional relationships occurring in the system and the flows of goods and services are depicted in Figure 4.1.

4.3.1 On the substitutability between NC and MC

Pearce (1988) takes the view that NC and MC are complements in the early stages of economic growth, whereas in industrialised economies substitutability applies above a certain minimum threshold level of NC that is needed to sustain life-support systems. It seems that Pearce's claim of complementarity–substitutability is based on differences between industrialisation stages. Pearce argues that industrialised countries appear to be less dependent on the natural resource base than less developed countries (LDCs) and to have a higher degree of resilience to environmental shocks. Notwithstanding the actual dependence of different countries on natural resources, the relative dependence on natural resources does not imply a different relationship between NC and MC.

Winpenny (1991) suggests that some NC may be characterised as 'critical'. This type of NC is described as irreplaceable and non-substitutable (e.g. the ozone layer). He asserts that the remaining NC, which includes renewable and non-renewable natural resources, can be 'replenished or substituted' by MC. This approach is similar to that of Pearce's because it sets a threshold of NC (i.e. critical NC) that has no substitute. However, Winpenny bases the notion of substitutability and complementarity on the physical properties of the resources. How MC might replace NC is not explained.

The argument that MC can be a substitute for NC has been rejected by Costanza and Daly (1992) on three counts. If MC is a substitute for NC, then there would be no reason to produce MC given that NC is, by definition, naturally

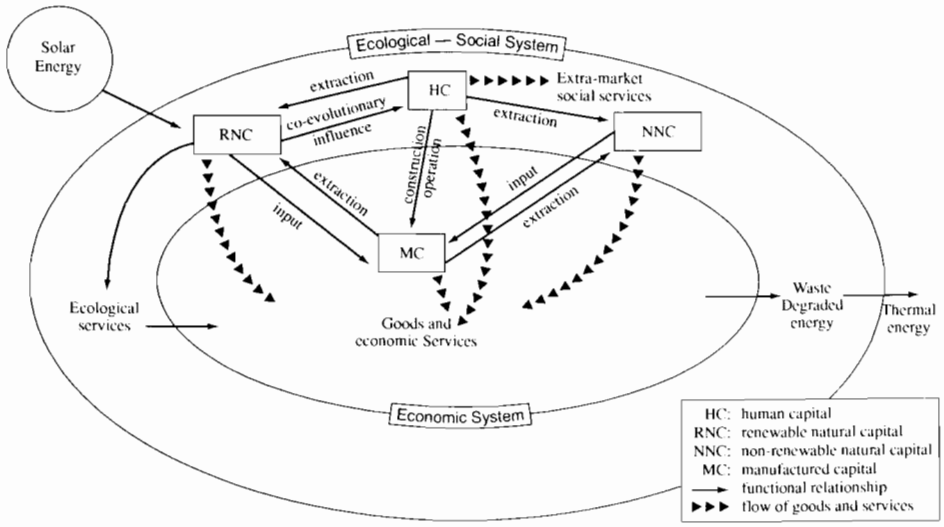

Figure 4.1 The economic system as part of the ecological system. (Modified from Perrings et al. (1992) and Constanza and Daly (1992)).

available. Secondly, MC is created by combining NC with HC, hence it is a contradiction in terms saying that MC can substitute for NC. Thirdly, in the production process, MC and HC are combined to transform NC into products; MC is created to process an increased amount of NC, not to decrease the use of NC.

The issue of complementarity or substitutability of NC and MC may be better understood by considering the major functions that they fulfil. From Table 4.1 it is obvious that NC and MC have a variety of often disparate functions.

The processing function of MC implies that, in specific industries, MC would not be of use in the production process without the existence of NC. The implication is that they are complements in production. NC is at times replaced with MC in the production process. This should not be confused with the possibility of substitution between NC and MC in physical terms. The 'substitution' of NC with MC in the production process is in fact a substitution between one type of NC and another type of NC, to which HC has been applied in order to transform it into MC.

The application of MC cannot create physical matter but it may provide access to, or make useable, elements of NC otherwise not amenable to human use. This means that an increased availability of economic resources may be derived from increases in the stock of MC and improvements in its technological efficiency. Thus, MC may enhance the stock of NC while not substituting for it.

To summarise this section, natural capital may be subdivided into non-renewable natural capital and renewable natural capital, with the latter made up of critical renewable natural capital and other renewable natural capital. It has also been argued that manufactured capital is not a substitute for natural capital, but manufactured capital and human capital can be used to extend the life of non-renewable natural capital and to restore the stock of renewable natural capital.

Decisions about the distribution and allocation of natural resources, such as the establishment of PAs, are based on specific ethical viewpoints. Ethical issues are addressed in the next section.

Table 4.1 Functions of natural capital and of manufactured capital.

Natural capital (NC)	Manufactured capital (MC)
Life support functions	–
Inputs in the economic process	Inputs in the economic process
– provision of raw materials (renewable and non-renewable)	–
– processing of raw materials	– processing of raw materials
– waste assimilation	– waste treatment (e.g. pollution control, recycling)
– provision of aesthetic services	– provision of aesthetic services
– provision of economic services (produced by combining NC and HC)	– provision of economic services (produced by combining MC and HC)

4.4 Ethics and Equity

To clarify the issues underlying the intergenerational distribution of natural resources and of biodiversity, the ethical underpinnings of total utilitarianism (hereafter referred to as *utilitarianism*) and of the contractarian theory developed by Rawls (1972) are considered. Rawls' theory starts from the same human behavioural model as utilitarianism but it arrives at substantially different conclusions on intergenerational equity.

Before proceeding with the analysis it is worth while making explicit that the issue of optimal population policy is not considered. The major reason for doing so is that the availability of natural resources is only one of the many factors that may influence population growth, i.e. the number of individuals who will be born in each generation.

Three requirements are at the basis of utilitarianism (Sen 1987). Firstly, only utility has intrinsic value. Hence, utility is the only measuring rod needed to judge the goodness of some action (welfarism). Secondly, utility is measured by considering only the total of all utilities (sum-ranking). Thirdly, choices are based on the goodness of the consequent outcome (consequentialism). A teleological theory such as utilitarianism judges the rightness of an action according to its consequences. If fulfilment of wants is said to be the exclusive good, any action that achieves this end is right. Hence, under a utilitarian maxim, the 'consumption' of an ice cream or of slavery is right, so long as it satisfies wants.[3]

At the basis of the utilitarian paradigm is the conceptualisation of a person as a self-interested rational being. *Economic man* is construed by assuming that individuals are rational, where rational behaviour is equated to satisfaction at self-interest. Thus, people's behaviour is assumed to be well described as the pursuit of

3. One colleague noted that most utilitarians would accept constraints in the means allowable for consequences. However, there is nothing in utilitarian theory that tells how to set these constraints.

maximal self-interest. In this behavioural model, well-being is a function solely of utility (which is normally assumed to depend only on one's own consumption); the individual maximises utility and each action is guided by the pursuit of one's aim. Several studies have questioned the validity of the assumption that actual human behaviour in economic matters is well approximated by purely self-interested behaviour (see Sen 1987; Etzioni 1988). There have been attempts to include altruism in the neoclassical economic model of human behaviour (e.g. Margolis 1982). However, neoclassical economists do not normally adopt these amended models, one reason being that they would make any applied analysis 'next to impossible' (Przeworski 1985).

Utilitarianism does not attribute intrinsic value to social and economic equity (e.g. Harsanyi 1985); the goodness of equity is judged on the basis of its contribution to an increase in total utility. In relation to intragenerational equity, if it is assumed that all people have the same utility function which is increasing and concave in income and total utility would be maximised by an exactly equal distribution. Of course, this case is only hypothetical given the differences that exist in people's preferences. Sen (1982, Ch. 16) notes that individual preferences differ and a utilitarian approach would attribute less income to a person A who receives less utility at any income level than another person B. This distribution would maximise total utility[4]. However, A would be worse-off than B, because she receives less income than B and, further, obtains less utility then B from that level of income.

Sen's example can be extended to an intergenerational context. If the objective is the maximisation of total utility, a generation G which receives less utility at any given level of resource use than generation J would be assigned a lower resource endowment than J. Hence, utilitarianism could lead to solutions of dubious equity. Even if it is assumed that there was agreement on the ethical basis of utilitarianism, it is obvious that it would be difficult to apply such an ethic to intergenerational matters. Welfare functions are elusive constructs with regard to current time questions, and this is more so in relation to issues relating to the future, as the needs and values of future generations are unknown. The consideration of altruistic behaviour (e.g. bequest values) might lead to distribution patterns more equitable then those arising from the utilitarian model grounded on selfishness. However, this resource distribution pattern would reflect the current generation's 'selfish altruism' (Page 1977). That is, there would be no assurance that future generations' wants and even needs were satisfied.

4.4.1 Rawls' theory of justice

The agents considered by Rawls (1972) are rational self-interested individuals. However, this contractarian theory is developed as an alternative to utilitarianism, as it seemed unlikely to Rawls that utilitarianism would be adopted as a rule for the basic structure of society. The reason proposed by Rawls is that it is implausible that rational self-interested persons would embrace a principle which may require personal sacrifice in order to maximise the total utility of society and which does not guarantee personal self-respect to everybody. The latter is seen as

4. The utilitarian income distribution pattern would result in B having greater total utility than A. However, their marginal utility would be equalised.

essential if people are 'to pursue their conception of good with zest and to delight in its fulfilment.' (Rawls 1972, p. 178).

The two principles of justice which Rawls specifies as the constitution of a society and will regulate all further agreements, are agreed upon in the 'original position'[5]. They affirm, lexicographically, equality of rights in basic liberties among individuals and that choices are to be made so that they benefit the least advantaged in society and provide for equal opportunities. In Rawls' 'original position', individuals are brought together and are assumed to be under a 'veil of ignorance'. They do not know the position they occupy in society, or their endowments, but they do know basic facts about society such as political, economic and psychological principles. This sets up a *fair* procedure which leads to the adoption of principles which can therefore be considered *just*.

Given that the original agreement is drawn under uncertainty, Rawls suggests that rational agents would adopt a strategy that maximises the minimum state, i.e. maximin strategy. In the 'original position', the maximin rule applies because: (a) there is no knowledge of the likelihood of the possible outcomes; (b) the principles of justice provide a satisfactory minimum, given that they result in a workable theory of justice compatible with the demands of efficiency; and (c) the principles of justice provide a satisfactory minimum when compared with the possible outcomes arising from the application of utilitarianism (Rawls 1972). The principles adopted will benefit the least well off and will not be regretted, once the veil is lifted and the position in society of the agents is revealed.

In Rawls' theory, equity is expressed in terms of primary goods. These are goods which Rawls assumed that every rational individual desires. Primary goods include not only income and wealth but also rights, opportunities and the social basis for self-respect. As stressed above, basic rights are afforded priority over other primary goods, hence trade-offs between basic liberties and social and economic goals are not allowed. Rawls' theory differs from utilitarianism in that advantage is not measured in terms of utility, but by considering an index of primary goods. Also, rights have an intrinsic value, whereas utilitarianism simply affords them instrumental value. Notice that rights also determine the opportunities open to people, and equality in outcomes is related to, but differs from, equality in opportunities.

Rawls noted that each generation should preserve natural assets, the 'gains of culture and civilisation', and just institutions. However, he addresses intergenerational justice as a question of determining a fair saving rate, where saving may take various forms, such as manufactured capital and education. Rawls stresses that saving is not required solely to make future generations better-off, but it is a condition needed to bring about a just society. However, focusing on the saving rate formalises the question of intergenerational justice in terms of making future generations better-off. This misses the fact that, during this process of accumulation, disruptive ecological effects may occur and could negatively affect future generations. This approach to intergenerational equity does not recognise that the obligation to avoid harm may be more vital than attempts to improve well-being (Barry 1977).

5. For a recent discussion of Rawls' work see Kukathas and Pettit (1990).

Rawls assumes that the persons gathered in the 'original position' are contemporaries. To extend the analysis (which is mainly concerned with intragenerational justice) to intergenerational justice, a motivational assumption is introduced. It is assumed that agents in the 'original position' care for their siblings. This creates a problem of consistency in the theory. The aim of the theory is to derive 'all duties and obligations' from a rational approach. However, assuming that rational self-interested individuals are concerned for the welfare of their direct descendants inserts in the model the answer to the problem that Rawls seeks to solve (Barry 1977; Richards 1983).

Page (1977) provides an application of Rawls' theory to intergenerational distribution of natural resources avoiding the problem just discussed by assuming that the agents in the 'original position' are from 'all generations' and that they are ignorant of which generation they will belong to. It is suggested by Page that, in the 'original position', agreement would be reached on: (i) the provision of the conditions needed for permanent livability (which may be taken as the assurance that life-support systems would not be disrupted), and (ii) the need for generational intertemporal self-sufficiency.

One criticism of the application of Rawls' theory to intergenerational justice of particular relevance here, is that there seems to be a problem of circularity. That is, the principles adopted in the 'original position' may determine how many generations will exist and consequently how many generations will be represented in the 'original position' (Pasek 1992). These issues are now considered.

4.3 Some Critical Issues in Intergenerational Equity

Two questions are addressed. First, how do we choose the patterns of resource-use which will allow the existence of future generations in the 'original position'? Second, by how far do the interests of the present generation diverge from those of the future generations?

Page (1991) asserts that it is necessary to keep the resource base intact in order to achieve intergenerational equity. However, it was noted above that MC and HC may be used to enhance the stock of NC. Hence, modifications of the resource base do not necessarily imply intergenerational inequality. Moreover, problems may be encountered in achieving the target suggested by Page. A non-decreasing stock of RNC may be maintained by definition, while taking advantage of the flow of its services, but the stock of NNC is reduced when extraction occurs. This could possibly limit the number of generations that will inhabit the planet, if RNC alone cannot provide sufficient resources. If the rights to the use of a finite stock of NNC are extended to infinite generations, the share of each generation will tend to zero, assuming no recycling. All generations would forego the benefits that could be derived from the use of NNC. This does not appear to be a satisfactory solution. Hence, what should be done with NNC?

One or other of three principles may be considered for adoption. Each generation could be asked to replace the NNC used by investing in RNC (Costanza and Daly 1992). They regard this compensation as a prudent condition to guarantee sustainability. The problem with this resource-use pattern is that it is difficult to see

on what principles the compensation should be based. A second approach may be to limit the rate of NNC consumption to the rate of improvement in technical efficiency achieved in its use. However, this resource-use pattern presents implementation problems. It is not known in advance the rate of technical progress that will be achieved by a generation. Also, this policy would require a particularly interventionist approach.

A possible alternative is the adoption of a more general principle which specifies that policies should be adopted in order to facilitate the transition to an economic system that relies almost entirely on renewable resources. This may be implemented by: a) introducing depletion taxes on NC eventually counterbalanced by a decrease in income tax (Costanza and Daly 1992); b) shifting the focus of research for development from NNC-based activities to RNC-based activities.

In relation to the sustainable use of RNC, it should be noted that the problems posed by uncertainty and irreversibility in devising sustainable practices should not be underestimated. For instance, while the need to shift to sustainable forest management is often advocated, it appears that no proven ecologically sustainable logging management scheme exists (Poore 1989; Keto et al. 1990). Trials of such schemes have mainly considered sustainability in terms of yield of commercial timber, not in terms of the sustainability of forest ecosystems.

Having examined the above approaches to NC management, it is obvious that, given the existing degree of uncertainty, it is not possible to guarantee that the chosen resource management conditions will allow the existence of an infinite number of generations. Due to ecological, economic and social uncertainties, it is impossible to define exactly the conditions that will lead to the indefinite existence of human beings, if this is indeed possible. It is only through an *incremental and adaptive* learning process that the use of NC will be tuned so as to facilitate the existence of future generations.

A Rawlsian approach to intergenerational equity is useful in deriving general principles of justice and in deciding on the potential resource patterns to be followed to achieve intergenerational equity. However, it cannot provide definitive answers to intergenerational resource distribution. We cannot know the exact conditions which will allow the certain existence of future generations. In this respect, the critique of circularity levelled against the Rawlsian theory is thus of limited practical relevance.

A further weakness of the Rawlsian approach relates to the framing of the problem. The question of intergenerational equity is formulated as one of having to decide on the distribution of a limited quantity of resources across generations. This is obviously correct in relation to NNC. For RNC there may not be so stark a distinction between the interests of different generations. It may be in the interests both of present and future generations to maintain a non-decreasing RNC. Some aggregate figures, derived from World Bank (1992), may exemplify the case canvassed here.

About one third of the world's arable land is affected by elevated salt concentrations. Soil degradation and erosion negatively affect agricultural production and water quality, and cause the siltation of dams. In some tropical LDCs, soil loss is thought to cause economic losses ranging between 0.5 and 1.5% of GDP. This list could continue (see World Bank 1992), but the items presented suffice to show that the interests of different generations do not always conflict.

4.6 Implications for Biodiversity Conservation

The ideas of the previous sections may now be brought together to draw the implications they hold for biodiversity conservation and the distribution of NC across generations.

Choosing a pattern of resource distribution between generations is not only a question of finding the one which is most equitable. The agents in the 'original position' 'will not enter into agreements they cannot keep, or can do so only with great difficulty.' (Rawls 1972, p. 145). In terms of the problem addressed here, this implies that it is necessary to identify which resource distribution pattern can actually be achieved. This is influenced by several factors such as the socioeconomic conditions of a specific country and the knowledge of the factors which make the sustainable use of ecosystems possible. This implies that (from an intergenerational equity point of view) *one*, 'optimal' resource-use pattern cannot be identified. Three patterns of resource-use are outlined below and are referred to as degrees of intergenerational equity. The specification of multiple resource use patterns is appropriate to an incremental and adaptive learning process, and also facilitates the identification of objectives to be adopted in the 'real-life' political process.

(i) *Extensive* intergenerational equity, requiring equitable access to NC. This may be achieved by not reducing the stock of RNC and by progressively facilitating the substitution of NNC with RNC in the economic process. This degree of intergenerational equity roughly corresponds to the Lockeian principle that each generation should bequest to the following generations at least an equivalent resource base (Kavka 1978).

(ii) *Intermediate* intergenerational equity, requiring only non-negative changes in the stock of RNC. This could imply that the stock of NNC is progressively depleted without consideration of the impact on future generations.

(iii) *Minimal* intergenerational equity, requiring the maintenance of critical RNC which provides life-support functions. This concept of intergenerational equity is the one that is closest to the obligation not to harm future generations.

It may be observed that it is in the case of minimal intergenerational equity that the interests of the current and future generations most closely concur, because it is indisputable that all generations need life-support systems. Also, different generations may not have diverging interests in maintaining a non-decreasing level of RNC.

Biodiversity is a critical factor in securing the continuing functioning of life-support systems. The conservation of biodiversity at the bioregional level would mean considerable progress in achieving intermediate intergenerational equity. In fact, protecting biodiversity at the bioregional scale implies that RNC is managed in a sustainable fashion. While PAs may be regarded by some as the most important way of protecting biodiversity, they represent only a partial insurance against biodiversity loss. Efforts by countries in protecting rare and representative ecosystems and species in PA systems would thus contribute to the conservation of part of their critical RNC. This would therefore comply only partially with the requirement for the achievement of minimal intergenerational equity.

The above arguments have two main implications. Firstly, other studies of the economics of biodiversity conservation have addressed the question of how to allocate a given budget for the preservation of species. They have noted that neo-

classical economics alone cannot provide a basis for deciding the amount of resources to be assigned to the conservation of species (Randall 1986). The task of deriving an ethical basis for determining the resources to be allocated to biodiversity conservation has been attempted here. The adoption by a country of the principle that future generations have rights (and most countries have done so by signing the Rio declaration), seems to imply that they ought to *at least* plan and fund the attainment of minimal intergenerational equity.

Secondly, the approach to the economic assessment of PAs should be reconsidered. The establishment of PA systems fulfils, at least partially, the ethically and ecologically based requirement that society has for conserving critical RNC. At this conceptual level, it would appear therefore that economic analysis should not be used to decide if PA systems should or should not be established, as is implied by Dixon and Sherman (1990) and Ruitenbeek (1992). This question would necessarily be answered in the affirmative on the basis of the interests of future generations, which at this level tend to merge with those of the current generation.

4.7 Conclusion and Summary

The foregoing analysis has been carried out by following a rationalist approach grounded on self-interested individual choice which, furthermore, excluded altruism. Adopting the view that individuals act unselfishly and are concerned about the future of their society would likely strengthen the conclusions derived in the previous section.

It is recognised that the ethical basis derived here for assessing natural resources distribution questions may not be transferable to all countries. Even within western countries, which are culturally closer to the ethical basis adopted here, other rather different ethical approaches exist. What is important to stress is that, because of the separation of economics from ethics (Sen 1987), the ethical implications of economic analysis are often not made clear or understood. The ethical underpinnings of economic analysis and the policies which may result should be exposed to and compared with the ethos of the specific society to which they are applied. This would facilitate the identification of dissonances which could hinder the successful application of the policies, and suggest viable alternatives.

Also, concern has been expressed about the dominance of the preservationist approach in environmental policy making (e.g. Adams 1990), because it pays little attention to the needs of the indigenous people. The emphasis of this chapter on intergenerational equity does not imply that the needs of local people belonging to the current generation should be overridden by the needs and rights of future generations.

It is now time to summarise the socioeconomic framework that guides the process of PA assessment and establishment presented in Parts III and IV.

The framework recognises the importance of integrating elements of neoclassical economics, institutional economics, and the people-centred approach to development. The analysis can be, and needs to be, carried out at three decision-making levels: the international, the national, and the local level. At the operational level, the specific elements of the framework guiding the process of assessment and establishment of PAs may be stated as follows:

- a system of protected areas should be established in order to achieve, at least partially, minimal intergenerational equity;
- the institutional features relevant to the succesful implementation of the conservation program, and their eventual modification or creation, should be considered;
- the process of assessment and establishment of protected areas should be carried out with the participation of the stakeholders;
- the most cost-effective way of establishing both a protected area system and the individual areas should be investigated;
- the intragenerational outcomes should be assessed and eventually counterbalanced.

Part III

Assessing and Establishing Protected Areas in Vanuatu

5 Overview of the Erromango Kauri Protected Area

Luca Tacconi
Jeff Bennett

5.1 Introduction

A socioeconomic framework for the assessment and establishment of PAs was developed in the previous two chapters. The application of this framework to two case studies in Vanuatu is detailed in this chapter and in the following three chapters.

The first case study relates to the Erromango Kauri Protected Area (EKPA). This chapter presents background information about the EKPA. Details of the process of socioeconomic assessment of the establishment of the EKPA are provided in the next chapter.

Since 1986, the Department of Forests of the Government of Vanuatu has been discussing with the landowners and other people of the area, the possibility of establishing the EKPA. From the Department of Forests' point of view, the main purpose of establishing the EKPA would be to protect of one of the most promising species of kauri tree (*Agathis*) for plantation purposes. However, the role of the EKPA in conserving biodiversity would be beyond that of simply protecting this important commercial species. It would safeguard an array of representative vegetation types of the country that, was nowhere else afforded protection from commercial logging activities at the start of the present research.

Since the inception of the idea to establish the EKPA, it has been proposed that the Government lease the land from the customary owners. However, for several reasons, the most important of which was probably the difficulty of reaching a settlement on financial details, the EKPA was not declared prior to the inception of this project. Hence, the research detailed here placed special emphasis on assessing what form of financial and institutional agreement would enable the establishment of the area.

5.2 A Brief History of the Erromango Kauri Protected Area

The establishment of the EKPA was suggested in 1971 by the members of the Royal Society–Percy Sladen expedition. 'Members of the Expedition have submitted a proposal to the British and French administration in the New Hebrides for the preservation of this area, and the proposal has been supported by the Royal Society and by the International Union for the Conservation of Nature.' (Lee 1975, p. 275). At the time of the proposal, the logging company Société Agathis was operating on Erromango. However, the company ceased its operations in 1974 without having logged the EKPA site, removing some of the urgency from the project.

Since 1980, four reports have been prepared on the need for and/or the feasibility of establishing the EKPA. Summaries of their contents follow.

Neil (1985) reviews ecological aspects of *Agathis macrophylla* and puts forward a proposal for the establishment of the EKPA. He suggests the conservation of about 1500 ha, because this would protect one of the most promising species of *Agathis* for plantation purposes. A protected area would conserve the species in its natural habitat and would also allow further ecological studies to be undertaken. Neil (1985) stresses that the EKPA would be of international importance, given that there are no protected areas in which *A. macrophylla* is found.[1] (*A. macrophylla* also occurs in Fiji and the Santa Cruz islands in the Solomon Islands.) He remarks that compensation for the landowners, although difficult to assess, should probably reflect the foregone logging royalties.

Gillison and Neil (1987) further review the ecological status of *Agathis* and report on a survey of the EKPA carried out to assess the area needed to maintain a viable population of kauri trees. They conclude that an area of approximately 3000 ha should be considered for conservation status. They further note that:

a) the area should be considered for inclusion in the World Heritage List;

b) the issue of compensation should be further considered; and

c) in order to assess the amount of compensation to be paid, and to attract funding from donor agencies, a forest inventory and a further ecological study should be undertaken.

A consultancy report (Leaver and Spriggs 1989) commissioned by the Food and Agriculture Organization (FAO) affirms that the conservation value of the area has already been established and that the further studies suggested by Gillison and Neil (1987) would merely extend the assessment process that had started in 1971 and had already consumed considerable resources. They remark that attention should be directed to: (a) determining the appropriate conservation status of the area; (b) making the establishment of the EKPA part of a national protected areas strategy; (c) devising a management plan for the area; (d) seeking appropriate international recognition; and (e) establishing a compensation framework.

In relation to compensation, they are critical of the suggestion that it should be tied to the value of foregone royalties from logging activities. Leaver and Spriggs (1989) note that: (a) the timber is not being used and will actually be returned to the landowners if the eventual lease agreement is terminated; and (b) the landowners see the value of not logging the area. Resolution of the question of compensation for the case of Erromango is seen by Leaver and Spriggs (1989) as being of great significance. It will, they assert, probably determine the pattern of conservation decisions in Vanuatu.

The question of compensation is further dealt with by Barrance (1989), who was at the time Forest Research Officer with the Department of Forests. He reports that the proposal to compensate the landowners on the basis of 'an arbitrarily chosen percentage' of the foregone timber royalties was abandoned because of the

1. According to James Paine, World Conservation Monitoring Centre, the establishment of the EKPA would be a 'unique and important step' in the conservation of *A. macrophylla* (pers. comm. to L. Tacconi, letter 19 July 1993).

problems faced by landowners in areas such as Erromango in managing large sums of money. (It should be noted that this may be considered a paternalistic approach and indeed Barrance later remarked that it is not fair to assume that landowners will not be able to manage their financial resources.) Compensation based on foregone royalties is, however, criticised by Barrance on other grounds. He argues that compensation based on foregone royalties would overestimate the actual opportunity cost to the landowners for at least two reasons:

a) the landowners value the forest in its undisturbed state, as it provides the opportunity for hunting, fishing, firewood collection, building materials, medicinal and food plants; it also provides more intangible benefits such as pride in having large kauri trees and providing children with the opportunity to see these trees; and

b) the forest in its undisturbed state prevents soil erosion.

The issue of compensation will be considered in detail in the next chapter. The geographical characteristics of the area are presented below.

5.3 Geographical Characteristics of the Protected Area

The protected area site is located on the western coast of Erromango (Figure 5.1). The village of Happy Land, situated outside the southern boundary of the EKPA, is located at about latitude 18°91′ South and longitude 169°07′ East. The total area of the EKPA with the boundaries proposed is approximately 3257 ha. The EKPA comprises the upper catchments of the Lampunari river and of the Pongkil river. The highest peak is Mount Vet Pop at 802 m above sea level (a.s.l.) and the lowest altitude occurs along the Lampunari river (which delimits the southern boundary of the EKPA) at about 150 m a.s.l. The EKPA area is presented in Figure 5.2.

In Figure 5.2, the EKPA is divided into two parts, A and B. Part A belongs to two cousins (for confidentiality reasons this landowning unit is referred to as Landowning unit one: LU1). When the research process described here was initiated, Part B was being disputed between three local families.

The upper slopes of the area experience a wet climate with average annual precipitation between 2000 and 2500 mm and relatively low rainfall seasonality. The lower slopes present an intermediate climate with an average annual rainfall of 1800–2000 mm and a short dry season.

According to data from VANRIS, there are five different vegetation types[2] in the EKPA area.

- Midheight forest with *Agathis—Calophyllum* (FmeAgCl): presents a moderately dense canopy; the main tree species recorded are *Agathis macrophylla, Calophyllum neo-ebudicum, Hernandia moerenhoutiana, Weinmannia denhamii, Syzygium* spp and *Bischofia javanica.*
- Midheight forest with *Calophyllum–Agathis* (FmeClAg): identical to FmeAgCl except that *Agathis* occurs sporadically.

2. The following description of vegetation types is based on Bellamy (1993).

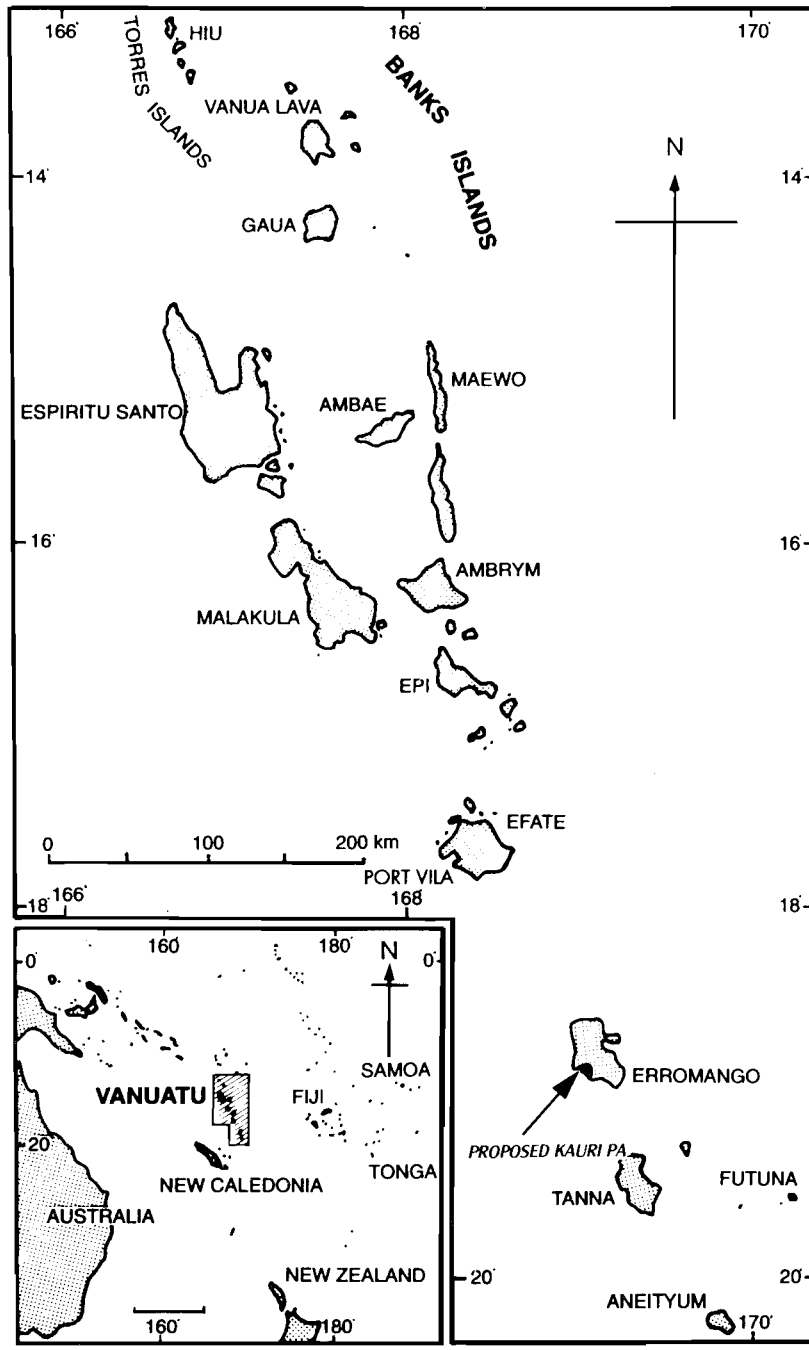

Figure 5.1 Map showing location of the Erromango Protected Area.

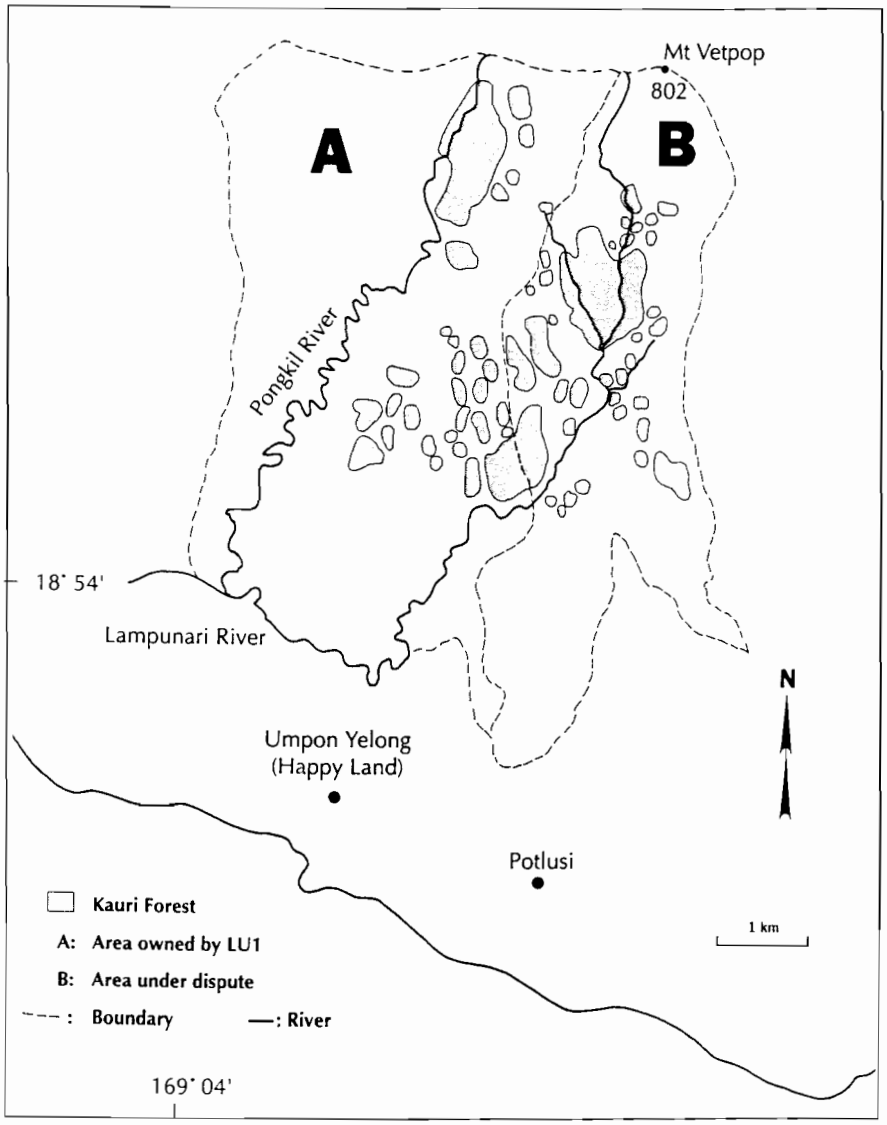

Figure 5.2 Map of the Erromango Kauri Protected Area.

- Low, montane forest with *Metrosideros-Weinmannia* (FIMW): an even canopy with emergent *Ficus* spp., *Metrosideros collina* and *Weinmannia* spp.
- Low forest with an open canopy, dominated by *Acacia spirobis* (FloAs), associated with patches of the vegetation type 'low scrub of *Vaccinium–Cyperaceae*' (SV)[3]. Some of the species in the canopy include *Alphitonia*

3. In VANRIS, the proportion of the first vegetation type is between 50% and 80% of the area of the resource mapping unit.

zyzyphoides, Mangifera minor, Dysoxylum amooroides, Canarium indicum, Syzygium spp. and *Pterocarpus indicus.*

- Grassland and/or herbaceous communities (G), locally known as 'white grass'. Schmid (1975) suggests that the dominant species in these herbaceous communities might be *Chrysopogon aciculatus*, but detailed surveys of the area have yet to be undertaken.

Detailed information on the vegetation types of the EKPA and some physical parameters are reported in Table 5.1.

Table 5.1 Description of the kauri protected area.

RMU[a]	Vegetation type[b]	Area (ha)	Forest area (ha)	Strata	Slope (°)	Loggable area in RMU[c] (%)
316	FIMW	424	424	–	> 30	0
323	FmeClAg	5	5	17	20–30	0–20
324	FmeClAg	20	20	17	10–20	80
325	FmeAgCl	821	821	17	20–30	0–20
326	FmeAgCl	125	125	17	10–20	80
327	FmeAgCl	139	139	16	10–20	80
328	FloAsSV	49	32	13	20–30	0
329	FmeAgCl	90	90	16	2–10	90
330	FmeClAg	42	42	21	2–10	90
331	FmeClAg	268	268	–	> 30	0
333	FloAsSV	85	55	12	10–20	80
336	FloAsSV	7	5	10	10–20	80
338	G	41	0	–	10–20	0
339	FloAsSV	10	7	12	10–20	80
340	G	238	0	–	20–30	0
341	FmeAgCl	27	27	15	20–30	50–70
342	FloAsSV	202	131	11	10–20	70
344	FloAsSV	6	4	9	10–20	80
345	FloAsSV	33	21	–	> 30	0
346	FloAsSV	548	356	12	10–20	80
347	FmeAgCl	36	36	15	10–20	50–70
356	FloAsSV	27	18	411	> 30	0
369	FmeClAg	14	14	423	> 30	0
Total		3257	2641			

[a] Resource Mapping Unit (RMU) adopted in the design of the Vanuatu Resource Information System

[b] FIMW: Low, montane forest with *Metrosideros–Weinmannia.*
FmeClAg: Midheight forest with *Calophyllum–Agathis.*
FmeAgCl: Midheight forest with *Agathis–Calophyllum.*
FloAsSV: Low forest with an open canopy, dominated by *Acacia spirobis*, associated with patches of the vegetation type low scrub of *Vaccinium–Cyperaceae.*
G: Grassland and/or herbaceous communities.

[c] Lower estimate parameters derived from Baldwin et al. (1993).
Source of vegetation types: Bellamy (1993).

Between the southern border of the EKPA and the sea lies an extensive area of forest which, as it is close to the villages, is used for slash and burn agriculture. This forest type is classified as:

- Midheight forest with an open canopy (Fmo): some of the common species include *Ficus* spp., *Antiaris toxicaria, Endospermum medullosum, Dendrocnide latifolia* and *Syzygium* spp.

Vegetation types FmeAgCl, FmeClAg and FlMW are primary rainforests; Fmo and FloAs are forests disturbed by human and/or cyclone activities; grassland (G) is a fire sub-climax.

The dominant landforms of the EKPA area are 'deeply dissected older volcanic cones' and 'finely dissected volcanic footslopes', mostly presenting very steep slopes (above 20°). Basaltic and andesitic pyroclastic rocks are the dominant rock type. Soil types of the area have been described by Quantin (1977) and are classified according to their agricultural potential as: very poor and poor (in the upper slopes) and mediocre in the lower slopes. The former are described in VANRIS as humitropets, and the latter as dystropepts (soil order: inceptisols).[4]

5.4 Tenure and Natural Resources Management

The institutional settings determine *how* resource use is distributed across individuals and groups, and thus *who* has the right to control and/or use the resources available in an the area. An understanding of these features is needed both for the economic assessment process and for the development of new and appropriate institutional arrangements that are eventually required for managing resources. The EKPA is no exception.

The area proposed for protected status on Erromango is under the control of two land-owning units. One section, of approximately 2042 ha, is owned by two cousins, hereafter called land owning unit 1 (LU1). The ownership of the other section, of approximately 1215 ha, was disputed when research in the area was carried out. According to the local customary rules, landowners have extensive control over the resources. This is exemplified by the notice shown below. This was written by LU1 as a reprisal following a land dispute concerning the area of the village school.

Public Notice

Following [village] court sitting on 23/9/92, we two do not agree with the decision of the court. We are the custom owners of Nampunari [that includes the EKPA]. We want to stop people from using Nampunari in the following ways:

1) Do not ask to go walk about [hunting]

2) Do not go to the river to fish

3) Do not take dogs to Nampunari

4) Do not fish Naura [freshwater prawns]

5) Do not take wood or bamboo

6) Do not use the road through Nampunari

4. The definitions of landforms, rocktypes and soils used here are derived from Bellamy (1993).

7) People going to Dillon's Bay should only use the road through the village

8) 3,000 vatu fine applies to people breaking the above rules

9) If a person does not pay the fine, the village chief will pay for him/her

May 1993 signed [LU1].
[Translated from Sie, the local language.]

This notice shows the several claims to resources held by landowners. They control the use of the land and of the resources on that land (i.e. trees, fish and water) and the rights of access to the area. These rights are recognised and accepted by the people in the area.

One feasibility study on the EKPA noted: the 'local community, including the customary owners, expressed a strong wish that the area not be logged and retained for enjoyment, traditional use and to educate their children. This is a classic community conservation aspiration and as such has an acceptable "cost" to that community in terms of revenue from resources foregone' (Leaver and Spriggs 1989, p. 8). The important point that arises from the resource tenure rules described is that it is the *landowners*, and not the community, who will have to forego certain resource-use benefits, if the EKPA is established. This, of course, has to be taken into account when addressing the issue of actual compensation for the establishment of the EKPA.

The specific institutional setting has also to be considered in devising the process of participation in decision-making for the establishment and management of the EKPA. Another study on the establishment of the EKPA reports:

> 'Lease negotiation meetings ... took place ... in a village adjacent to the reserve [EKPA], and they were open to all members of the community. ... In the discussions the landowners were represented by the overall chief of the several villages of the area: *they had little direct input themselves*. ... [T]he fact that one of the landowners, who lives in Vila [the capital city], waited until he returned to Vila before raising objections to some points in the lease, implies that he felt restricted in the community meeting from making his views felt.' (Barrance 1989, p. 131; emphasis added).

The participation of the landowners in all phases of the decision-making process is of fundamental importance to the successful implementation of any conservation project in Vanuatu. The extent of the customary owners' rights to the land requires their full agreement to the establishment of the EKPA. Aware of the problems arising from a misdirected participation process, particular attention was given during the research process to obtain the views of the landowners and of the people trusted by them (e.g. one village chief).

5.5 The Current Status of the Erromango Kauri Protected Area

Following the research presented in detail in the next chapter, the landowners decided to sign a land lease agreement that will allow the government to establish the EKPA. The lease agreement was signed on 1 May 1995.

The lease agreement is initially for a trial period of five years. This will allow the landowners to test the compatibility of the establishment of the EKPA with their lifestyles. According to the wishes of LU1, the government has paid the value of their five-year lease in a lump-sum. Because of this lump-sum payment, the lease rate for the first five years is fixed. If the lease agreement is renewed for a longer period, it is expected that the lease rate will be periodically revised in accordance with any increases in lease payments for unimproved agricultural land on Erromango, as determined by the Department of Lands. It should be noted that it is not expected that a further lump-sum payment will be made. If the lease is renewed for a longer term after the five-year trial period, annual payments would be made as a safeguard against contravention of lease conditions. Under the current agreement, the Department of Forests can enforce the lease agreement. This is the department that must authorise any logging plan in Vanuatu and can therefore guarantee that no logging activities will take place in the area.

The European Union has provided funds to finance the five-year lease agreement. In order to ensure the long-term maintenance of the EKPA, a long-term lease agreement needs to be established. To renew the lease, more funds are needed. Trust funds appear to be useful tools to ensure the long-term availability of money needed to meet periodical payments such as lease payment. To facilitate the establishment of a trust fund for the maintenance of the EKPA, a finance company was contracted to develop the Trust Deed. A draft of the deed has been developed and supplied to the competent authorities of the Government of Vanuatu (see Appendix 2) who are in the process of consulting with aid donors to seek funding for the establishment of the fund.

A further contribution to the long-term maintenance of the EKPA may derive from the establishment of income streams that are alternatives to logging royalties. One possible income source is from the cultivation of sandalwood. Economic aspects of sandalwood cultivation are therefore considered in Chapter Seven. The analysis turns now to a detailed account of the process of assessment of the EKPA.

6 Assessment Process of the Erromango Kauri Protected Area

Luca Tacconi
Jeff Bennett

6.1 Introduction

A general overview of the Erromango Kauri Protected Area (EKPA) was presented in the previous chapter. The process of assessment of the EKPA and its outcomes are described in this chapter.

The socioeconomic characteristics of the study area are presented in Section 6.2. In Section 6.3 the assessment of the EKPA is presented. In that section, both the commercial benefits and the subsistence that may be derived from the forest are considered. The process for the assessment of the economic incentive to be provided to the landowners in order to establish the EKPA is described in Section 6.4. The conclusion for the chapter is presented in Section 6.5.

6.2 Socioeconomic Characteristics of the Study Area

There are four villages along the southern border of the EKPA. The 1989 national census found that the villages had 32 households and 143 inhabitants. Happy Land is the largest village with 13 households and 82 inhabitants. At the time of the survey conducted for this study 15 households and 77 inhabitants were counted. Only two households did not have gardens. One household had its garden in another village, and the teacher did not have a garden. The area has a population density of only one inhabitant per square kilometre.

The village of Happy Land was founded in 1942/43 when the people living in sparse settlements decided to come together in order to be serviced by a doctor sent to Erromango by the Condominium Government of the New Hebrides (i.e. the joint British and French colonial administration). The settlement is located (see Map 5.2) at about forty minutes walk (about 3 km) from Pongkil Bay (the nearest landing for a small boat) and about four to five hours walk (about 14 km) from Dillon's Bay. There is no road access to the village. This is a constraint on the development of the agriculture sector.[1]

The economy of Happy Land is subsistence based. Traditional gardening is practiced in the area. In the traditional gardening–farming system (Weightman 1989) crops such as taro, yam, sweet potato, manioc and breadfruit are grown. There are no cash crops. Banana and sugarcane are also produced but again for

1. In the course of village meetings and individual interviews, it was ascertained that this is also a view widely held within the local population.

own consumption only. This farming system is no longer common in Vanuatu, as most farmers combine traditional crops with cash crops such as coconut, kava, coffee and cocoa. The climate, the soil type (detailed in Chapter Five) and the lack of roads are the three main factors contributing to the persistence of the traditional farming system in the area. Farmers report that kava, coffee and cocoa do not grow well in the area. Coconuts will grow well along the coastline but will be less productive if planted close to the village, which is about 329 m above sea level.

The garden area of the village was surveyed in order to ascertain whether the establishment of the EKPA, according to the boundaries detailed here, would conflict with subsistence farming. The gardens located close to the village are established on 'red soil' and those further away from the village, towards the Lampunari river, are on 'black soil' (these are the soil categories described by the farmers). Black soil is reported to be suitable for all the crops grown, whereas red soil is not suitable for yam. Also, bananas planted on red soil produce for only one year, while those planted on black soil are productive for two years. The minimum fallow period needed to have good regeneration of trees and thus allow satisfactory production of garden crops was reported to be four years. The gardens are located no more than 20 minutes walking distance from the village (it takes about 30 minutes to reach the Lampunari river).

Gardens are also established on the terraces towards the sea, at up to one hour walking distance from the village. The fallow period for these gardens should preferably be no more than eight to ten years. A longer fallow period would involve more work in clearing the area from the relatively large trees that would have had time to grow.

At the time of the survey, the thirteen households had a total of 98 gardens (7.5 per household). In order to assess the total area of garden land, 44 gardens belonging to ten of the thirteen households were surveyed. The mean size of a garden was found to be about 538 m^2 (standard deviation 276). The total area of garden land was derived by multiplying the number of gardens which had not been measured by the mean and adding this to the actual area of the 44 gardens which were measured. This gives a total yearly garden area of 54,326 m^2 (about 4178 m^2 per household). Assuming an average fallow cycle of five years, the area required for gardening is about 271,630 m^2 (27.163 ha). The villagers have about 1100 ha of land south of the EKPA. Even if it is assumed that only 50% of this area is suitable for agriculture, there appears to be sufficient land for agricultural enterprises. This reflects the opinion of the villagers. Without quantification of the land available, they affirmed that, for the foreseeable future, at the current growth rate of the village population, the land outside the EKPA could meet villagers' needs.

The sale of sandalwood was the main source of income declared by the villagers. Trade in sandalwood is problematic for two main reasons. There are few mature trees in the forests in the area of Happy Land. When harvested, these trees have to be carried by hand from the forest to Pongkil Bay. This may take several hours. The income earned in 1992 from the sale of sandalwood varied from household to household: it ranged from a few thousand vatu to a maximum reported of 75,000 vatu,[2] for a household which cut sandalwood in northern Erromango.

2. The value of the Australian dollar has been fluctuating during the period 1992–1995 between 80 and 85 vatu.

Expenditures are also very limited. There are no taxes, or fees for primary school students. The few goods used, such as lamp fuel, sugar, tobacco and tea, have to be purchased at the cooperative store in Dillon's Bay. A weekly market is held in the village but only the local people take part and the few things for sale are food crops, fish and cooked food. Prices for these items are about one tenth of those recorded at the market in Vila.

6.3 The Economic Assessment of the Protected Area

A first important question to be addressed is: without the intervention of the Government of Vanuatu, would the landowners themselves conserve the forest that has been proposed as a protected area? It is obvious that a positive reply would avoid the need for government intervention. This issue is addressed below.

It could be expected that the landowners would not conserve the forest proposed for inclusion in the EKPA if they did not receive, from this land-use, benefits that are at least equivalent to those arising from alternative uses of the same area (e.g. logging). One of the parties involved in the land dispute over about one-third of the EKPA, had previously signed a contract to allow a logging company to operate in the forest. This could be taken as providing some evidence that the landowners would not conserve the area. However, there is a need for a more detailed assessment of the current and potential benefits derived at the local level from the forest. This could help the landowners to better assess their land-use options. Moreover, it may indicate the type and extent of the government intervention eventually required.

The benefits that could be derived from the forest by the local people include: a) direct use values (subsistence and commercial use); b) indirect use values (soil run-off control and water quality maintenance); and c) non-use values (e.g. existence and bequest values).

The landowners of the EKPA can capture only part of these benefits. They can capture the direct use values and benefit from part of the indirect and non-use values. In assessing the benefits derived by the landowners, the following analysis considers only direct use values. There are two reasons for this approach. Firstly, to assess indirect use values, data on the physical characteristics of the area that are currently unavailable would be required. Secondly, the assessment of non-use values would require the use of techniques such as contingent valuation. Several problems faced by this approach have been noted in previous chapters. Furthermore, the approach is particularly prone to problems of inaccuracy or bias when very small numbers of beneficiaries are involved (four landowners in this case) (Bennett and Carter 1993).

To the landowners, royalties from logging operations are, potentially, the most important commercial value of the forest to be included in the EKPA. In order to conserve the forest, landowners would have to forego logging royalties. An assessment of the value of these royalties follows.

6.3.1 Commercial benefits from the forest

The assessment of timber volumes in tropical forest ecosystems is notoriously difficult and the accuracy of the results of any such enterprise highly uncertain. This is evident in the study of Erromango forests undertaken by Johnson (1971). The study was commissioned by the Condominium Government[3] in order to assess the economic potential of the timber resources of the island. It was a very detailed study, involving fieldwork carried out over the period of one year (1966/67) and covering an area of 14100 ha. The area being considered for protected status was surveyed by Johnson's team (Section 2, Subsection D, Ridge Unit No. 16, part of No. 15 and part of No. 17 in the Johnson's report). The results are presented in Table 6.1.

Table 6.1 Volumes of merchantable timber (60 cm diameter at breast height)

Ridge unit[a] No.	Total area (ha)	Species (ha)	Mean volume (m^3/ha)	Standard error (m^3/ha)	Percentage standard error	Reliable minimum estimate[b] (m^3/ha)
15	544	Kauri	7.0	11.3	161.7	-4.3
		Tamanu[c]	36.0	19.3	53.6	16.7
		Other species	12.2	4.3	35.0	7.9
		All species	55.1	17.2	31.1	37.9
16	1266	Kauri	16.9	17.6	104.0	0.7
		Tamanu	27.1	17.6	64.7	9.5
		Other species	16.9	11.5	68.1	5.4
		All species	60.9	22.3	36.6	38.6
17	345	Kauri	0.0	0.0	0.0	0.0
		Tamanu	29.8	15.7	52.5	14.1
		Other species	15.3	8.4	54.9	6.9
		All species	45.1	19.9	44.2	25.2

Source: Johnson (1971).

[a] Mapping area adopted in Johnson's study.

[b] Reliable minimum estimate = mean – standard error.

[c] *Callophyllum neo-ebudicum.*

The data presented by Johnson (1971) cannot be used directly to estimate the royalties foregone by the landowners. The frequency of cyclones in Vanuatu may have affected the volumes of timber occurring in the area. Also, a complete data set for the area is not provided. Furthermore, the merchantable timber volume was derived by Johnson by applying an *ad hoc* reduction factor to account for inaccessibility. One-third of the forest area was considered inaccessible. The information from VANRIS, however, allows a more detailed specification of the areas which are inaccessible. It also permits identification of those areas which are difficult to access but from which some timber could be forested.

3 Before independence in 1980, Vanuatu, then called New Hebrides, was ruled by an English–French joint colonial government, known as Condominium Government.

Rather than carrying out another full survey of the area (at considerable cost and with the likelihood of obtaining yet more data with a large statistical variability) Johnson's findings, information collected during the National Forest Resource Inventory (NFRI), data made available by VANRIS and the results of a small supplementary survey[4] are consolidated.

The large standard errors for the estimates of stocking volumes for kauri (Table 6.1) arise because of the uneven distribution of this species (Johnson 1971). Kauri trees occur in scattered groups, so some transects show high volumes of kauri whereas others present low volumes. To overcome this problem, the supplementary survey measured the stocking volumes of kauri by placing six transects in areas designated 'kauri forest' or in Johnson's vegetation map. This is thought to provide a more accurate estimate of the stocking volume of kauri. Six more transects were also placed in other forest areas of a different vegetation type to supplement the data already available through the national forest resource inventory.

The slope and 'loggability' parameters reported in Table 5.1 are of particular importance for the determination of the merchantable volume of timber standing in the EKPA. Logging on slopes greater than 30° is not allowed in Vanuatu. The analysis therefore excludes resource mapping units with slope greater than 30°. The landform and rock type, together with slope, determine the loggability parameters. For instance, deeply dissected landforms with a steep slope have a low loggability parameter. The loggability parameters presented in Table 5.1 are derived from Baldwin et al. (1993). In the table, some resource mapping units exhibit two parameters. Some of the parameters given by Baldwin et al. (1993) may appear too restrictive to some. For these parameters a higher value is considered in order to carry out sensitivity analysis. In Tables 6.2–6.4, the timber volumes derived from the application of the two sets of parameters are referred to as 'low range' (low loggability parameters) and 'high range' (high loggability parameters).

The mean values from the six transects established in kauri forests were:

- kauri: 37.985 m^3/ha (standard deviation 8.608)
- tamanu: 18.820 m^3/ha (standard deviation 6.742)
- other species: 4.800 m^3/ha (standard deviation 3.000).

Table 6.2 reports the volumes of kauri, tamanu and other species in dense kauri forests. Timber volumes for other forest types are presented in Table 6.3.

Data collected during the national forestry inventory provide the basis for the assessment of merchantable timber standing in the other forest areas. For each resource mapping unit, the area of dense kauri forest (eventually found in the resource mapping unit) is subtracted from the area of forest, and the loggability parameter applied. This gives the loggable area for the resource mapping unit.

The timber volumes presented in Tables 6.2 and 6.3 are combined in Table 6.4. The value of royalties accruing to landowners is derived by applying royalty rates at the time of the survey: 1300 vatu/m^3 for kauri, 1000 vatu/m^3 for tamanu and 600 vatu/m^3 for other species.

4. The assistance of Japeth Hidson (Forestry Officer with the Department of Forests, Vanuatu) in making this survey possible is acknowledged. The survey was carried out during 1–7 July 1993.

The royalties presented in Table 6.4 would be foregone by the landowners if the EKPA were to be established.

The sale of sandalwood is a further commercial benefit that the landowners can derive from the forest. The establishment of the EKPA would not cause the loss of this resource to the landowner. They would be permitted to continue extracting it, though logging operations may damage the stock of sandalwood in some instances.

Table 6.2 Merchantable timber in kauri forest.

RMU	Area (ha)	Loggability (%)	Kauri (m^3)	Tamanu (m^3)[a]	Other species (m^3)[a]
324	8	80	243	96	25
325	233	0	0	0	0
		20	1170	701	179
326	8	80	243	96	25
327	29	80	881	349	89
328	10	0	0	0	0
		20	76	30	8
346	9	80	273	108	28
347	13	50	246	98	25
		70	345	137	35
Total		Low range	1886	747	192
		High range	3831	1517	389

[a] A reduction factor of 20% is applied to allow for defects.

The people of Happy Land consider the sale of sandalwood an important source of income. However, they believe that the resource is limited. In 1992, apparently only three trees were cut in the forest to be included in the EKPA, for an approximate return of 50000 vatu. Currently, landowners sporadically plant sandalwood in the garden areas close to the village. The potential economic benefits from sandalwood cultivation are discussed in the next chapter.

6.3.2 Subsistence benefits from the forest

The benefits that the local people derive from the forest in its non-logged state are considered here. Information on this topic is needed in order to: (a) understand the current resource-use patterns (eventually to be incorporated in the management plan for the EKPA); and (b) assess the economic incentive that will need to be provided to the landowners in order to obtain their agreement on the establishment of the EKPA.

If subsistence use of forest resources provides a significant contribution to the landowners' livelihood it would be expected that they would have an incentive to conserve the forest. However, it should be noted that logging in Vanuatu has not involved clear felling. Thus, some of the subsistence benefits could be enjoyed even if the forest area were to be logged.

In relation to the non-timber forest products found in the EKPA, it should be noted that about two-thirds of the forest area is currently 'closed off' because of the land dispute mentioned earlier. Thus, the natural resources found in this area are

not presently being exploited. The assessment of the value of forest resources relates to past and potential use of these resources. This assessment was carried out adopting rapid rural appraisal tools: a) village meeting; b) group interviews; c) individual open-ended questioning; d) analysis of aerial photographs carried out together with the villagers; and e) walks through the forest area close to the village and through the forest to be included in the EKPA.

Table 6.3 Merchantable timber for the other forest types.

RMU	Loggable area[a] (ha)	Kauri (m^3/ha)	Kauri (total m^3)	Tamanu (m^3/ha)[b]	Tamanu (total m^3)	Other species (m^3/ha)	Other species (total m^3)[b]
323	0	2.65	0	32.29	0	5.27	0
	1	2.65	2.65	32.29	26.32	5.27	4.22
324	9.6	2.65	25.44	32.29	247.99	5.27	40.47
325	0	2.65	0	32.29	0	5.27	0
	117.6	2.65	311.64	32.29	3037.84	5.27	495.80
326	93.6	–	–	32.29	2417.87	5.27	394.62
327	88	–	–	9.07	638.53	1.51	106.30
329	81	–	–	9.07	587.74	1.51	97.85
330	37.8	–	–	5.07	153.32	0.50	15.12
333	44	–	–	2.09	73.57	–	–
336	4	–	–	–	–	–	–
339	5.6	–	–	2.09	9.37	–	–
341	13.5	–	–	8.88	95.90	–	–
	18.9	–	–	8.88	134.27	–	–
342	91.7	–	–	10.70	784.95	2.44	223.75
344	3.2	–	–	–	–	–	–
346	277.6	–	–	2.09	464.15	–	–
347	11.5	–	–	8.88	81.7	–	–
16.1	–	–	8.88	114.37	–	–	
Total	Low range		25.44		5555.09		878.10
	High range		339.73		8690.29		1378.13

a See Table 5.1 for loggability parameter.

b A reduction factor of 20% is applied to allow for defects.

Table 6.4 Value of timber royalties (vatu).

	Kauri (m^3)	Value	Tamanu (m^3)	Value	Other species (m^3)	Value	Total value
Low range	1911.44	2484872	6302.09	6302090	1070.10	642060	9429022
High range	4170.73	5421949	10207.29	10207290	1767.13	1060278	16689517

Subsistence gardens

As already discussed, the forest area outside the EKPA appears to be sufficient for the requirements of the village population. If the forest to be included in the EKPA were to be logged, this would not incur costs in terms of lost garden production.

Firewood

Several species of timber are being used as firewood, with the following five species reported as being most favoured: nilaru (*Elattostachys falcata*), nangal (*Cupaniopsis* spp.), netor (*Syzygium* spp.), novou (*Macaranga* spp.), and pongnut (*Ficus adenosperma*).

With the exception of netor, these species grow in the garden areas. Novou is the first to grow after a garden is abandoned, followed by nilaru and nangal after four to five years. Pongnut is normally found in garden areas that have been abandoned for ten years or more.

Inquiries revealed that firewood is collected in the garden areas and in the secondary forest close to the village. In the words of one of the villagers, 'the dark bush is too far away for collecting firewood'.

From the species used and from the declared pattern of collection, it is apparent that the forest area to be included in the EKPA, which is considered 'dark bush', is not a primary source of firewood.

Building materials

All the houses in the village are built from plant material, with the exception of the corrugated iron roofs of the school and three houses.

The species most used for posts is namariu (*Acacia spirobis*) (which is found in garden areas and secondary forest close to the village) because of its durability (a strongly built house may last 15–20 years). Netor, novou, and namariu are commonly used to make rafters. The roof and the side walls are made with deniun (a cane species yet to be formally identified) and also with leaves of the sugarcane. Deniun grows wild in the gardens, but is also planted in order to produce larger and stronger canes.

The gardens and the forest close to the village provide building material sufficient for current and foreseeable use.

Medicinal plants

For several reasons, the assessment of the contribution of medicinal plants to local livelihood is a difficult task. First, people often guard their knowledge on medicinal plants and it is therefore difficult to assess whether the information collected reflects real uses. Secondly, medicinal plants are not used on a regular basis as is, for example, firewood. Long periods of continuous observation would be needed for a reliable estimate of their consumption to be made (whether this is indeed achievable is difficult to say, given the constraint mentioned above). Nevertheless, as for the previous resource categories, an attempt was made to determine the pattern of use of medicinal plants.

A list of plant species with their scientific and local language names was read to two respondents knowledgeable of plant names and uses. They recognised the names of all 135 plant species that had been collected on the west coast of Erromango by forest botanists[5] and gave their generic use (e.g. firewood, medicinal).

Forty-three plants were reported as having medicinal use. The locations (as defined by the respondents) where these plants could be collected can be grouped into five categories. 1) 'Dark bush': refers to closed-canopy forest essentially found in the EKPA and similar forest types not included in the EKPA but at significant distance from the village. 2) 'Bush close up': indicates secondary forest close to the village. 3) 'White grass': indicates the grassland area that is found in the EKPA. 4) 'Garden': medicinal plants that are commonly planted are listed in this category; some plants included in the next category are also found in garden areas. 5) 'Everywhere': several plant species widespread throughout the various vegetation types and their location was thus described by the informants.

The locations of the medicinal plants used in the village are summarised in Table 6.5. It may be noted that it is likely that the answers provided by the informants about the location of the plants do not fully describe the distribution of these plants in the local environment. A bias towards the places of most frequent collection may exist. This, however, does not compromise the analysis, which attempts to extrapolate the pattern of resource use.

Table 6.5 Place of collection of medicinal plants and their frequency distribution.

	Location				
	'Dark bush'	'Bush close up'	'White grass'	'Garden'	'Everywhere'
Only[a]	1	9	2	8	
Mix[b]	3	9	1	2	16

[a] Only one location was given for the plant.

[b] Two locations were given for the plant.

It is evident from Table 6.5 that only very few of the medicinal plants used in the village are collected in the areas to be included in the EKPA. Just 3 of 43 plants can be found only in locations associated with the EKPA.

Food

Wild pigs are a major food item that can be derived from the forest included in the EKPA. Currently, they cannot be hunted inside the EKPA because of the ban mentioned earlier. However, they can be hunted in other forest areas and around the garden areas. They are hunted with dogs or caught in traps set to limit the damage caused to crops.

[5] The botanists were P. Caballion and C. Sam, (Office de la recherche scientifique et technique outre-mer: ORSTOM), and P. Curry, Department of Forests.

Other food products can be obtained from the forest included in the EKPA. These are freshwater prawns, nuts (e.g. *Canarium spp.*), edible leaves and wild yam. Villagers reported using wild yam after cyclones, when other food is scarce.

It should be noted that wild yam, nuts and edible leaves are also found in gardens and the forest close to the village. It is difficult to assess whether the eventual loss of access to these items in the EKPA harm the villagers' livelihood, but the ban (described in the previous chapter) currently imposed on the utilisation of the resources from the forest included in the EKPA does not appear to have done so.

The foregoing analysis suggests that the ecosystems to be included in the EKPA have limited importance to the subsistence activities of the villagers of Happy Land and to the landowners of the EKPA. The landowners of the EKPA might therefore have no economic interest in conserving the forest in its current state, since the benefits of doing so do not outweigh the costs, which are the foregone logging royalties. It seems that there is thus a need for external intervention in order to conserve the forest area. From the analysis presented here, it is also possible to conclude that the establishment of the EKPA does not appear, at present, to be likely to conflict with subsistence activities of the people living in the surrounding area. Moreover, given the relatively limited pressure currently exerted on resources, no ecological damages should arise from the continuing use of the EKPA by the local people for their subsistence activities.

6.4 Determining the Economic Incentive for the Landowners

The question that now needs to be addressed is: what type of external intervention is required in order to conserve the area?

The Department of Forests had proposed to lease the land from the landowners. At the outset of research it was not evident, however, that this was the option favoured by the landowners. Also, it was unclear both to the landowners and the Department of Forests if lease payments would be a sufficient compensation for the benefits foregone by the landowners. Other mechanisms by which a EKPA could be established are now considered.

The possibility of developing an income-generating project was discussed with the landowners. The government, or a donor agency, could provide landowners with financial and technical support to develop income-generating activities in exchange for an undertaking to protect the forest. The landowners did not favour this option, arguing that the development of economic activities in the area is constrained by the lack of roads and access to markets (i.e. shipping facilities). Also, it is obvious that an income-generating project is riskier for the landowner than a lease agreement. A lease agreement provides a guaranteed steady income: an income-generating project may succeed or fail.

Nevertheless, following the examples of approaches adopted in several protected areas around the world that attempt to develop conservation-related income-generating activities, the potential for the development of these activities was considered. Unfortunately, no viable short-term economic activity was found. Only san-

dalwood cultivation, a long-term activity, was identified and will be discussed in the next chapter.

The option of building a road to link Happy Land to the airstrip and boat landing of Ipota (on the eastern coast of Erromango) was then considered. The government (or a donor agency) could build the road in exchange of the landowners' commitment to conserve the forest area. One of the landowners noted that this option would have been accepted if put to a village meeting. However, he did not agree with it. He is the owner of the land and the road project would not provide him with the benefits he expected.

It is noteworthy that a 'project for rain forest conservation swap' approach has been attempted in Western Samoa (Cox and Elmqvist 1991). In one case a village school was built in exchange for the agreement by the village to protect a rainforest for fifty years. This approach faces several problems. It has been noted that, as with project aid, it could produce a dependency mentality, thus stifling local initiatives, and it may create needs that cannot be satisfied once the assistance ends (Peteru 1993). However, the greatest weakness of this approach is probably the difficulty of enforcing compliance with the agreement. Peteru (1993) remarks that it is unlikely that the government, or a donor agency, would take the villagers to court if they decided not to honour the agreement once the project had taken place.

Once the options detailed above were discussed with the landowners, they indicated a preference for a land lease agreement. It was not clear, however, what the lease rate should be, and if a lease agreement *cum* foregone logging royalties compensation should be paid to the landowners. The agreement that was reached is detailed below.

It was pointed out to the landowners that if they allowed logging to go ahead on their land, they would receive logging royalties but they would not be able to lease their land afterwards. Apart from the fact that there is very limited demand for land on Erromango, their land has poor agricultural potential. This would be further reduced by logging. Thus, their land-use options were: a) signing a lease agreement with the government;[6] or b) allowing logging operations to go ahead, without the possibility of leasing the land afterwards.

Table 6.6 presents the discounted values of the options open to the landowners. The value of the land lease is based on the current rate, set by the Department of Lands, for unimproved agricultural land on Erromango. This is 100 vatu per hectare per year. Some islands of Vanuatu that are more developed than Erromango exhibit relatively higher rates (e.g. unimproved agricultural land on the island of Efate, where the capital Port Vila is located, may be leased at 500 vatu/ha/year). If it is assumed that, as economic development in Erromango accelerates, the opportunity cost of using the land will rise, eventually the leasing rate will also increase over time. Table 6.6 presents the discounted value of the lease for the EKPA calculated at the fixed rate of 100 vatu/ha/year and a hypothetical scenario in which this rate increases by 25 vatu/ha/year every decade.

6. At this stage of negotiations, details of the lease had not being exactly defined. However, it had been made clear that the EKPA could be used for subsistence purposes and that the landowners would be involved in the management of the area.

Table 6.6 also shows the present value of royalties (reported in Table 6.4) that would be paid if the forest in the EKPA were to be logged. It is assumed that logging will take place in three years time, given that the current infrastructures (i.e. roads) do not permit immediate access to the area. (This is a realistic assumption. At the end of 1993, a company had submitted a logging plan envisaging that logging would take place in the proposed EKPA in three years time. The competent Ministry, however, ruled out logging within the EKPA.) It is assumed that the area could be logged in one year. It is further assumed that the forest could not be harvested again during the next 75 years. This assumption has been made given the poor regeneration rates that occurred in Erromango following the logging undertaken by Société Agathis during the late 1960s and early 1970s.

Table 6.6 Present value of proposed protected area lease and timber royalty (vatu: vt).

Proposed protected area	**3257 ha**			
		Discount rate		
		0	4%	8%
Present value of:				
Fixed rate lease (100 vt/ha/year; 75 years)		24427500	8021217	4383261
Increasing rate lease (100 vt/ha/year and 25 vt/ha/year increase every 10 years; 75 years)		44376625	11364178	5303464
Royalty	Low range	9429022	8382366	7485062
	High range	16689517	14836920	13248677

Both logging royalties and the lease are discounted at three different rates. The rate of 0 reflects the real bank deposit rate of Vanuatu, which averaged at 0.1% during the period 1983–90, and –1.5% and 0.2%, respectively, in 1991 and 1992 (Reserve Bank of Vanuatu, pers. comm.; Hillilan and Athy 1993). The other two rates of 4% and 8% are also considered in order to assess better the impact of higher market rates, and also to account for the fact that the landowners may have positive discount rates.

From Table 6.6, when the 4% discount rate is adopted, the discounted value of a lease agreement is comparable to that of logging royalties in the low range scenario. If the high range scenario is considered, payment of a lease would be sufficient to counterbalance foregone royalties only when the discount rate adopted is 0. It may be noted that under the high range scenario logging will take place on steep slopes (more than 20°) and deeply dissected landforms. While this is legal in Vanuatu, logging on this kind of terrain can be expected to cause substantial soil erosion. During the consultation process, the landowners (and the villagers at large) expressed concern about the potential environmental damage that could be caused by logging. This seems to indicate that it is the low range scenario that should be adopted as a reference point for discussions on the level of the eventual compensation to be paid to landowners.

The landowners' views about the *acceptable* level of compensation and the status of the consultation process are summarised in the concluding section.

6.5 Conclusion

This chapter has shown that the EKPA is potentially the object of very limited subsistence use. It was noted that this is because the villagers mostly use the resources located close to their residences. The establishment of the EKPA does not conflict with these activities. The lease agreement allows, within limits, the use of the EKPA for subsistence purposes. These activities would be regulated by the management committee of the EKPA. The structure of the management committee is such that the landowners maintain their customary control over the area.

Viable short-term income generating activities (that could substitute the income derived by landowners from logging royalties) were not found. Therefore, a land lease contract between the Government of Vanuatu and the landowners was the option adopted to establish the protected area. The research approach adopted here has resulted in the implementation of the research findings: the lease agreement for the establishment of the Erromango Kauri Protected Area has been signed.

It is important to note that land lease agreements appear to be useful instruments in mitigating the negative intragenerational impacts often caused by protected areas. They may also contribute to the achievement of intergenerational equity by providing financial benefits that can be enjoyed by the descendants of the current landowners. Leasing agreements have positive features. It has to be stressed, however, that the exploitation of income-generating opportunities arising from the establishment of (or in connection with) protected areas should always be considered. In so doing, the scarce funds available for conservation could be directed to those initiatives that are ecologically important but not financially viable.

It is important to note that the long-term prospects of financial viability of the EKPA would be enhanced by the establishment of non-logging forest resource uses. The following chapter considers the viability of one such option, the cultivation of sandalwood. This could be promoted as an income-generating activity to be carried out in connection with the Erromango Kauri Protected Area.

7 Sandalwood Cultivation and the Establishment of the Erromango Kauri Protected Area

Luca Tacconi
Livo Mele

7.1 Introduction

It was noted in Chapter 5 that the land lease agreement for the EKPA covers initially a period of five years and that the establishment of a Trust Fund is currently being considered. The Trust Fund would aim to provide sustainable funding for a long-term lease agreement. While the lease agreement may be extended for a longer period, it is also important to assess whether income-generating activities (that are compatible with the conservation of the forest) can be developed in the area. The establishment of income-generating activities would decrease the need to rely on external funding for the payment of the lease agreement. This would improve the sustainability of the protected area and could free funds for other conservation projects that do not generate income.

The potential of sandalwood as an income-generating activity to be established in conjunction with the EKPA is assessed in this chapter. While carrying out the assessment of the EKPA, it became clear that the owners of the land to be included in the EKPA regarded sandalwood (*Santalum austrocaledonicum*) as an important resource in terms of its contribution to their income. For this reason, the proposed land lease contract, agreed between the landowners and the Government of Vanuatu for the establishment of the EKPA, allows the landowners to extract sandalwood from the area. However, due to the exploitation of the resource over the years, there is currently little sandalwood left in the EKPA forest. The obvious impoverishment of the resource led to the question of whether sandalwood planting could be a viable economic activity, from the landowners' perspective, and if this could be done within or close to the EKPA.

The pricing of sandalwood in Vanuatu is considered first in section 7.2. The information presented there becomes the basis for the detailed analysis of sandalwood cultivation made later in this chapter. In section 7.3, the research methods adopted in this study are presented. Sandalwood growth rates and heartwood yields derived from data collected in the island of Erromango are detailed in section 7.4. In section 7.5, the financial aspects of a smallholder sandalwood plantation are examined. Some issues concerning actual sandalwood cultivation activities by rural people are considered in section 7.6. In section 7.7, the implications for the development of sandalwood cultivation in connection with the EKPA are outlined. Some conclusions are then drawn.

7.2 Sandalwood Prices in Vanuatu

A survey conducted in Erromango, described below, revealed that in 1992 and 1993 the price paid to villagers for sandalwood heartwood ranged between 100 and

250 vatu/kg. The price was not determined according to a grading system. Most villagers, with practically no knowledge of market prices, simply accepted the price offered by the buyers. During the period December 1993 to March 1994, trade was opened again for the islands of Santo, Malekula and Erromango. In Erromango, buyers purchased the heartwood for 420 vatu/kg. The buyers usually bore the cost of transporting the heartwood by boat from the various collection points along the coast to the main villages (e.g. Dillon's Bay). When the sellers paid for land transport by truck, they received 430 vatu/kg. In Santo, prices for the heartwood ranged between 250 and 280 vatu/kg. During March 1994, sandalwood extraction and trade was opened also for the islands of Tanna, Aniwa and Aneityum. In Tanna and Aniwa, traders purchased sandalwood at prices ranging between 200 and 300 vatu/kg. No sales were reported from Aneityum.

Currently, there is no available independent information on the price that the heartwood exported from Vanuatu commands on international markets. Data from the Department of Customs show that in 1994 one export transaction of sandalwood took place at a free on board (FOB) price of 583 vatu/kg (US$5/kg at an exchange rate of 116.59 vatu = US$1).[1] Two other export transactions registered FOB prices of 275 vatu/kg and 356 vatu/kg. For these two transactions, it is likely that the FOB export price was understated. The trader involved is known to have paid 420 vatu/kg for heartwood from Erromango.

Prices for sandalwood exported from other countries may be used to estimate, albeit approximately, whether the prices paid by the traders to the villagers in Vanuatu reflect the actual value of the commodity.

In 1989–90, export prices for *S. spicatum* from Western Australia ranged between US$4.26/kg and US$5.6/kg (Applegate et al. 1990). At the average exchange rate for 1990 of 116 vatu = US$1 (Reserve Bank of Vanuatu, pers. comm.), prices would be vatu 494 and vatu 649. For 1994, Radomiljac (1995) reports that export prices for *S. spicatum* from Western Australia ranged between 7.65 $Aust/kg (for chips) and 10 $Aust/kg (for logs) (at the exchange rate of 83 vatu = $Aust1, these are, respectively, vatu 635 and 830 vatu). Considering that the sandalwood from Vanuatu appears to be of a better quality than that from Western Australia (Frank McKinnell, Department of Conservation and Land Management of Western Australia, pers. comm.), it could be expected that export prices for sandalwood from Vanuatu could increase to the Western Australian level, provided that proper marketing arrangements are put in place.

The 1994 prices for sandalwood purchased in Vanuatu appear to be below those commanded by this commodity in other markets. This is especially true in the case of the heartwood purchased on the islands of Tanna and Aniwa where, in certain cases, prices less than half than those paid in Erromango were registered. From this evidence, it appears that there is some rationale for government intervention to maximise the prices obtained by the villagers of Vanuatu who sell sandalwood.

During the fieldwork undertaken for this study, villagers often asked whether the Department of Forests could set a 'recommended' price for sandalwood so that buyers would be 'forced' to pay higher prices. This thinking follows the current practice for some important agricultural products in Vanuatu (e.g. copra and

1. In this transaction, chips and small branches were sold at 1 US$/kg.

cocoa). Rather, the Department of Forests is considering the establishment a system of tender for the sale of sandalwood, as suggested by Tacconi (1995a).

7.3 Methods

The information used in this study was collected during two periods of fieldwork.

To obtain information on sandalwood growth rates, it was decided to measure some of the sandalwood trees planted by villagers in Erromango. During a period of four weeks, in October–November 1993, 121 sandalwood trees whose ages were known by villagers were measured. The information collected included age, diameter at breast height and at 20 cm from the ground, the existence of a fork in the tree below breast height, and whether or not the tree appeared to have grown in association with a host plant. Information was also sought on the time required for the formation of the heartwood, problems encountered in planting and maintaining trees, and on prices obtained during the 1992 harvest season. Information on sandalwood planting and selling activities was also collected.

Limited data on heartwood yields for *S. austrocaledonicum* are available for New Caledonia (Cherrier 1993). For Vanuatu, these data are not available. In order to derive heartwood yields, a second period of fieldwork was carried out in Erromango between 22 February and 18 March 1994. Sandalwood trade in Vanuatu opened during the period December 1993 to March 1994. When the survey was initiated, most of the landowners had already terminated sandalwood extraction, which limited the sample to 35 trees. These trees were 'wild' (i.e. they had not been planted by the villagers).

7.4 Sandalwood Growth Rates and Heartwood Yields

The girth growth rates and heartwood yields are considered in turn. Throughout the discussion, 'growth rate' means 'average annual growth rate'.

7.4.1 Growth rates

The girth growth rates derived from a sample of 111 trees are presented in Table 7.1.[2] The table also reports maximum, minimum and average size for the trees in each age class measured. The growth rates for the age classes between five and eighteen years inclusive, average about 3.5 centimetres per year or more. For the age classes between 20 and 33 years, growth rates appear to be somewhat lower, ranging between 1.97 cm and 2.67 cm. These growth rates are well above those reported by Cherrier (1993) for *S. austrocaledonicum* growing in natural stands in New Caledonia. He found that growth rates ranged between 1.2 and 1.5 cm per year. It should be noted that the trees included in Cherrier's sample had a girth (at 20 cm from the ground) ranging between 40 and 130 cm. Therefore, it seems that the trees considered in Cherrier's study were older than those included in the sample reported here. This may be one of the reasons for the higher growth

2. The total sample was 121. Ten trees were excluded from the final sample because of doubts about the accuracy of the measurements.

rates found on Erromango. It is worthwhile noting that although annual growth rates for other sandalwood species (i.e. *S. spicatum* and *S. album*) are also reported to average between 1 cm and 1.3 cm in girth, cultivated trees of *S. album* in India have been found to grow at rates up to 5 cm/year in girth (Rai 1990). Hence, the fact that the trees included in the Erromango sample had been cultivated may be another factor determining the relatively fast growth rates observed. Obviously, environmental factors specific to Erromango may also determine the higher growth rates registered in this study. The influence of different environmental conditions on sandalwood growth should be examined in more detailed field studies.

7.4.2 Heartwood yields

The information derived from the sample of 35 trees measured on Erromango is presented in Table 7.2. For comparative purposes, this table also presents yield data reported by Cherrier (1993).

Heartwood yields derived from the sample taken in Erromango show a large variation around the mean value (Table 7.2). This could be caused by the small sample size. However, the New Caledonia sample tends to confirm the existence of a large degree of variation in heartwood yields. For the girth size classes above 50 cm, all but one of the minimum and maximum heartwood weights derived from the Erromango sample are within those derived from New Caledonia. Given the large deviation around the mean of heartwood weight and the small samples collected, it is not surprising that there are some large differences in the mean weights derived from the two samples. Wide deviations around the mean, limit the accuracy of estimates of expected financial returns from sandalwood cultivation.

Together with the qualitative information described below, the sample from Erromango provides information on small-sized sandalwood trees. This information is useful both for the management of the natural stand and for cultivation purposes. In relation to the latter issue, sandalwood can be, in some instances, a very slow-growing tree, needing 50 to 100 years to reach merchantable size (Applegate et al. 1990). This has been an important factor in limiting the interest on sandalwood cultivation (Newell 1990). Sandalwood extraction and trade is not limited only to large sized trees. Trees as small as 24.8 cm in girth have been cut and have yielded heartwood, even if in small quantities. It is important to note that small sandalwood trees are not necessarily immature trees. A small tree may have suffered stress and developed heartwood.

The relatively rapid growth rates of sandalwood (Table 7.1) and the presence of heartwood in relatively small-sized trees suggests that sandalwood cultivation in Erromango may require time spans much shorter than 50–100 years. This conclusion relies on the assumption that relatively small-sized trees grow at rates similar to those of larger trees (e.g. 2–3 cm in girth per year). This assumption cannot be assessed from the quantitative data collected for this study. None of the trees included in the sample collected to determine heartwood formation had been planted. However, qualitative information collected during the survey provides useful insights on the time spans involved in sandalwood cultivation on the island of Erromango. For this qualitative information we rely on the knowledge that the local people often have of their natural environment.

For the Dillon's Bay area, two informants said that 15-year-old trees are often ready to be cut. During the growth-rate survey in Tamsal village, a discussion with

Table 7.1 Annual average growth rates of sandalwood (girth at 20 cm from ground; total sample 111).

Age (years)/sample size	2/5	5/11	6/18	7/2	8/17	9/6	10/6	11/12	12/6	13/3	14/7	18/2	20/4	26/7	28/3	33/2
Maximum size (cm)	17.50	28.60	35.80	45.50	47.40	46.20	38.90	52.10	48.40	62.80	54.00	59.40	63.70	69.10	81.70	85.10
Minimum size (cm)	12.00	9.40	9.40	35.50	20.90	33.60	23.40	22.00	32.30	39.00	34.30	53.60	38.90	33.00	50.60	44.90
Mean size (cm)	14.38	18.57	22.54	40.50	30.68	39.48	29.63	39.00	39.22	54.77	46.59	56.50	53.30	51.61	65.67	65.00
Growth rate (cm/year)	7.19	3.71	3.76	5.79	3.84	4.39	2.96	3.55	3.27	4.21	3.33	3.14	2.67	1.99	2.35	1.97

Table 7.2 Sandalwood heartwood yields in Erromango and New Caledonia

Girth at 20 cm (cm)	24–29.9	30–39.9	40–49.9	50–59.9	60–69.9	70–79.9	80–89.9	90–99.9	100–109.9
Erromango									
Sample size	2	5	10	8	3	2	3	1	1
Maximum weight (kg)	33.50	22.50	96.00	121.00	165.00	176.00	153.50	168	285.00
Minimum weight (kg)	15.50	11.50	12.00	45.00	39.00	139.50	110.00		
Mean weight (kg)	24.50	17.90	43.30	83.88	100.67	157.75	127.33		
Standard deviation	13.44	7.63	40.13	48.79	71.24	79.29	66.10		
New Caledonia[a]									
Sample size	n.a.	n.a.	3	12	33	43	27	11	8
Maximum weight (kg)			54	146	469	321	554	395	555
Minimum weight (kg)			22	30	44	55	67	148	166
Mean weight (kg)			33	75	134	162	185	271	320

[a] For New Caledonia, the data were derived from Cherrier (1993). The lower limit of each girth size class corresponds to the single value used by Cherrier to define his girth size classes.

a group of four villagers revealed that 17 to 18 years are required for sandalwood to mature. For example, in 1992 two trees planted in 1975 were sold, yielding a total of 54 kg of heartwood. One tree planted in 1982 measured 50 cm in girth at the time of the survey and, according to the owner, would be ready for harvesting in about six years. In South River village, two trees that had apparently been planted in 1984, yielded about 50 kg of heartwood in 1992. In the same year, in Antioch village, about 70 kg of heartwood were extracted from a 21-year-old tree. In the course of the growth-rate survey in Ipota village, two trees measuring 49 and 67 cm in girth had been planted in 1973 and were identified by the owner as 'ready to be sold'. One villager thought that sandalwood matured in about 20 years in the Ipota area. In Ifo village, sandalwood is reported to have matured in 15 years; four trees planted in 1968–69 were harvested in 1992 yielding 160 kg of heartwood. Finally, in the Port Narvin area sandalwood growing on red soils may mature at age 20–25 years; sandalwood growing on black, rich soils takes longer to develop heartwood. It was also reported by informants in Dillon's Bay village and South River village that sandalwood growing on poor and rocky soils develops heartwood faster than that growing on rich soils. In fact, the rocky coastline of Erromango is reported to be an environment leading to relatively fast development of heartwood.

7.5 Financial Aspects of Sandalwood Cultivation

The potential financial benefits that may be derived from sandalwood plantations were assessed by using cost–benefit analysis. The returns that could be derived from a sandalwood plantation are presented in terms of their net present value (NPV). The financial analysis of forest plantation activities may either determine the optimal harvesting time (in the case when harvesting is a single event and replanting is not considered) or the optimal rotation period (in an infinite-horizon model that considers successive replanting and harvesting activities) (see Tietenberg 1988). In order to carry out these types of analyses, well-defined yield functions are needed. These are not currently available for sandalwood, a major reason for the specific approach taken here to assess the financial viability of sandalwood cultivation.

The information on growth rates and heartwood yields presented in the previous sections can be used to provide an indication of possible, although approximate, financial returns that may be obtained from sandalwood cultivation. The objective of this financial assessment is to use the best financial information available at the current time in order to assess whether sandalwood cultivation could be established as a viable economic activity in conjunction with the EKPA.

7.5.1 Costs of a sandalwood plantation

The costs detailed here refer to a hypothetical plantation of 10 ha. It is assumed that planting takes place every year on 5000 m^2. The plantation is thus based on a 20-year rotation cycle; the assumption that sandalwood reaches maturity in 20 years is based on the qualitative evidence presented in the previous section.

To ensure the availability of about 500 seedlings to be planted over 5000 m^2, about 1000 seeds would be germinated in the nursery. Nursery activities are esti-

mated to require 30 person-days/year.[3] Costs for nursery bags, seed and labour are presented in Table 7.3.[4]

Table 7.3 Summary of costs for the establishment and maintenance of a sandalwood plantation.

Capital costs (fencing of 5 ha)			
	Barbed wire	8 rolls (500 m each) @ 7700 vatu	61600
	Posts	180 @ 200 vatu	36000
	Staples		3000
	Wages	50 person/day @ 500 vatu	25000
	Total capital cost		125600
Annual nursery costs			
	Nursery bags	600 @ 5 vatu	3000
	Seeds	1000 @ 3 vatu	3000
	Wages	30 person/day @ 500 vatu	15000
	Total		21000
Annual labour costs for planting activities			
	Vegetation clearing	10 person/day @ 500 vatu	5000
	Planting	10 person/day @ 500 vatu	5000
	Total		10000
Other annual labour costs			
	Fence maintenance	5 person/day @ 500 vatu	2500
	Tree maintenance[a]	10 person/day @ 500 vatu	5000
	Total		7500
	Total operating costs in year 1		38500

[a] Tree maintenance will require a maximum of 50 person-days/year when five plots have to be attended to in the same year.

Sandalwood would be planted at 3 × 3 m spacings with host plants, as currently recommended by the Extension Section of the Department of Forests. Some limited clearing of the established vegetation cover will take place when planting sandalwood; it is estimated that this would take about 10 person-days/year. It should be stressed that only a limited part of the existing vegetation would be cleared. The remaining vegetation would provide 'host' plants and shade to sandalwood. About 500 seedlings (approximately 6 months old) would be planted annually over 5000 m^2. It is estimated that planting requires 10 person-days/year. After planting, sandalwood needs occasional maintenance work for the first 5 years

3. E.g. 30 person/day/year implies that 30 work days are required per year. If necessary, this work could be carried out by two people in 15 days.

4. Costs such as administration and overheads are not considered here, given that the analysis focuses on a smallholder plantation in an almost subsistence economy.

in order to keep the tree free of climbing vines; this work is estimated to amount to another 10 person-days/year.

Further labour costs are involved in harvesting. Currently, data on harvesting costs from plantations are not available. The labour needed to harvest sandalwood naturally occurring in the forest can provide only a rough guide to labour needs for plantation harvesting.

To harvest sandalwood in the forest of Erromango, groups of four, six or even more men camp in the forest or along the coastline for several days. A group of four men may harvest one or two trees per day. They have to go into the forest searching for the next tree to harvest, cut the tree, remove the sapwood, then carry the heartwood to a place where it will be loaded on a boat or truck to be transported to a collection point (e.g. Dillon's Bay). Obviously, plantation harvesting would be less labour intensive than the harvesting of natural stands. Transport would also be facilitated by the concentration of sandalwood in a relatively small area. During the survey carried out in Erromango, the time required to cut a tree varied between thirty minutes and one hour. The time required to remove the sapwood also varied, depending on the size of the trees, from 1–2 hours.

It is assumed here that one person-day is required to cut three trees and to remove the sapwood.

7.5.2 Benefits of a sandalwood plantation

The weight of heartwood derived depends on tree size, heartwood yield per tree and survival rates. A projection of the range of possible sandalwood yields is presented in Table 7.4. The tree size is derived from Table 7.1. The two alternative tree sizes are the minimum and the mean size for 20-year-old trees. Heartwood yields are those presented in Table 7.2. For heartwood, the minimum, mean and maximum yields are considered. The minimum size of a 20-year-old tree (38.9 cm) falls into girth class 30–39.9 cm, whereas the mean tree size falls into girth class 50–59.9 cm. Thus, the minimum, mean and maximum heartwood yields for these classes are adopted in Table 7.4.

The assumed survival rate of 10% is derived from research undertaken in Fiji (Jiko 1993). For the Fijian experiment, seedlings were planted at a spacing of 3×3 m with mixed host species. After four years, only 10% of the seedlings had survived. It is not clear, however, if the experimental trial carried out in Fiji was representative of the natural growing conditions of sandalwood in that country and, of course, whether conditions in Fiji are similar to those in Erromango. The survival rate of 40% is based on the assumption that 3 years after planting, 80% of seedlings survive; it is then assumed that the remaining trees would suffer a 50% mortality rate over the following 17 years.[5] The survival rate of 60% was derived in a similar way, but a higher probability of survival after the third year was assumed.

The data in Tables 7.3 and 7.4 are used to calculate the NPV derived from a smallholder sandalwood plantation based on a 20-year cycle, with planting activities ending in year 60 from the beginning of the project. The operating costs are

5. Andrew Tolft, former Principal Extension Officer (Department of Forests, Vanuatu) regarded the 10% rate as a minimal survival rate and suggested testing the effect of adopting a survival rate of 40%.

incurred on a yearly basis. Nursery and planting costs would accrue from year one to year sixty. The first sandalwood harvest is assumed to take place at year 20 and the last one at year 80.[6]

Table 7.5 presents the NPVs for eighteen heartwood yield scenarios combined with three alternative scenarios relating to the structure of costs and benefits accruing from the plantation. The real discount rates applied here are the same as those used for the assessment of the present value of timber royalties and of the lease agreement for the EKPA. The adoption of similar discount rates facilitates the comparison of the benefits derived from sandalwood cultivation with the value of timber royalties and that of the lease agreement.

The heartwood scenarios have been derived from Table 7.4. For example, the heartwood yield scenario 'MinMin 40% survival' is the combination of 'minimum tree size', 'minimum heartwood yield' and hypothetical survival rate of 40%. The expected heartwood value for this combination of factors at a price of 420 vatu/kg is vatu 966,000. This is assumed to be the gross annual value of the harvest derived from the plantation and would accrue from year 20 to year 80.

The alternative costs and benefits scenarios are derived as follows. The Benchmark scenario adopts the costs and benefits presented in Tables 7.3 and 7.4. The exception to this is the fact that the cost of nursery bags and seeds is supposed to accrue to the 'sandalwood project'; that is, it is supposed that external funding is provided to the rural people undertaking the project. In scenario Sensitivity 1 the price of heartwood is assumed to decrease by 25% (in this case it is 315 vatu/kg instead of 420 vatu/kg). It should be noted that the 1993 heartwood price is thought to be lower than the potential price that sandalwood from Vanuatu could command.

This fact, and the strength of international demand for sandalwood and the limited international supply available (Applegate et al. 1990), suggest that the price of sandalwood from Vanuatu is unlikely to decline as much as assumed in scenario Sensitivity 1. Scenario Sensitivity 2 assumes an increase in costs by 25%, and a heartwood price of 420 vatu/kg.

The first conclusion that may be drawn from Table 7.5 is that there are only two negative NPVs for the hypothesised smallholder sandalwood plantation. These occur when the trees harvested fall in the minimum size tree class and the minimum heartwood yield class, with a survival rate of just 10% (heartwood yield scenario: MinMin, 10% survival) and the discount rate applied is 8%. In all other cases the NPV is positive. Therefore, the results presented in Table 7.5 suggests that under a wide range of conditions, sandalwood cultivation would be a profitable activity for smallholders.

In concluding this section, it is worthwhile noting that the NPVs presented above provide only a partial indication of whether smallholders might adopt san-

6. This time horizon was chosen to make the returns from a sandalwood plantation comparable to those from the lease for the EKPA. Note that the length of the lease considered in the previous chapter is 75 years (this is the maximum length for a lease in Vanuatu). There is, therefore, a gap of five years between the length of the lease and the length of the scenario for sandalwood considered here. However, this does not constitute a practical problem in comparing the lease case with the sandalwood case. The discounted value (at 4%) of five years of lease payments, occurring from year 76 to year 80, is only about 75,000 vatu (ca US$680).

dalwood plantations as an income-generating activity. Other factors may influence sandalwood cultivation, as noted in the next section.

Table 7.4 Heartwood yields (after 20 years) and financial returns from a 5000 m^2 sandalwood plantation.

Tree size (cm)	Heartwood yield (kg)	Survival rate (%)	Number of remaining trees	Total heartwood weight (kg)	Heartwood value[a] (vatu)
		10	50	575	241500
	Minimum 11.5	40	200	2300	966000
		60	300	3450	1449000
		10	50	895	375900
Minimum 38.9	Mean 17.9	40	200	3580	1503600
		60	300	5370	2255400
		10	50	1125	472500
	Maximum 22.5	40	200	4500	1890000
		60	300	6750	2835000
		10	50	2250	945000
	Minimum 45	40	200	9000	3780000
		60	300	13500	5670000
		10	50	4190	1759800
Mean 53.9	Mean 83.8	40	200	16760	7039200
		60	300	25140	10558800
		10	50	6050	2541000
	Maximum 121	40	200	24200	10164000
		60	300	36300	15246000

[a] Market price as in 1993/94 for heartwood from Erromango: 420 vatu/kg.

7.6 Rural People and Sandalwood

The financial analysis of smallholder activities incorporates all the factors that might influence the decision to adopt a specific economic activity. To assess whether sandalwood cultivation will be adopted by smallholders, it is useful also to consider existing sandalwood planting activities.

From the interviews conducted during October–November 1993 in Erromango, 52 of the 75 interviewees had planted sandalwood in the previous year. Of the 23 interviewees that had not planted sandalwood in the previous year, 8 reported having planted it in the past, 6 did not have land close to their house where they could plant, and 2 intended to plant in the current year; 7 respondents had not thought about planting sandalwood.

Table 7.5 Net present value of output from a 10 ha sandalwood plantation

	Benchmark case			Sensitivity 1			Sensitivity 2		
Discount rate	0%	4%	8%	0%	4%	8%	0%	4%	8%
Heartwood yield scenarios:									
MinMin:									
10% survival	11774000	1532845	69154	8091125	855878	−117979	11034625	1239089	−100690
40% survival	54443500	9376136	2237260	39712000	6668266	1488729	53322875	9012300	2048044
60% survival	82839000	14595653	3680081	60741750	10533848	2557284	81451500	14182761	3477305
MinMean:									
10% survival	19972400	3039833	485728	14239925	1986119	194452	19233025	2746077	315883
40% survival	87237100	15404089	3903556	64307200	11189231	2738451	86116475	15040254	3714340
60% survival	132029400	23637582	6179525	97634550	17315296	4431867	130641900	23224691	5976748
MinMax:									
10% survival	25865000	4122981	785140	18659375	2798480	419011	25125625	3829225	615296
40% survival	110807500	19736680	5101206	81985000	14438675	3636688	109686875	19372845	4911990
60% survival	167385000	30136470	7976000	124151250	22189461	5779223	165997500	29723578	7773223
MeanMin:									
10% survival	54687500	9420987	2249658	40276250	6771984	1517399	53948125	9127231	2079814
40% survival	226097500	40928703	10959277	168452500	30332692	8030241	224976875	40564868	10770060
60% survival	340320000	61924504	16763106	253852500	46030487	12369553	338932500	61511613	16560330

Continued on next page.

Table 7.5 (cont'd) Net present value of output from a 10 ha sandalwood plantation

	Benchmark case			Sensitivity 1			Sensitivity 2		
Discount rate	0%	4%	8%	0%	4%	8%	0%	4%	8%
MeanMean:									
10% survival	104390300	18557103	4775138	77553350	13624071	3411509	103650925	18263347	4605293
40% survival	424908700	77473170	21061195	317560900	57741042	15606680	423788075	77109334	20871978
60% survival	638536800	116741203	31915983	477515100	87143011	23734211	637149300	116328312	31713207
MeanMax:									
10% survival	152043500	27316473	7196474	113293250	20193598	5227511	151304125	27022717	7026629
40% survival	615521500	112510648	30746539	460520500	84019150	22870688	614400875	112146812	30557322
60% survival	924456000	169297420	46443999	691954500	126560174	34630223	923068500	168884529	46241222

Notes:
MinMin: minimum tree size class, minimum heartwood yield class (see Table 7.4).
MinMean: minimum tree size class, mean heartwood yield class.
MinMax: minimum tree size class, maximum heartwood yield class.
MeanMean: mean tree size class, mean heartwood yield class.
MeanMax: mean tree size class, maximum heartwood yield class.
Benchmark: costs as from Table 7.3 (nursery bags and seeds provided by project); benefits as from table 7.4.
Sensitivity 1: heartwood market price vatu 315 per kg (a decrease in price of 25% is assumed).
Sensitivity 2: increase in costs by 25%.

Sandalwood is normally planted as part of gardening activities. A few trees (e.g. 5–10) are planted in the garden area and in the forest close to the garden. Only 3 of the 52 interviewees who reported planting sandalwood had planted more than 100 trees in one year. They had undertaken sandalwood planting as a specific activity, distinct from gardening.

It is useful to report briefly on what could be called a small 'sandalwood project'. During fieldwork, it was found that one villager had started a small sandalwood nursery. He expressed interest in upgrading his nursery and establishing a plantation. Therefore, in January 1994, about vatu 240000 was provided by the Australian High Commission in Port Vila to purchase materials to upgrade the nursery and to purchase barbed wire to fence off land for two plantations in North Erromango.[7] The barbed wire for fencing was shared by the villager who had started the nursery and two other villagers who were interested in planting sandalwood. They had agreed to help in the nursery in exchange for sandalwood seedlings.

At the time of a subsequent visit by the authors in May 1994, sandalwood seedlings were being raised in the nursery. One of the three villagers mentioned above was in the process of erecting a fence and had also planted sandalwood in the area. This smallholder has been planting sandalwood intercropped with orange trees. The rationale for doing so is that he hopes to derive greater benefits from the fenced off area by harvesting oranges while waiting for the sandalwood to mature.

This experience tends to indicate that a sandalwood project established in connection with the EKPA should take into account the short-term cash requirements of the people implementing the project.

The next section considers some issues relating to the eventual establishment of sandalwood cultivation within or near the Erromango Kauri Protected Area.

7.7 Implications for the Erromango Kauri Protected Area

The establishment of a sandalwood plantation within the boundary of the EKPA (or close to it) could provide the landowners of the EKPA with an alternative source of income to logging royalties. As a result, this may ease the pressure on the landowners to allow logging activities to take place in the EKPA.

It should be stressed, however, that there is only a weak link between the establishment of sandalwood cultivation activities and the conservation of the forest located in the EKPA. It cannot be discounted that the landowners could choose to establish sandalwood planting activities and, at the same time, allow logging in areas of the EKPA where sandalwood is not grown. Sandalwood cultivation at a smallholder scale would conceivably require a relatively small land area, as detailed below.

A further issue to be considered is the impact of sandalwood cultivation on the ecology of the EKPA. Sandalwood planting, when carried out at the currently recommended spacing of 3×3 m, appears to lead to substantial clearing of the estab-

7. Fencing is required in Northern Erromango to protect sandalwood seedlings from feral cattle and horses.

lished vegetation. If this activity were to be carried out on a large scale inside the EKPA, it would conflict with the maintenance of the ecology of the area. It is therefore important that, if an area suited to the cultivation of sandalwood is identified within the EKPA, the EKPA lease should be amended to allow for some regulation of clearing.

Sandalwood cultivation may be initiated in the area with two distinct objectives. One is to complement the income provided by lease payments for the EKPA. In an alternative case, sandalwood cultivation would be introduced with the objective of replacing the income generated by lease payments. The latter case is considered below.

The potential of sandalwood cultivation to provide an alternative to the income generated by the lease agreement (or derived from logging royalties[8]), can be assessed by considering Table 6.6 (see Chapter 6).

Table 7.5 shows that, given the current knowledge of the production of sandalwood, the expected NPVs of a sandalwood plantation are spread over a large range. Even if only one discount rate in considered (e.g. 8%), the NPVs vary (in the benchmark case) from a minimum of vatu 69,154 to a maximum of vatu 46443999. This large variation in values indicates that currently there is a substantial risk inherent in undertaking sandalwood plantation activities. This risk factor has to be accounted for in defining the objectives and the mode of operation of an eventual sandalwood project established in conjunction with the EKPA.

Comparing the data from Table 7.5 and Table 7.6, it seems that the benefits generated by sandalwood cultivation in a situation of 'average yield' (e.g. MeanMean 40%: mean tree size class, mean heartwood yield and intermediate survival rate) and at a discount rate of 8% could match (from a landowner's point of view) those generated by the lease payment or by logging royalties. It is obvious that the survival rate has a large influence on the NPV for sandalwood cultivation.

In conclusion, it appears that, because of the risk currently involved in sandalwood cultivation, and because of the long time span involved in this activity, it cannot be expected, at the current stage, to be a substitute for a lease payment. Initially, sandalwood cultivation could be established by the landowners with the objective of generating additional income. Over the long-term, if it proves to be successful, consideration could be given to the possibility of having sandalwood cultivation replace lease payments. Given the weak link between the conservation of the forest in the EKPA and sandalwood cultivation activities, this option presents important institutional difficulties. For instance, how could the provision of support for the establishment of sandalwood planting be directly related to the continued maintenance of the EKPA status of the forest?

A final caveat to this analysis should be made. It was shown above that the NPV of sandalwood cultivation may match, under certain conditions, that of logging royalties. It is important to note, however, that the totality of logging royalties would accrue to the *current generation* of landowners, whereas lease payments and benefits from sandalwood cultivation would be distributed *across generations*. The land-

8. Logging royalties and lease payments are mutually exclusive in the case considered, as outlined in Chapter 6.

owners' choice between the different options will be therefore influenced by their attitudes towards future generations and their needs for immediate monies.

7.8 Conclusion

The research on the production aspects of sandalwood cultivation presented in this chapter shows that sandalwood in Erromango may be harvested in a shorter time than that reported for other countries. This is an important factor contributing to the apparent profitability of smallholder sandalwood cultivation evidenced by the financial analysis presented. It is important to stress that rural people have been, and still are, actively planting sandalwood. However, only two cases are known of landowners planting on the scale suggested here. This may imply that factors such as labour and capital availability, and knowledge of sandalwood cultivation practices could be constraining the development of sandalwood smallholder plantations.

The evidence presented tends to indicate that sandalwood is an income-generating activity that has the potential to supplement the income of the people owning the EKPA and of other people living nearby. However, it seems that, at least over the next 20 years, growing sandalwood could not substitute for a land lease agreement. Indeed, whether sandalwood cultivation replaces a lease agreement over the long-term depends on the institutional setting that will be developed to strengthen the 'weak link' existing between sandalwood cultivation and the continued maintenance of the protected status for the EKPA.

This chapter concludes the application to the first case study of the framework developed in Part II. The next chapter will apply this framework to the second case study.

8 Malekula Island Conservation Planning

Luca Tacconi

8.1 Introduction

This chapter presents the second case study considered in this project. It differs from the case of the EKPA, considered in the previous chapters, for reasons that will be explained below. Both approaches have a place in the conservation of forests and biodiversity in Vanuatu. Their specific roles and how they may be integrated to provide an overall strategy for forest and biodiversity conservation in Vanuatu are discussed.

The approach to the assessment and establishment of individual PAs adopted in Malekula was designed to establish areas that are consistent with local people's needs and wants in relation to ecosystem conservation. The individual PAs considered in Malekula have been identified and assessed through a process of participatory planning that differs from that adopted in the case of the EKPA.

In order to implement this approach to conservation, the appropriate institutional structure has to be devised. Therefore, the institutional background specific to Malekula and the particular institutional formula for the establishment of PAs are considered. It is proposed that the PAs could be declared protected by the Local Government Council (LGC) upon a request presented by the landowners. It is important to note that one of the objectives of the conservation legislation developed is to strengthen the customary rights that landowners have on their resources. During fieldwork carried out in Malekula it became apparent that these rights were being eroded. A substantial diminution of customary rights could result in an open access regime. Open access regimes lead to over-exploitation of resources. It should also be noted that attempts carried out by governments to replace private or communal property regimes with state property regimes have on occasion actually resulted in open access regimes. Consideration of these issues played an important role in the development of the conservation legislation presented.

Before proceeding with the analysis, it is useful to put the research presented here into its policy context. In February 1994, the LGC of Malekula recognised the need to establish PAs on the island of Malekula. In a letter addressed to various ministries, departments of the Government of Vanuatu, and to this author, the LGC requested assistance in establishing PAs. The work presented in this chapter attempted to fulfil, at least partially, that request.

The chapter proceeds as follows. General features of the process of assessment of PAs are considered in Section 8.2. That section details also the specific approach adopted in Malekula. Geographical details of the island of Malekula are provided in Section 8.3. In section 8.4, the institutional background specific to

Malekula is considered. The conservation legislation developed for the implementation of the approach to conservation described in this chapter is also discussed in Section 8.4. The specific PAs considered are presented in Section 8.5. Conclusions are drawn in the final section.

8.2 Protected Area Identification and Assessment

8.2.1 Protected area identification

Several criteria are normally adopted for the selection of PAs (MacKinnon et al. 1986; Smith and Theberge 1986). These criteria refer to ecological characteristics of the area (e.g. species richness and diversity, ecosystem typicalness) and opportunities for conservation (that is, the socioeconomic and political situation inherent to conservation activities). MacKinnon et al. (1986) stress that in selecting the area to be protected, it is important:

a) to identify areas which have significant ecological features;

b) to consider the socioeconomic and political conditions affecting the establishment and continued viability of these areas as PAs.

MacKinnon et al. (1986) suggest that if the socioeconomic and political conditions do not favour the conservation of an area that has been attributed high priority on an ecological basis, it is advisable to attempt to protect an alternative area of lower ecological importance, but which shows favourable socioeconomic and political conditions.

The above principles for the identification of PAs have been partly applied by Maruia Society (1990) and Maruia Society and Royal Forest and Bird Protection Society (1989) in a Melanesian context.[1] It is useful to consider in detail the selection and design criteria adopted by these studies.

In relation to point (a) above, the biological criteria adopted are:

(i) include habitat examples from major centres of diversity and endemism;

(ii) include examples of all significant forest types;

(iii) include all significant land ecosystems;

(iv) wherever possible, include intact forested ecoclines from the sea to the highest point on the island concerned, and enclose the catchment area;

(v) design each PA to include a representative sampling of habitats of the region where the PA is located.

In relation to point (b) above, the social and economic criteria adopted in the design of PAs are (Maruia Society 1990, p.20):

> i Responsibility for forest protection has, where possible, been spread throughout all the provinces.

1. Melanesia includes the following countries: Papua New Guinea, Solomon Islands, Vanuatu, Fiji, and New Caledonia.

ii Allowance has been made around each village site near to or inside protected forest areas for exclusion zones into which gardens may be expanded and where timber may be felled for village purposes.

iii Densely settled areas have been avoided.

iv Areas identified as agricultural opportunity areas have been avoided.

v Forests where advanced negotiations with logging companies are under way, have been avoided.

vi Where [proposed PAs] were near to important tabu sites, boundaries were extended to include them if this was desired by landowners.

vii Boundaries of protected forest areas must remain flexible until all land owners have the chance to fully discuss the recommendations in this chapter.

The approach detailed above (hereafter referred to as the Maruia/Forest & Bird approach) seeks to identify PAs on the basis of biological criteria. It then adjusts the areas earmarked for conservation according to the specified social and economic criteria. The authors of the two studies recognise that the establishment of PAs thus designed may involve costs for the landowners of the areas, for other people living near or within the areas, and for the government. They point out that specific projects, aimed at providing (partial) compensation to the affected parties, should be developed. It should also be stressed that this approach seeks to address the issue of equitable distribution of conservation costs by spreading them across the different geographic areas of a country.

Before further discussing the Maruia/Forest & Bird approach, it is useful to note that two scenarios for the establishment of PAs are possible. In the first scenario, a PA may be set up by the landowners and/or the local community if the benefits that they receive from this land-use option are higher then their costs. In the alternative scenario, when the local costs are higher then the benefits, the PA may be funded by national and/or international institutions.

Two features of the Maruia/Forest & Bird approach are especially important. Firstly, proposing to landowners that a PA should be established on their land because their area is important from an ecological viewpoint, may raise their expectations for financial gains from the initiative. This may influence the evaluation of the PA, making it difficult, for example, to ascertain the values that the landowners attach to the area in question. They may be inclined to indicate that they do not attribute significant conservation values to the area considered for conservation status. This would cause an under-estimation of conservation benefits which, in turn, would result in the over-estimation of the compensation to be provided to landowners. Alternatively, it is possible that an increased awareness of the ecological significance of the specific area may increase the landowners' willingness to protect the area on their own initiative.

Secondly, the development of compensation packages implies that funds are actually available for that purpose when, in fact, funds for conservation initiatives are limited or may not be available. Therefore, the use of any available funds for each specific conservation initiative must be minimised. In relation to funding, it may be noted that developing countries often rely on international conservation organisations and development agencies to fund conservation initiatives. These organisations may attach a higher funding priority to conservation initiatives focusing on areas presenting ecological features of international relevance. When

designing conservation initiatives of local relevance in a developing country, it is therefore important to develop an approach that minimises funding requirements.

The provision of compensation to landowners is an important cost factor in the establishment of PAs, as discussed in the previous chapters. If PAs were also designed to satisfy landowners' conservation needs, this cost could be avoided or reduced. One way to do this is to discuss with the landowners their conservation interests and ascertain whether these may be conducive to the establishment of PAs.

This is the approach adopted in Malekula and discussed in the next section.

8.2.2 The process of protected area assessment

In order to contrast the process of assessment carried out in Malekula with that undertaken for the EKPA, it is useful to recall some significant steps of the latter.

The issues researched and the research methodology adopted depended partly on circumstances existing at the beginning of the research process described in Chapters Six and Seven. Firstly, the area to be included in the EKPA had already been identified by ecological assessments, but socioeconomic factors in the identification of the PA and its boundaries had not been considered. Secondly, as a result of negotiations undertaken before the onset of research, the landowners expected the Government of Vanuatu to lease their land in order to establish the EKPA. This influenced the approach to the assessment of local conservation needs and the design of a compensation framework.

Given that the landowners had already been offered an agreement to lease, it would have not been in their interest to reveal whether they would protect the forest without government intervention. In fact, this would have reduced the likelihood of receiving compensation payments. The assessment of their conservation needs through participatory rural appraisal (PRA) methodology was, therefore, not appropriate. As a result of this, it was assessed whether the landowners would conserve the forest without external intervention. This assessment was carried out by considering the contribution of subsistence uses of forest products to the local people's livelihood and by determining the potential value of logging royalties. The former were assessed with rapid rural appraisal (RRA) methods. It was found that the landowners did not appear to have an economic interest in protecting the forest. Thus, a compensation package had to be devised.

The approach to the assessment and establishment of individual PAs adopted in Malekula was designed to establish PAs that are consistent with local people's needs and wants in relation to ecosystem conservation. The individual PAs considered in Malekula were identified and assessed through the process of participatory planning using PRA rather than RRA. No mention was made, at any stage, of compensation to be paid in exchange for the establishment of PAs.

Whether a PA should or should not be established, its boundaries, the resource use rules to be applied, and the term of the PA were defined through meetings with the landowners and chiefs. These meetings were held with those landowners who:

a) had approached the LGC, or the author, asking for assistance in establishing a PA; or

b) have rights to areas that had been indicated as potential PAs by the LGC.

Following the request for assistance from the LGC, visits to some of the areas proposed for conservation[2] were carried out during the period 12–15 December 1995. The objectives of these visits were to:

a) introduce the research team;[3]

b) identify some of the owners of the areas of interest; and

c) find out whether the landowners where interested in pursuing some form of conservation.

In every case the response appeared to be positive. Arrangements were made to visit the areas to carry out detailed work.

At the beginning of the first meeting (for each PA), it was stressed that the objective of our work was to help landowners in assessing their conservation needs and wants, if they were interested in doing so. At the beginning of these meetings, it was noted that:

a) the LGC was interested in establishing PAs, and it had identified certain areas;

b) one objective of the visit was to assess with the landowners whether they were interested in protecting these areas, or other areas, and to find out what other conservation issues they needed to pursue.

In presenting point (a), it was made clear that there was no intention to impose any decision on them. It was also stressed that the LGC did not have the power to do so.[4] It was emphasised that landowners would be helped in protecting their resources, if it was found that they needed to do so.

In the further visits to each of the areas, meetings were carried out to assess conservation needs and ways of achieving these. The following issues were discussed before actually proceeding with the detailed assessment of local conservation needs:

a) positive and negative aspects of logging, both ecological and socioeconomic;

b) meaning of the concept of resource conservation;

c) meaning of the concept of protected area.

The specific assessment of conservation needs and wants, and of the allocation of resources, was carried out through open-ended discussions. The major issues addressed were:

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2. Not all the areas proposed for conservation by the LGC were assessed. The reasons that led to the exclusion of some areas are detailed in Section 8.5.
3. Livo Mele (Research Assistant) took part in this phase of the fieldwork with the author.
4. This helped in starting the discussion in a more relaxed environment. People's trust in our explicitly stated points and work appeared to increase during our permanence in the villages.

- Should logging activities be allowed in the area, or part of the area (controlled by the landowners taking part in the meeting)? If yes, in which areas?
- Should agricultural activities be carried out in any part of the area being considered?
- Should water sources be protected? How should they be protected?
- Should specific forest resources and/or marine resources be collected for commercial and/or subsistence purposes? Should the use of some of these resources be banned?
- Should some of the resources, considered above, be left for the use of future generations?
- Should a PA be established? What area should it include? What is the term of the PA?
- Are the resources allocated to consumption sufficient for the population (current and future) living near to the area?

The results of this assessment are detailed in Section 8.5 for each specific area. Here, it is important to note that the assessment described above resulted in:

1) modifications to the boundaries of some of the areas proposed by the LGC;
2) identification of new PAs; and
3) provision of resource use rules and period of existence specific to each PA.

Having considered the general features of the process of assessment and establishment of PAs adopted in Malekula we now examine the geographic and institutional details of the Malekula situation.

8.3 Geography

The island of Malekula is situated in the central part of Vanuatu. With a land area of about 2067 km^2, Malekula is the second largest island of the archipelago. The 19,289 inhabitants (Statistics Office 1991a) live mainly along the coast and on smaller adjacent islands. The average population density is 9.3 inhabitants/km^2, which is lower then the national average of 11.6 inhabitants/km^2. The eastern coast of the island is more densely populated than the western coast.

Details of the vegetation cover of Malekula are given in Table 8.1. It appears that about 40% of the island is covered in low and medium height forest. A further 45% is covered by thickets. The forests of Malekula hold an estimated 300,000 m^3 of merchantable timber.[5] This represents about 8% of the total merchantable timber found in the forests of Vanuatu.[6] The forest areas that are considered to be unloggable are detailed in Figure 8.1.[7] There is very limited information on the ecology

5. Information provided by the Utilisation Section, Department of Forests of Vanuatu.
6. Incoll (1994) indicates that there are about 3727000 m^3 of merchantable timber in the forests of Vanuatu. This figure relates only to forests with timber stocking of more than 10 m^3/ha.
7. These areas were derived from a map prepared by a logging company intending to operate on Malekula.

of the forests of Malekula.[8] Only two surveys, detailed in Section 8.5, have attempted to identify forest conservation needs for the island.

In relation to marine species and ecosystems, Thorsell (1989) provides a list of areas in the Oceanian realm that are of national, regional, and international importance. The island of Malekula is listed as being of regional and international importance for the conservation of turtles. The South Pacific Regional Environment Programme (1994) reports that the presence of the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*) and the leatherback turtle (*Dermochelys coriacea*) has been confirmed in Vanuatu; but that there has been no confirmed sighting of the olive ridley turtle (*Lepidochelys olivacea*). The first three species have been recorded from Malekula; the fourth species has been sighted by villagers in Wiawi (west coast Malekula). It is also important to note that a recent survey of the Vanuatu Environment Unit (1994) found the loggerhead turtle (*Caretta caretta*) nesting in the area of Wiawi.

Table 8.1 Vegetation cover of Malekula.

Vegetation type	Area (ha)	Percentage of land area
Midheight forest (20–30 m)	11998	5.8
Low forest (10–20 m)	70472	34.1
Thickets (3–8 m)	93527	45.2
Grassland	942	0.5
Swamp communities	30	–
Mangroves	1841	0.9
Other*	27946	13.5
Total land area	206756	100.0

* Bare ground or human made.

The leatherback turtle, the green turtle, and the hawksbill turtle are found throughout the South Pacific; the loggerhead turtle and the olive ridley turtle are less common in the South Pacific (South Pacific Regional Environment Programme 1993). IUCN (1990) lists the last four species as endangered.

8.4 Institutional Setting

In 1994, the LGC of Malekula identified a number of areas that should be considered for conservation status. These areas were identified on the basis of (a) the councillors' and the Regional Development Planner's (Kaltok Massing) knowledge of the island,[9] and (b) one landowner's request (Nagha mo Pineia Area). The areas proposed for conservation status at that time are shown on Figure 8.1.

As made clear by the letter copied in Appendix 3, the impending logging operations played an important part in bringing about the LGC's decision to establish PAs. Timber licenses are issued by the Ministry of Agriculture, Livestock,

8. A few remarks on the vegetation of Malekula are made by Chew (1975).
9. All the councillors of the Malekula Local Government Council and the Regional Development Planner were people born on the island.

Forestry and Fisheries. The LGC may influence forestry operations only by withholding a business licence.[10]

At the time when the LGC made the decision to set up a PA system, one logging company had been granted a timber licence on the island for a maximum annual harvest of 70000 m^3. Given the volumes of merchantable timber found in Malekula (300000 m^3), such a licence would have meant that the whole island would have been logged in a few years. Before the company could start operations, the licence was suspended by the Government of Vanuatu. It was then re-issued in December 1994 for a maximum annual volume of 35000 m^3 and a minimum annual volume of 15000 m^3. At that time, a second company was also negotiating with the government for an additional logging license. Note that an annual harvest of 35000 m^3 implies that all merchantable timber would be exhausted in about 8 years. Logging at the minimum annual harvest of 15000 m^3 would extract all the island's merchantable timber in 20 years.

In 1994, when the LGC decided to develop the PA system, it did not have the legal powers to establish such areas. This situation changed during 1994, when the *Bill for the Decentralization and Local Government Regions, Act No. 1 of 1994*, was passed by the Parliament of Vanuatu. This *Act* expands the powers of the LGCs in several areas. As noted in Chapter Seven, a LGC can now make by-laws regulating, among other issues, the establishment of PAs.

Following the introduction of this legislation, the author suggested to the Council of the MALAMPA Region[11] the adoption of a specific kind of by-law for the establishment of PAs. The type of by-law suggested aims at providing the legal framework for the establishment of PAs designed according to the participatory land use planning approach discussed in Section Three. The draft of the by-law for the establishment of PAs to be adopted by the LGC of MALAMPA is presented in Appendix 3 (hereafter, the MALAMPA protected areas by-law is simply referred to as the by-law). This by-law was modelled on *The Isabel Province Conservation Areas Ordinance 1993* (Solomon Islands) but modified to (a) make the legislation suitable to the land-tenure regime found in Vanuatu, (b) make it suitable to the specific conservation needs of the ni-Vanuatu people, (c) adapt the by-law to the legislation of Vanuatu, and (d) introduce provisions for the establishment of management committees for the PAs.[12]

The intent of the by-law is to enable the landowners to request the LGC to declare PAs whose boundaries, rules for resource management, and terms of existence are to be devised by the landowners themselves.

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10. A business license is required to undertake any commercial activity in Vanuatu. It should be noted that if a LGC refuses to issue a business license, in order to stop logging operations from going ahead, a company could take the LGC to court on the basis that it is not within the powers of the LGC to deliberate on logging and sawmilling matters. There are no precedent court cases in Vanuatu in relation to this kind of problem.

11. Following the introduction of the *Act 1 of 1994*, the LGC of Malekula was abolished and the Local Government Region of MALAMPA was instituted. This region includes the islands of Malekula, Ambrym and Paama.

12. Many thanks to Raewyn Peart, a New Zealander lawyer, who prepared the Isabel Ordinance and kindly supplied a copy of it to the author. The draft of the by-law is the result of the joint effort of the MALAMPA Council, Ham Bulu (Principal Legal Officer, Legislation, Attorney General's Chamber's of the Government of Vanuatu) and the author.

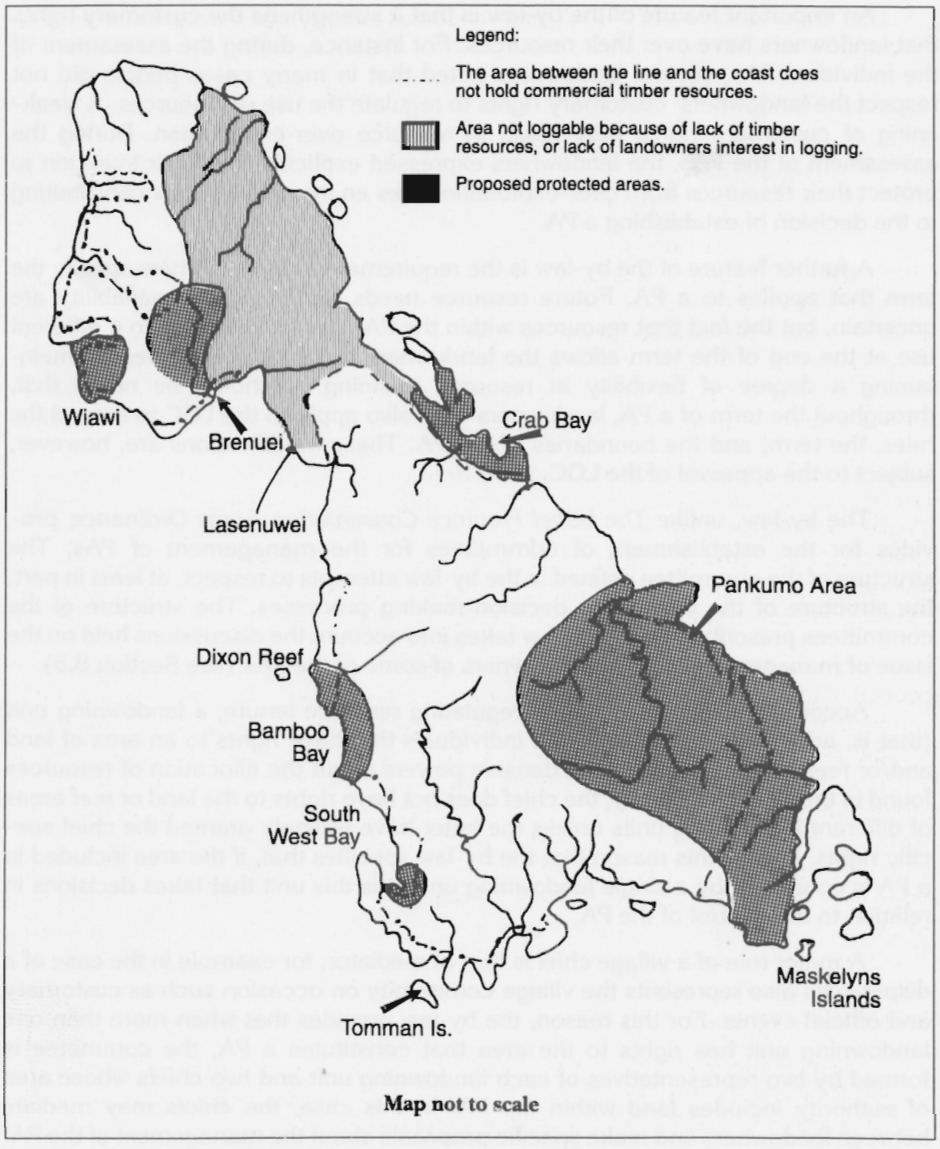

Figure 8.1 Map of proposed protected areas and non-loggable areas of Malekula.

It is apparent from Article 2 of the by-law that its purpose is rather broad. It enables the protection of areas that may be considered significant on the basis of stringent ecological criteria, but also on the basis of other benchmarks, such as custom and amenity purposes. The general statement that resources may be protected for 'conservation purposes' implies that areas (or resources) important for their contribution to people's livelihood can receive protected status. It is not necessary for these resources or ecosystems to be of outstanding ecological importance in order to be protected.

An important feature of the by-law is that it strengthens the customary rights that landowners have over their resources. For instance, during the assessment of the individual PAs, several landowners noted that in many cases people did not respect the landowners' customary rights to regulate the use of resources. A weakening of customary rights may result in resource over-exploitation. During the assessment of the PAs, the landowners expressed explicitly that their intention to protect their resources from over-exploitation was an important factor contributing to the decision of establishing a PA.

A further feature of the by-law is the requirement that landowners specify the term that applies to a PA. Future resource needs and resource availability are uncertain, but the fact that resources within the PA may be allocated to a different use at the end of the term allows the landowners to face uncertainties by maintaining a degree of flexibility in resource planning. It should be noted that, throughout the term of a PA, landowners may also apply to the LGC to amend the rules, the term, and the boundaries of the PA. These modifications are, however, subject to the approval of the LGC.

The by-law, unlike *The Isabel Province Conservation Areas Ordinance*, provides for the establishment of committees for the management of PAs. The structure of the committee defined in the by-law attempts to respect, at least in part, the structure of the customary decision-making processes. The structure of the committees prescribed by the by-law takes into account the discussions held on the issue of management with the landowners of some of the PAs (see Section 8.5).

According to customary rules regulating resource tenure, a landowning unit (that is, an individual or a group of individuals that have rights to an area of land and/or reef) normally has very extensive powers about the allocation of resources found in their area. Normally, the chief does not have rights to the land or reef areas of different landowning units unless the latter have willingly granted the chief specific rights. It is for this reason that the by-law specifies that, if the area included in a PA is controlled by a single landowning unit, it is this unit that takes decisions in relation to the control of the PA.

A major role of a village chief is that of mediator, for example in the case of a dispute. He also represents the village community on occasion such as customary and official events. For this reason, the by-law provides that when more than one landowning unit has rights to the area that constitutes a PA, the committee is formed by two representatives of each landowning unit and two chiefs whose area of authority includes land within the PA. In this case, the chiefs may mediate between landowners and make specific proposals about the management of the PA. However, the landowners will always be in the majority. They are the ones who take the final decision.

In concluding this section, it is appropriate to note that the by-law is intended to complement the *National Parks Act No. 7 of 1993*.

Firstly, the purpose of the *Act* is to protect areas which: (a) have unique ecosystems and resources; or (b) constitute the habitat of threatened species; or (c) have outstanding natural beauty; or (d) are of archaeological, or scientific importance (Article 2). Unlike the by-law, the *Act* does not provide for the protection of areas that do not have important ecological features but are significant for their contribution to people's livelihood.

Secondly, the *Act* provides for the appointment of a local management committee (Article 13). In this committee, the landowners are in the minority. They have only one member out of five. This committee structure is *perhaps* suited to PAs established by the payment of compensation to the landowners. However, if one or more landowning units intend to protect their resources because these are important to their livelihood, then they cannot be expected to relinquish control of their resources. In this situation, the structure of the management committee defined by the by-law is more appropriate.

The specific areas considered for protected status in Malekula are described in the next section.

8.5 The Areas Considered for Protected Status

It may be noted that only some of the areas that had been earmarked for protected status by the LGC (see Figure 8.1) have been assessed during the research work presented here. There are a number of reasons for this. The Brenuei area was not considered as it was at the time the subject of a court case between the landowners and the Government of Vanuatu. The landowners sued the government for damages caused by a contractor who was building an electricity transmission line. Two of the areas had been proposed in order to protect marine resources (Maskelynes Islands and Tomman island): these were outside the scope of the research project, which focuses mainly on forest resources. The South West Bay area did not appear to be under threat, and due to time limitations it was not investigated. Lack of time also prevented the assessment of the Crab Bay area.

All the cases discussed below have been identified and assessed according to the process described above. The only exception is the Lasenuwei area, which is discussed first.

8.5.1 The Lasenuwei area

The Lasenuwei area was identified as a possible site for protected status on the basis of the information derived by the author from VANRIS. According to VANRIS, Malekula has about 5850 ha of closed-canopy forest. In VANRIS, the Malekula closed-canopy forest is described as 'Midheight forest with *Kleinhovia hospita*'. This vegetation type is found only in Malekula, and is located on very accessible terrain. Only 1% of this forest is situated in areas inaccessible to loggers. Thus, if logging were to be carried out, only 60 ha of this forest type would survive. It is on the basis of this information that the Lasenuwei area, where an area of 'Midheight forest with *Kleinhovia hospita*' type forest is located, was earmarked as an area to be considered for conservation status.[13]

Two landowning groups with interests in the area were approached in May 1993.[14] During the initial stage of consultation, the nature of this research project, the work which had been carried out in Erromango in relation to conservation, and

13. The area considered for conservation status covers about 1000 ha.

14. Research work in the Lasenuwei area had started before the LGC's initiative for the establishment of a system of PAs. Field work in the area took place in the following periods: 21 August–3 September 1993; 12 December 1994; 21 February 1995.

the specific approach to conservation adopted in the latter case were discussed with the landowners (i.e. it was explained that in Erromango the Government of Vanuatu intended to lease the land from the owners). It was explained to the landowners that in order to decide whether to establish a PA or not, ecological surveys should be carried out in order to assess the ecological significance of the area. The landowners agreed to have these surveys carried out on their land.

Both landowning groups noted that they were not interested in having logging companies operating on their land. A major factor influencing that decision appeared to be the fact that they regarded logging activities as having significant negative effects on the agricultural potential of the land.

Fauna and flora surveys were carried out in the area (Flux and Maturin 1993; Curry et al. 1994). The fauna survey recommends that the Lasenuwei area be protected, on the basis of the representativeness of its fauna. The survey recorded: (a) 55% of the bird species of Vanuatu; (b) 36% of the gecko species of Vanuatu; and (c) 69% of the lizard species of Vanuatu. The vegetation survey does not recommend whether or not the area should be protected. This is probably because the authors did not have enough information to compare the specific site considered with other areas of Malekula[15] and of Vanuatu. Therefore, they could not judge the representativeness of the site.

The results of the surveys were discussed with the landowners, pointing out to them that they were not conclusive. That is, the surveys did not clearly indicate that the area should be conserved because of its ecological importance. Therefore, it could not be envisaged that, at that stage, the Government of Vanuatu would take a land lease to protect the area, as in the case of the EKPA. During this consultation process, one of the landowners remarked that he would be interested in pursuing the conservation option. He asked whether small-scale tourism could be developed in the area. This option was considered but it was deemed to be not viable at the time.

At that stage, consultations were broken off. The landowner who was interested in tourism did not have a specific reason to formalise his control over his land by establishing a PA. The establishment of a PA would constrain his options for the use of the land. Given that his ownership and control of the land resources are not threatened, it is advantageous from his perspective to leave open the option of converting the forest area to other uses, such as the production of cocoa. It should be noted that this does not imply that the forest will certainly be cleared. During the last phase of the consultation process, the landowner noted that he had been asked by the owner of a portable sawmill[16] if he would allow limited logging on his land. However, he had refused because he wanted to conserve the trees on his land.

8.5.2 The Nagha mo Pineia Protected Area

Research in the Nagha mo Pineia Protected Area (marked in Map 8.1 as Wiawi area) was initiated following a request for support from the landowners of the

15. This fact was noted by Curry and co-authors in a draft of the report. However, this issue is not mentioned in the final report.

16. This type of equipment is also known as 'walkabout sawmill'. It may be operated by four to six workers to saw timber directly in the forest with relatively minimal environmental impact, if properly operated.

area to the LGC of MALAMPA. The reasons for the landowners' request and the research carried out in the area are outlined below. A more detailed account of the issues presented here is contained in Wiawi Village Community and Tacconi (1995), on which this section draws.

In 1993, the representative of a logging company visited Wiawi village and asked chief Timothy Nehapi (the head of the family owning the land to be included in the Nagha mo Pineia Protected Area) to sign a logging contract with the company. The chief said that he had to consult with the family before making any decision. A family meeting was held. At this meeting it was decided that logging was not a good resource use option for the Nagha mo Pineia area. It was decided that other activities may provide income over a longer period of time than logging. Logging was regarded as a short-term activity. At the family meeting it was also noted that:

a) logging may result in severe damage to the land;

b) reduction in forest cover may result in a decrease in rain and water availability; and

c) the interests of the children, who will need land, water and trees, should be taken into account.

Following the meeting, one representative of the family visited the Environment Unit in Port Vila and asked for assistance in the protection of the environment in the area. The Environment Unit organised a turtle survey and helped in drafting a letter (reporting the decision to protect the Nagha mo Pineia area) that was sent to various Government Departments and community groups.

An outline of some characteristics of the natural resources of the area is provided below. The resource use rules for the proposed PA are then presented.

Marine wildlife. The most important feature of the marine ecology appears to be the existence of turtle nesting sites. In two surveys conducted by the Environment Unit, two species of turtles were recorded in the area: loggerhead turtle (*Caretta caretta*) and green turtle (*Chelonia mydas*). The olive ridley turtle (*Lepidochelys olivacea*) and hawksbill turtle (*Eretmochelys imbricata*) have been sighted by the people of Wiawi.

Birds. Several species of birds are found within the Nagha mo Pineia area. Detailed surveys of the relative frequency of the different species have not been carried out. By looking at drawings and photographs, the people in Wiawi identified all the species (with the exception of two that could not be recognised in the material available) found in the Nagha mo Pineia area. A list of these species is reported in Wiawi Village Community and Tacconi (1995). Of the 121 bird species present in Vanuatu, 57 have been sighted in the Nagha mo Pineia area.

Vegetation. According to VANRIS, the following vegetation types are found in the area.

- 'Thicket dominated by *Leucaena* and *Acacia spirobis*', mixed with 'Low forest with a high proportion of deciduous trees'. This is the main vegetation type of the area.
- 'Thicket dominated by *Hibiscus tiliaceus*', mixed with 'Low forest with emergents'.
- 'Low forest with a high proportion of deciduous trees'.

A survey carried out in the area revealed that this description of vegetation types containing no commercially exploitable forest is incomplete. The field survey revealed that within the area there are various forest types that could be logged. A list of the plant species identified by Chanel Sam (Herbarium Curator, Department of Forests) within the area is presented in Wiawi Village Community and Tacconi (1995).

The resources found within the boundary of Nagha mo Pineia are the primary source of livelihood for the people of Wiawi, and are also used by people in neighbouring villages. Before drafting a management plan for these resources, it was important to see how they were being used.

Water. In Wiawi, a tank collects rainwater for drinking; a well provides water for other uses. The creeks located within and along the boundary of Nagha mo Pineia are important sources of water for the villages of Wiel and Wiliekh. The availability of water in the area depends on the amount of rain received. Over recent years, a decrease of the quantity of water in the area has been noted. Some creeks that ran permanently now have water only when it rains. Three ponds in the area are dry most of the time; different species of birds that used to be seen around them, do not remain in the area any more. The maintenance of water availability is a major concern for the villages in the area and one of the reasons contributing to the decision to establish the PA.

Subsistence products. The most important sources of subsistence products are the gardens and the reef area. Use of marine resources is detailed below. Forest areas do not constitute an important source of food. Also, firewood and building materials are all collected in the vicinity of the village.

Marine resources. Marine resources in the area are important for their subsistence use and for their commercial value. Firstly, it should be noted that almost all the people in Wiawi belong to the Seventh Day Adventist Church and do not consume shellfish and crustaceans (turtles are also taboo), but various fish species are eaten. People in the villages of Wiel and Wiliekh do eat shellfish and crustaceans. Marine resources are one of the most important commercial resources in Wiawi. The shells of green snail and trochus are sold to traders. People from neighbouring villages are allowed to collect these species in the Wiawi customary reef area. The collectors retain the meat for consumption and sell the shells to the custom owners for a stipulated price. Lobsters are present on the reefs of Wiawi but currently are not being exploited.

Other resources. Cattle grazing and a taxi business are the major sources of income in Wiawi, together with the exploitation of marine resources. There is also some copra production.

Four resource-use zones have been defined within the PA. They are: a) turtle nesting zone; b) protected forest zone; c) garden and plantation zones; and d) reef zone. The rules regulating the use of these zones are detailed below. They will apply for 10 years following the declaration of protected status for the area. The total area of the Nagha mo Pineia Protected Area is about 1050 ha.

Turtle nesting zone

In Vanuatu, the nests and eggs of all species of turtles are fully protected; the trade or export of hawksbill (*Eretmochelys imbricata*) shell is prohibited. Consumption and sale of turtle meat is not regulated.

Within the Nagha mo Pineia Protected Area, nests, eggs and live turtles are fully protected. In the area *Turtle Nesting Zone*, a zone extending from the reef edge to 100 m inland from the shore line, the following rules apply.

a) The vegetation may not be subject to alterations.

b) Collection of firewood or any other wood product is prohibited.

c) Fires may not be lit.

d) Buildings of any kind may not be erected.

e) Earthworks of any kind are prohibited.

Protected forest zone

This zone is subject to the following rules.

a) Any resource from this zone may be used for subsistence use.

b) Persons other than those belonging to the Wiawi community need to ask permission to the chief of Wiawi before taking any resource from this zone.

c) Trees with diameter at breast height less than 40 cm and more than 60 cm shall not be cut. However, if a tree of natora (*Intsia bijuga*) greater than 60 cm is needed for customary purpose (e.g. curving of tam tam), the chief of Wiawi may grant permission to cut the tree, if one cannot be taken elsewhere. The person that is granted permission to cut the tree will have to pay for it according to custom requirements to be agreed with the chief of Wiawi.

d) Gardens and plantations shall not be established in this zone.

e) No earthworks may be carried out in this zone, with the exclusion of those eventually required for the construction of a road.

Garden and plantation zones

Two garden and plantation zones were identified. The northern zone is used by the people from the community of Wiliekh. The southern zone is used by the people from Wiawi and also from Wiel.

The following rules apply to these zones.

a) The people from Wiliekh and Wiel who are currently using these zones for gardening may continue to do so.

b) The people from Wiliekh and Wiel who currently have plantations in these zones may continue to work them. However, they are not allowed to extend them. At the end of the life span of the current plantations, they shall not replant them.

Reef zone

The Reef zone is regulated as follows.

a) Turtles are fully protected in the reef zone.

b) People from communities other than Wiawi may take marine resources from this zone only for personal consumption, and only if authorisation to do so has been granted by the chief of Wiawi.

c) The chief may declare specific areas of this zone to be taboo areas. In these areas, collection of marine resources by any person is prohibited.

8.5.3 The Vendik Dik (Bamboo Bay) Protected Area

The conservation of the Bamboo Bay area was firstly suggested by the Malekula LGC in 1994. The establishment of the area was designed to conserve the forest and the marine resources.

Meetings were held with the landowners to discuss their views about conservation and the proposal advanced by the LGC to establish a PA on their land.[17]

The landowners noted that they had been told by a councillor that the LGC intended to protect the area, but they had not been consulted. They noted that part of the area earmarked for protected status was being used for gardening. They did not intend to have a logging company operate on their land. They considered their land 'not very big' and wanted to make sure that enough land, with non-disturbed soil, would be available for future gardening needs. The landowners noted that they were interested in conserving their forest but also remarked that the land was required for gardening.

The author asked the landowners whether they had an area of forest that they were interested in conserving for the protection of the forest itself and as a bird habitat.

A discussion about the possible area to be protected followed. A forest zone was identified as the area to be protected. The landowners noted that there were good stands of timber in that area and no gardens. According to them, the area was therefore worth protecting. The landowners decided that, future gardens would be located in the area north of the PA.

The use of marine resources was then addressed. The landowners pointed out that the resources of the reef area controlled by them were subject to increasing exploitation; turtle eggs and turtle meat were being collected in the area. It was pointed out to the landowners that under Fisheries Regulations, turtle eggs were totally protected in Vanuatu. They could not be collected for consumption or sale. It was also noted that the number of turtles throughout the South Pacific had declined as a result of fishing and alteration or destruction of the hab-

17. Fieldwork in the Bamboo Bay area (Vendik Dik protected area) and the adjoining Dixon Reef area (Lakorombanga protected area) took place during the following periods: 13–17 February 1995, 6–10 March 1995, 16 May 1995, 3–4 June 1995.

itats where turtles lay eggs. The landowners discussed these issues at length and decided that:

(i) they will enforce the Fisheries Regulation prohibiting the collection of turtle eggs;

(ii) in the reef and beach areas controlled by them, turtles would totally protected.

In relation to the term of the PA, the landowners initially decided that this would be 10 years. However, at a later stage the landowners communicated to the author that they had decided to reduce the term of the PA to 5 years.

The landowners have decided that the following rules will apply within the PA.

Protected forest

In this area, there will be no gardening, no logging of any form, no lighting of fires and no earthworks. Hunting of pigs, wild cattle and birds is permitted but only with the approval of the landowners.

Reef area

Along the seashores and the beaches of the PA, turtles are totally protected. Fish, trochus and other marine resources may be collected only with the approval of the landowners.

The area of the protected forest is about 260 ha. The length of the reef subject to the rules specified above is about 8 km.

8.5.4 The Lakorombanga Protected Area

The conservation of the Lakorombanga catchment area had not been suggested by the LGC. In December 1995, a meeting was held in the village of Tavendrua (also known as Dixon Reef) to identify the landowners of the Bamboo Bay area. In the course of the meeting, the landowners noted that they were interested in protecting the Lakorombanga River from logging operations. Since 1987, when a cyclone destroyed part of the forest in the catchment area, they have noted a decline in the water level in the river. They thought that if the remaining forest was going to be cleared, this would further lower the level, and given that the river is an important source of water for the village, they wanted to prevent any further reduction in its availability.

Three further meetings were held in the village. During the first of these, the need to protect the river from the potential negative impacts of logging operations, and to protect the forest so as to safeguard the habitat of birds and flying foxes were discussed. The question of how large the PA around the river should be was addressed. The author remarked that, when carrying out logging operations, the logging companies must leave a vegetation buffer on both sides of watercourses.[18] The landowners decided to define the area to be protected in terms of a buffer around the river. Distances in metres were considered. To visualise the concept of a buffer around the river, several distances (e.g. 100 m) were paced with the land-

18. According to the draft of the new Code of Conduct for Logging, the buffers range between 10 and 30 m wide, starting from the point where the vegetation is at least 10 m high.

owners in the village. Initially, the landowners decided that the vegetation buffer, on each side of the main course of the Lakorombanga River should be 500 m. The vegetation buffer for the tributaries should be 100 m.

A further two meetings were held to consider the issue of agricultural activities within the area designated as buffer zone during the first meeting. The landowners noted that they needed land for gardening. It was decided that agricultural activities should be excluded from a buffer zone of 50 m on each side of the tributaries to the Lakorombanga River. For these tributaries, the buffer zone for logging activities was set at 500 m each side.

The total area that the landowners intend to protect from logging is about 4390 ha. Within this area, some 1360 ha are also protected from gardening. The landowners decided that the term to be applied to the Lakorombanga Protected Area should be 10 years.

Within the inner PA the following rules will apply.

a) There will be no gardening, earthworks and cattle development 500 m of either side of Lakorombanga River and 50 m of either side of all tributaries that run into Lakorombanga River.

b) There will be no logging 500 m of either side of the Lakorombanga River and all tributaries that run into Lakorombanga River.

8.5.5 The Pankumo Protected Area

The establishment of a PA in southeastern Malekula, as marked in Figure 8.1, was first suggested by the Malekula LGC in 1994. It should be noted that the area denoted included all the villages and cultivated land in the area. It is also clear from Figure 8.1 that the coastal area would not be logged as it is not considered to be commercial forest. For these reasons, it was decided that a more appropriate area to focus on was the catchment area of the Pankumo River.

During the first round of consultation with the landowners, they emphasised that the Pankumo River was rich in fish resources that they wanted to conserve.[19] They also wanted to ensure that the quality of the water was not reduced by development activities. It is important to stress at this point that the landowners appear to have a strong attachment to the land and the conservation of the resources seems to play an important part in the local culture. For example, the landowners in the village of Bankir noted that they have 'large areas', located in the forest, that are taboo.[20] In these taboo areas, every resource is protected.

During the first round of consultations, the author described to the landowners the work carried out with the landowners of the other areas considered for protected status in Malekula. They thought that they could adopt the same approach to conservation chosen by the landowners of the Lakorombanga area. That is, they would establish forest buffer zones around the Pankumo River and its tributaries: the PA

19. Fieldwork in the Pankumo area took place in the following periods: 27 March–6 April 1995, 15–26 May 1995.

20. The landowners themselves described these taboo areas as large. Due to time constraints, these areas could not be surveyed. It would be important (especially if logging takes place in the area) to survey and mark out these taboo areas.

would extend 500 m either side of the Pankumo River and 100 m either side of the tributaries. Rules regarding fishing and hunting were also discussed, and are described below.

Once the boundaries of the PA, as proposed by the landowners, were drafted on the map it appeared that it would be rather difficult and expensive to mark the boundaries of the PA in the field. Also, and most importantly from an ecological point of view, it would be more appropriate if the whole catchment of the Pankumo River were protected. Therefore, it was decided to sketch on the map the boundaries of the catchment area and further discuss with the landowners whether they thought the whole catchment area should and could be protected.[21]

During the second round of consultations, it was discussed with the landowners whether logging, gardening and other agricultural projects, such as cattle grazing, should take place within the catchment area of the Pankumo River.

All the landowners said that the catchment area of the Pankumo River, as marked on the map presented to them, should be protected from logging activities, but noted that part of the land included in the catchment area may be needed for gardening and other agricultural activities. For this reason, they decided that gardening and other agricultural activities should be allowed within the catchment area. However, all activities would be excluded from the vegetation buffers on either side of the Pankumo River (500 m buffer area) and of its tributaries (100 m buffer area). They also noted that gardening carried out in the catchment area does not require burning and therefore has a lower impact on existing vegetation than gardening that involves burning.

The detailed rules to be applied to the Pankumo Protected Area are as follows.

a) All wildlife resources can be used for local consumption only.

b) Fishing is permitted but only with the approval of the landowners.

c) All methods of fishing may be used in the PA with the exclusion of nets and explosives.

d) Hunting of birds, pigs and wild cattle is permitted but only with the approval of the landowners.

e) Fires shall not be lit.

f) Earthworks of any kind are prohibited. Roads may be built with the approval of the Management Committee.

g) There will be no gardening or livestock development within 500 m of either side of the Pankumo River and 100 m of either side of the tributaries joining the Pankumo River.

h) Logging operations are not allowed within the PA.

21. To enable the landowners to visualise the catchment area of the Pankumo River, a survey of the boundary of the catchment area was conducted. This survey aimed at identifying the custom names of the hills that delimit the catchment area. The landowners know their land, and once the custom names were reported on the map, it was possible for them to visualise the area that was being considered for protected status. Jean Paul Batick (from the Vanuatu Cultural Centre) carried out the field survey with the help of five landowners.

The term to be applied to the PA is 10 years. The total land area included in the Pankumo Protected Area is about 11 500 ha. The area from which agricultural activities are excluded is about 5090 ha.

8.5.6 The Nevnal (Leviamp) Protected Area

The Leviamp PA had not been suggested by the LGC. In May 1995, during the last visit to the Nagha mo Pineia PA, the chief of Wiawi village mentioned that the chief of Leviamp village had asked for information in relation to the process of PA establishment. The chief of Leviamp had heard on Radio Vanuatu (the national radio station) an interview with the chief of Wiawi concerning his area and the need to establish PAs in Vanuatu.[22] He asked the chief of Wiawi to put him in contact with the Department of Forests, as he was interested in setting up a PA on his land.

A meeting with the chief of Leviamp village was held on 19 May 1995. He noted that part of his land had previously been logged. These operations had taken place in an area that was going to be used for gardening. He thought that, rather than burning the timber, it was preferable to sell it. However, he had not been very pleased with the logging. Trees had been cut but not removed from the land. Only part of the total royalties owed by the logging company for the timber extracted had been paid.

He was interested in setting up a PA on his land (i) to avoid further pressures from logging companies, and (ii) to protect some of the marine resources that were coming under increased pressure from the local people.

He decided that an area of forest that had not been gardened or logged should be protected. Specific rules would also apply to the watercourses located in the area allocated to agricultural activities. The specific rules to be applied to the PA are listed below.

The term for the PA should be 10 years. The total area of the PA is about 530 ha. The area of protected forest is about 180 ha.[23]

Within the PA, the following rules will apply.

Protected forest

a) Trees shall not be cut.

b) Fires shall not be lit.

c) Earthworks of any kind shall not be carried out.

Water streams (located in the protected forest and in the garden area)

a) Crayfish and fish can be taken but only with the approval of the landowner.

b) Hunting is permitted but approval must be sought from the landowner.

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22. The interview was recorded by Mr Livo Mele. Several interviews with landowners were recorded during the period of the work presented here. These interviews were broadcast during the weekly forestry information program.

23. The boundary of the PA assessed during our survey is only a rough approximation of the actual boundary. A detailed survey has to be carried out to mark the boundary of the area owned by the chief of Leviamp village.

Reef area

a) Turtles are totally protected.

b) Other marine resources may be taken but only with the permission of the landowner.

8.6 Conclusion

The general features of the process of assessment and establishment of PAs adopted in Malekula have been presented in this chapter, together with details of the areas selected. A declaration of the formal protection of these areas has not yet been made. The Malekula LGC has approved in principle the protected area by-law. Once the by-law comes into force, the landowners may apply to the LGC for the establishment of the PAs.

It is now worthwhile summarising the features of the approach and commenting on some of its general aspects. It is discussed below how the approach adopted in Malekula might be integrated with that adopted in the case of the EKPA in order to provide an overall approach to conservation in Vanuatu.

The approach adopted in Malekula may be summarised as follows. Some of the PAs had been first identified by the LGC. However, the decision whether to establish them and the determination of their boundaries were made by the landowners through a process of consultation that focused both on the requirements of ecosystem conservation and the economic needs of the local people. The cost-effectiveness of the Malekula conservation initiative was ensured by having the landowners establish the PAs without external financial support (that is, without compensation payments). In Malekula, the landowners themselves expressed their interest in establishing the PAs through the process of participatory planning. This appears to reduce the likelihood of generating negative intragenerational equity impacts.

The approaches to conservation adopted in the cases of Malekula and the EKPA have their specific roles in a national forest and biodiversity conservation strategy in Vanuatu.

Let us now consider two possible negative aspects of the approach to PA assessment and establishment adopted in Malekula.

Firstly, there is the issue of long-term existence of the areas. The PAs described above, once declared, will have a (renewable) term of 10 years (only one area will have a term of 5 years). This is a relatively short period. The long term, continued existence of these PAs depends on whether the landowners derive continued net benefits from them. This highlights that monitoring of these PAs has to take place. New institutional arrangements may have to be developed in order to guarantee the continued existence of the PAs. However, this situation is no different from that of any other PA. Even national parks, normally established on state land with long-term security, require monitoring and, at times, modification of management plans.

It has been noted above that the approach adopted in Malekula addresses intragenerational distribution issues. This is because the landowners themselves decide to establish a PA and benefit from it. However, the creation of a PA could

make people other than the landowner worse off. For example, this may happen if the establishment of a PA enables the landowner to enforce his rights to resources, and other people are prevented from using resources they consumed before the PA existed. In this case, the PA causes changes to the *de facto* intragenerational distribution of resources. Certainly, these changes are negative ones from the perspective of people other than the landowner. The latter would regard them as positive changes. It is clear that what is at stake here is an issue of rights. If the protection of the landowner's rights is considered 'a good thing', then the establishment of the PA could not be said to produce negative intragenerational effects.

It was noted in Chapter Four that the interests of the current generation and future ones tend to coalesce, at the level of critical natural capital. A positive aspect of the participatory approach to conservation presented here is that the establishment of PAs, designed on the basis of landowners' needs, contributes to this convergence of interests between generations.

The approach to conservation presented here is relevant not only to Malekula, but also to the rest of Vanuatu. Evidence of this is that some landowners in the northern island of Espirito Santo have approached the Department of Forests seeking assistance, in order to protect their resources. The competent LGC has been provided with the by-law presented here. The President of the LGC has expressed the intent of the LGC in adopting the by-law. The same by-law has already been adopted by the SHEFA LGC (this council includes the Shepherd Islands and the island of Efate, where the national capital is located).

This chapter completes the presentation of the assessment and planning of PAs in Vanuatu. The international values that may be associated with PAs in Vanuatu are considered in the following chapters.

9 Estimating Demand from Australians for Vanuatu Forest Conservation

Jeff Bennett
Glenn Flatley
John Rolfe

9.1 Introduction

The framework for the establishment of PAs developed in this volume involves two potential avenues for action. The first, as exemplified by the Erromango Kauri Protected Area, is characterised by the payment of compensation to the owners of ecologically significant forests. In such cases, compensation is required because, without it, forest uses which are incompatible with conservation—such as logging—are the most attractive to the landowners. That is, from the perspective of the landowner, the benefits of logging are greater than the benefits of conservation. Only with the payment of the compensation will conservation become the preferred alternative of the landowner.

The second avenue for action, as exemplified by the Malekula case studies, does not involve compensation. Here, the landowner's benefits from opting for conservation outweigh the benefits of alternative, extractive uses. There is no need for external financial support for the conservation option because it is preferred choice of the landowner. What is required, however, is the establishment of an institutional structure that enables landowners to make their choice of conservation secure in the context of the existing social structure.

What remains problematic in the implementation of this framework is the supply of funds for the payment of compensation required under the first avenue for action. In the case of the EKPA, compensation has been arranged in the form of a five-year lease. Funds to make the lease payments have been supplied by the European Union. However, to extend the existing lease into perpetuity requires further injections of funds, potentially into a trust fund of the kind given in Appendix 2. It is unlikely that such funds will come from within Vanuatu. If it can be shown that the benefits of tropical forest conservation are enjoyed by people in more developed countries, then there are intra-generational equity arguments to support the proposition that the funds for compensation payments should come from the people of countries like Australia.

The notion that Australians benefit from the establishment of PAs in Vanuatu is the focus of this chapter. This issue is important not just to establish the viability of the principle of international compensation. By estimating the extent of Australians' benefits arising from Vanuatu forest conservation, it is possible to formulate more effectively the amount of compensation that Australians would be willing to pay. This information is helpful to Australian organisations—both private and public—that would seek to convert the expressions of forest conservation interest into the hard currency required for compensation payments. This conversion could take the form of NGOs raising funds through public donation. NGOs need to be

reassured of the magnitude of the demand for the 'product' they wish to sell before committing resources to a fund-raising campaign. Alternatively, government aid agencies arguing for public funds to be re-allocated for the purpose of forest conservation could use the benefit estimates as evidence of public support for such a course of action.

Knowledge of the extent of the benefits of Vanuatu forest conservation enjoyed by Australians—and by extrapolation, other developed countries—is also useful to the authorities in Vanuatu who are involved in planning for a forest PA network. If the amount of compensation that could be paid is known, then the area of land to be sought for conservation can be better estimated.

The estimation of the benefits enjoyed by Australians as a result of the establishment of PAs in Vanuatu is far from a straightforward exercise. While economists can rely on markets as a source of information on the extent of benefits for many goods and services, the public or shared nature of forest conservation benefits means that they are not marketed. Non-market valuation techniques are required in such circumstances. Two of these techniques—contingent valuation (CV) and choice modelling (CM)—are used in this chapter to estimate the benefits of forest conservation in Vanuatu to two groups of Australians. In sections 9.2 to 9.4 the benefits to Australians visiting Vanuatu as tourists are estimated using CV. In sections 9.5 to 9.7 the benefits to Australian residents who do not visit Vanuatu are estimated using CM.

9.2 Contingent Valuation

Contingent valuation (CV) is a 'stated preference' non-market valuation technique. It involves respondents to a survey questionnaire being asked to state their preferences for a non-market good or service. The expression of preference usually takes the form of the amount an individual is willing to pay for the good being analysed in a hypothetical situation. Value estimates so obtained are said to be contingent on the set of circumstances created by the survey. The flexibility afforded by the specification of the hypothetical circumstance gives CV the ability to address a wide range of valuation tasks. It has been used in fields as diverse as evaluating public programs to assist the elderly to transportation risk assessment (Mitchell and Carson 1989). A particular strength of CV is its ability to estimate both 'use' and 'non-use' benefits that individuals enjoy from environmental resources. According to Imber et al. (1991, p. 6), 'use' benefits are those that 'accrue from the physical use of environmental resources' such as recreational fishing or agriculture, while 'non-use' benefits are regarded as the 'well-being' that individuals may obtain from environmental resources without ever directly using such resources'. The 'non-use' benefits are of specific interest in the context of Australians benefiting from Vanuatu forest conservation.

The advantages offered by CV are somewhat offset by related difficulties. Critics claim that CV-derived estimates of benefits are biased. The bias arises, it is suggested, because respondents are unfamiliar with the CV process and the goods being evaluated (Diamond and Hausman 1993), and because the setting used and the preferences expressed are hypothetical (Brunton 1991). Despite these problems, CV has received tentative endorsement as an appropriate starting point for non-market benefit estimation by the economics profession (Portney 1994).

9.3 The Vanuatu CV Application

The CV method was used to estimate the benefits Australian visitors to Vanuatu enjoy from the conservation of forests in the EKPA and Malekula case study areas detailed in Chapters 5–8.

A CV questionnaire was designed to limit the extent of possible estimation biases and to restrict the complexity and thus the costs involved. The latter goal was introduced in order to assess the potential for applying the technique in developing country circumstances where research budgets are limited. Flatley and Bennett (1996) give full details of the design of the questionnaire.

The survey population was defined as those Australian tourists visiting Vanuatu by commercial airline. The survey was conducted with passengers departing Vanuatu over a two-week period during 1994. The Vanuatu Civil Aviation Authority granted permission for interviewers to access the Bauerfield International Airport departure lounge to carry out the interviews. The interviews were carried out by Flatley and several ni-Vanuatu employees of the Vanuatu Government who were provided some training for the task. The questionnaire was pre-tested in Australia and in Vanuatu.

Some 231 responses were collected over the survey period. Initial analysis of the results identified interviewer bias in 68 of these responses. The remaining data set of 163 observations was found to be representative of the corresponding population of air travellers as documented in Vanuatu Statistics Department (1993).

The survey found that, on average, respondents stayed in Vanuatu for just over 8 days. In addition, 31% of respondents stated that they had visited a rainforest area during their stay, while a similar proportion (30%) indicated that they had visited an island other than Efate. More importantly, it was found that only two respondents had visited the islands of Erromango and Malekula where the PAs of interest are located.

Attitudinal data collected are instructive. Only 11% of respondents surveyed believed that the conservation of tropical rainforest areas is less important than non-conservation issues such as the provision of health care. Furthermore, 88% of the sample thought that the conservation of tropical rainforest areas was at least as important to them as other conservation issues, such as water pollution. It was found that almost all respondents (95%) believed that conserving Vanuatu's rainforests was at least as important as conserving tropical rainforests in other parts of the world. These results suggest that a strong positive view toward the conservation of Vanuatu's rainforests prevailed among the people interviewed.

The study revealed that 95 respondents (58%) were prepared to pay something for the conservation of the forest areas described. The payment vehicle used was a donation to a conservation trust set up specifically for the task of establishing the PAs. In follow-up questions that were posed to the remaining 42% of respondents, it was found that refusal to contribute to the trust was primarily a function of reasoned preference to forego the rainforest benefits rather than a protest against elements of the hypothetical scenario created in the questionnaire. The majority of respondents who refused to contribute stated either that they could not afford to do so, or would rather contribute to Australian-based conservation causes.

Willingness-to-pay bids for the forest conservation scheme outlined in the questionnaire ranged from $5 to $300.[1] Of those respondents who were prepared to contribute to the trust, 15 could not assign a dollar value to their contribution. The minimum bid obtained from the remaining respondents, i.e. $5, was assigned to each of these unspecified observations. Given this adjustment, Australian visitors were, on average, willing to pay a once-off payment of $20.22 to the trust fund. Furthermore, if this sample based figure is extrapolated across the relevant population, then it can be concluded that Australian residents who visit Vanuatu are willing to pay around $403,000 per annum to see the PAs established.[2] This cash flow through time can be aggregated to a present value using an appropriate discount rate. At a 10% rate in perpetuity, the willingness to pay cash flow comes to about $4 million. Carter (1992, p.98) acknowledges that present value estimates based on current-year values alone are likely to be understatements because of 'increasing population, changes in technology, increased income and [shifts in] preferences towards the benefits of environmental conservation compared with traditional goods and services'. In addition, extrapolations of current-year values may be insufficient because of increased levels of tourism through time. However, given that some Australians are recurrent visitors to Vanuatu, the present value estimate may be excessive as visitors may not be willing to pay to the trust fund on subsequent visits.

A regresssion analysis was conducted to determine which demographic factors, if any, influenced the extent of respondent willingness to pay to the trust. This task was particularly important given that one of the aims of the study was to provide information relevant to potential funding arrangements for the PAs. Six independent variables were tested in the regression model: respondent's income, age, gender, educational level, membership of environmental organisations (e.g. Greenpeace) and visitation to Vanuatu rainforest areas. The analysis revealed that respondent benefit, as reflected by willingness to pay, was positively related to their income. The strength of this relationship was significant in statistical terms at the 10% level of significance. The results for the other independent variables were not so conclusive. This finding suggests that apart from income, the factors that influence willingness to pay are highly individualised.

9.4 Benefits to Australian Tourists

Through the application of CV in the study reported here, it can be concluded that Australian tourists visiting Vanuatu by air benefit from the conservation of the forests in Erromango and Malekula described in Chapters 5–8 to the extent of $403,000 per annum. This figure represents a valuation of approximately $20 per Australian visitor to Vanuatu. Although the analysis made no attempt to segregate 'use' from 'non-use' benefits, the fact that only two respondents had actually visited the islands concerned suggests that the estimate contains a strong 'non-use' or existence value element. If the PAs are developed to the extent of providing ecotourism venues, use values would also be generated but with the potential to diminish such 'non-use' values.

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1. Bids were made in Australian dollars. Three bids of between $500 and $1000 were removed as outliers.

2. This figure assumes that different Australian residents visit Vanuatu each year.

The value that has been estimated in this analysis may be only a small component of the total value that the PAs provide. Another component of value may be held by non-Australian tourists to Vanuatu, given that only 55% of visitors to Vanuatu are Australian. Furthermore, the strong element of 'non-use' value thought to be present in the estimates presented above, suggests that Australians and others who have not visited Vanuatu may also value the rainforest sites. This possibility is investigated in the remaining sections of this chapter.

The extent of the estimates of benefits enjoyed by Australian visitors to Vanuatu clearly swamps the annual lease fees for the EKPA ($2606). This implies that there are strong net benefits to be enjoyed from the establishment of that PA and others. It is only necessary to draw on the resources of tourists to fund their establishment. However, the issue of how to raise the funds from tourists raises some important questions. The CV study reported here used donations to a specific purpose trust fund as the payment mode. Hence, the benefit estimates obtained are *contingent* on that specific funding mechanism. Drawing conclusions on the feasibility of other funding mechanisms is therefore somewhat difficult. However, it is clear that the Vanuatu Government could pursue alternative ways of raising the money from tourists for the PA leases. It would be necessary for these alternatives to be considered carefully, as they may bring about unintended consequences. For instance, if a bed tax were levied to raise the funds, there might be a drop in visitor numbers. The extent of the drop-off in tourism would be dependent on the elasticity of demand over the range of the accommodation price rise brought about by the tax. The results of the study do indicate that the introduction of a mechanism whereby tourists can donate to a forest conservation trust at their point of departure from Vanuatu may well raise sufficient funds for the establishment in perpetuity of a number of PAs.

9.6 Choice Modelling

The CV study of the benefits enjoyed by Australian tourist in Vanuatu through the establishment of PAs indicated that 'non-use' benefits were likely to form a major component of overall benefit. This conclusion implies that these 'non-use' benefits may also be enjoyed by Australians who do not visit Vanuatu. Such benefits include what are known as 'pure existence benefits'. The remainder of this chapter presents the results of a study designed to investigate the presence and extent of such existence benefits amongst Australian residents.

While CV is a technique that could be applied to this estimation task, the particular circumstances involved limit its usefulness. CV is limited in applications where respondents have insufficient knowledge to easily depict and frame the hypothetical scenario presented to them in the questionnaire. It is especially important in cases where limited knowledge or experience of the good is present that respondents are able to understand the array of complementary and substitute goods that are available. This framing of the good ensures an unbiased estimate of benefits. The Australian population has very low levels of knowledge of Vanuatu forests. Focus groups reported by Rolfe and Bennett (1995) show that some Australians do not know where Vanuatu is, while many are not aware that Vanuatu has tropical rainforests.

Choice modelling (CM)[3] is the alternative to CV where framing difficulties are likely to arise. CM has its origins in three disciplines—transport economics, marketing and psychology. Its use in the context of environmental valuation has so far been limited and largely experimental. A choice modelling exercise consists basically of survey respondents being asked to make a series of choices. Each choice involves the selection of a favoured option from a range of alternatives. One option reflects the status quo and acts as a base for value estimation as well as providing a necessary degree of realism to the choice process.

In the application of the method to Vanuatu rainforests, each option represents a specific conservation proposal. Just as a marketed good can be described in terms of its various attributes (milk, for instance, can be characterised by fat content, packaging type, cost etc.) so can a forest conservation proposal. Hence, an option in a CM exercise consists of a number of attributes or characteristics. In the rainforest case, the attributes making up each option could include the size of the PA, its location, the effects its establishment would have on local people, the extent of donation required to secure the PA, etc.

Differences between options are created by assigning different levels to each of the attributes making up the options. The size attribute may have three levels—100 ha, 1000 ha and 10,000 ha—whereas the location attribute may have more levels—Vanuatu, Indonesia, South America, Queensland, etc.

CM involves people being confronted with a whole series of choices between alternatives. The questions involve choices between different options that comprise differing levels of the same attributes. Each choice is different because some of the levels of the attributes that go to make up each of the options are changed for each question.

Respondents' answers to this type of question depend on the strength of their feelings for or against the combinations of attributes involved in each option. The probability of their selecting a particular option is dependent on how much they value the levels of the attributes present (and on some unexplained factors that are assumed to occur at random).

Once a sufficiently large number of choice outcomes have been collected in a survey, the CM analyst can estimate statistically the relationship between attribute levels and the probability of choices being made.

In turn, this relationship enables the researcher to see, on average, how willing people are to trade-off between attributes. For instance, holding the probability of choice constant, it is possible to determine the number of hectares of protected rainforest people are willing to give up in order to improve the conditions for local people. By using the cost attribute in this type of trade-off analysis, it is possible to estimate how much people are willing to pay to have an increase in the size of the forest PA, the presence, or absence, of an endangered species etc. relative to the status quo. In other words, a window into peoples' values has been established. With the values of the individual attributes estimated in this way, it is possible to estimate the values of combinations of attributes that go together to make up actual forest protected areas.

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3. A review of CM, along with other stated preference techniques for estimating non-market values is provided in Morrison et al. (1996).

9.7 The Vanuatu CM Application

The practicalities of CM involve three separate phases: the determination of attributes; questionnaire design; and statistical analysis.

In a sequence of focus groups, the attributes of rainforest conservation options were distilled to a concise but coherent group that captured the essential processes by which people make choices about rainforests. These were undertaken in Brisbane in March 1995.

The key attributes identified were:

- location
- rarity
- effect on local people
- potential for future visits
- size
- possession of special features

Location was identified as a key attribute, particularly in terms of Australian versus overseas rainforests. Respondents expressed substantial support for Australian rainforests over international ones because of feelings of identification, ownership and responsibility. There were two strong themes to the support for Australian rainforests. There was the feeling that, because of a sense of ownership, Australian rainforests should come first. Second, people were hesitant about imposing judgments on other countries. It was better to 'clean up our own backyard first' and 'lead by example'. Thus, even though focus group participants ranked overseas rainforests as being more important, judgments about ownership and responsibility may lead them to rank conservation of Australian rainforests ahead.

Two CM questionnaires were designed and put into the field in Brisbane during 1995. Both questionnaires consisted of three sections. The first section comprised a series of attitudinal and behavioural questions designed to set the scene, frame the choice sets and to familiarise the respondents with the type of choices to be asked in the second section. This consisted of the choice sets, examples of which are given in Appendixes 4 and 5. The two questionnaires differed only in the choice sets presented to respondents. In turn, these differing choice sets were selected to provide differing information.[4] The context of the choice sets was described in terms of respondents deciding which forest conservation option they would prefer to support, given that a donation would be required. An option which allowed respondents to reject all the forest conservation options presented was also provided. The third section of both questionnaires contained socio-demographic questions.

The first survey involved the attribute 'location' to be varied across 8 possibilities—2 Australian, 1 Vanuatu and 5 other overseas. A straightforward strictly additive model was assumed. Some 145 respondents were surveyed using a 'drop-off/pick-up' approach and a 100% response rate (of those that accepted the invitation to participate) was recorded. The surveying was conducted by REARK Research.

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4. The authors are grateful to Jordan Louviere of Sydney University for assistance in the design of the choice sets used.

The results for the first survey are presented in Appendix 6. Several points are worth noting. First, the results are generally in line with the qualitative findings of the focus groups. For example, the Australian and South American locations generated the highest coefficients within the location attribute. Second, the signs of the coefficients tend to be as expected *a priori*. For instance, size and rarity have positive coefficients, indicating that as these variables increase in an option, the probability of that option being chosen increases. Significantly, the price variable has the expected negative coefficient. The t-statistics for most coefficients are significant, indicating that the model estimated is a reasonably good fit to the data.

A number of features of the results are cause for concern. The importance of Australian locations is clear from the results. However, the choice sets presented to respondents did not always involve an Australian option. Biased estimates could thus result. There is also the possibility of interactions between the variables, something which the design of the first survey could not take into account.

For these reasons, the second survey was undertaken. This was designed to concentrate on the location attribute and how it contributes to the utility of respondents. This was achieved by providing a choice of each location in each choice set. To expedite this design, the number of locations was reduced to six. One overseas and one Australian location were dropped. Each choice set thus comprised seven options—the six locations plus the standard 'no choice' option. Appendix 5 gives a sample of a choice set for the second survey. The second survey went to the field in Brisbane in November 1995.

Results for the second survey are presented in Appendix 7. They represent an improvement over the first survey because the t-statistics are slightly higher, but there is little overall change in the results, apart from Australia becoming more significant in terms of location.

The results of both surveys can be used in a number of different ways. They can be used to estimate willingness to pay for changes within attributes. That is, the benefit arising from improving an attribute can be estimated. This is possible because the underlying choice process embodied in CM is directly related to the utility or well-being contributed by each attribute. By holding utility constant for an individual, it is possible to hypothesise that a change in the levels of one attribute can be directly compensated by a change in the level of willingness to pay a donation. Dividing the change in utility coefficients for a particular attribute by the price coefficient gives that compensating measure in terms of willingness to pay.

For example, the willingness to pay for a scenario that is extremely rare as compared with a scenario that is only fairly rare can be calculated as the difference in rarity coefficients divided by the price coefficient. Using the results of the first survey, this can be calculated as follows:

$$\text{WTP (rarity increase)} = -(0.535 - 0.105)/-0.193$$
$$= \$2.23.$$

In other words, the benefit enjoyed from an increase in rarity is estimated to be worth $2.23 per person. Repeating the exercise with results from the second survey yields a benefit estimate of $2.27. In another example, the benefit generated by a rainforest in far north Queensland is $4.67 greater than that of a similar rainforest in Vanuatu. This is calculated as follows:

WTP (Qld vs Vanuatu) $= -(0.739 - 0.162)/-0.193$

$= \$4.67.$

The second way in which the CM results can be used is to estimate the benefit enjoyed by particular combinations of attribute levels. That is, a specific rainforest conservation proposal can be constructed from the various attribute levels, and the benefit of that proposal relative to the status quo can be estimated. This marginal benefit estimate is calculated by taking the ratio between the sum of the specific attribute coefficients attached to a scenario and the price coefficient. Under this process, it is possible to estimate the marginal benefit associated with any scenario that can be formed from a combination of the attributes and levels used. The scenarios are not limited to the ones used in the CM survey. Take for example the following hypothetical scenario:

A 10,000 ha area in Vanuatu which is fairly rare but without any special features, that it is possible to visit and where the local people are better off because of the PA establishment.

Using the results of the first survey (see Appendix 6), the sum of the relevant coefficients divided by the price coefficients is as follows:

Benefit $= -[-0.162 + (0.148 \times 3) + 0.105 + 0.192 + 0.424 - 0.384]/-0.193$

$= \$3.21$

The results of the second survey (see Appendix 7) yields a marginal benefit estimate of $3.78.

It is important to note that the CM results are sensitive to alternative scenarios. For comparative purposes, consider the marginal benefit yielded by the following scenario:

A 10,000 ha area in far north Queensland which is extremely rare with special landscapes and animals that is easy to visit and where no local people are affected.

The first survey yields a marginal benefit estimate for this case of $10.10, while the second survey estimate is $10.12.

The implication of these results is that Australians have significant 'non-use' values for the conservation of Vanuatu rainforests. The result substantiates the findings of the CV study reported earlier in this chapter. While the estimated benefit per person is only in the order of $3, when extrapolated across the population of Australian adults, the national benefit is indeed substantial, dwarfing the value of the benefits enjoyed by Australian visitors to Vanuatu. The conclusions drawn in the earlier sections of this chapter regarding the existence of net benefits from the conservation of forests in Vanuatu are therefore supported by the CM results.

It would also appear that the CM results are relatively robust across alternative model specifications and survey design. The differences between the benefit estimates yielded by the two surveys are statistically insignificant. The application of CM, which must be regarded as an innovative and as yet unproven technique for non-market benefit estimation, to the Vanuatu issue is therefore heartening in terms of the future usefulness of the method.

The extent of the benefit of forest conservation estimated here using CM should serve as an indicator to the Australian Government that aid donations to fund forest conservation initiatives in Vanuatu would be in accord with public sentiment. The results of the study should also be of interest to governments of other developed Pacific Rim countries with an interest in Vanuatu, such as New Zealand, and to the governments of U.K. and France, the former colonial powers in Vanuatu.

9.8 Conclusions

The two studies reported in this chapter have both concluded that there are substantial benefits to be enjoyed by Australians as a result of forest conservation initiatives in Vanuatu. The magnitude of these benefits more than eclipses the costs born by the ni-Vanuatu landowners because of foregone extractive use income. From a global perspective, there are clear net benefits to be gained from forest conservation in Vanuatu. To ensure intragenerational equity, it is important for the ni-Vanuatu landowners to be adequately compensated for the costs they incur as a result of conservation. The studies reported here show convincingly that even after the payment of compensation, Australians would be better off with the forest conservation initiatives in place.

What remains problematic is the establishment of institutional arrangements that will ensure the availability of funds to pay for compensation. Without these funds, it is likely that landowners facing the situation that arose in the case of the EKPA will choose the income producing, extractive use of their forests. The net gains from conservation to the wider community that have been demonstrated in this chapter will then be lost.

The studies reported here should provide evidence to governments, NGOs and the private sector that the potential gains from forest conservation are substantial. This should in turn provide an incentive for action to secure these gains—be it through the provision of aid funds or the establishment of private trusts to finance leases of the type negotiated for the EKPA.

Part IV

Conclusion

10 Assessing and Establishing Protected Areas

Luca Tacconi

10.1 Introduction

Protected areas are important means for the conservation of forests and biodiversity. By helping to protect species and ecosystems, they may provide benefits to the people living in or near the areas, to the national and international community, and to future generations. But, protected areas also present costs. These are often born at the local and national level. The uneven distribution of costs and benefits, and problems originating from management arrangements have often resulted in social conflict and the demise of protected areas.

The issues of costs, benefits, their distribution, and the management of protected areas have been taken into account in the development of the socioeconomic approach to protected areas assessment and establishment presented in this monograph. In this final chapter, this framework is first summarised. We then describe some details of its application and consider some concluding issues related to protected area policy.

10.2 The Socioeconomic Framework

The socioeconomic approach to protected areas assessment and establishment presented in this monograph recognises the importance of integrating elements of neoclassical economics, institutional economics and the people-centred approach to development.

Institutions influence individual and collective behaviour, regulate the distribution of natural resources and, therefore, influence their allocation. Thus, the study of the institutional structure, and of possible ways to strengthen or modify it, is fundamental to a successful process of assessment and establishment of protected areas.

Individuals, although influenced by the existing and evolving institutions, play an important role in their own right in the process of resource management. Neoclassical economics stresses that the costs and benefits faced by individuals are significant factors in determining their choices in relation to resource allocation. The magnitude and distribution of the costs and benefits associated with alternative resource management options have to be assessed in order to obtain outcomes that are equitable and viable over the long term. Inequity in resource distribution is a major cause of demise of resource management projects in general. Cost–benefit analysis, which is based on neoclassical economic theory, is a useful tool in the assessment of the costs and benefits associated with resource management projects.

Values, norms, beliefs, costs and benefits of options are all important elements that enter into the definition and selection of ends and means related to choices in general and, of specific interest here, decisions related to natural resource management. The people-centred approach to development stresses the importance of allowing the stakeholders to participate in the decision-making process. Participation allows the stakeholders to bring their values, norms, beliefs, and views about costs and benefits to bear on the allocation and distribution of natural resources. Processes and tools designed to facilitate a better understanding of peoples' views, needs, wants, and their participation in research and decision-making have been developed within the people-centred approach to development. These processes and tools are important element in a successful process of assessment and establishment of protected areas.

The socioeconomic framework presented here recognises three levels of the decision-making process for the assessment and establishment of protected areas.

At the international level, conventions are signed, and political and financial incentives are directed to individual countries. The setting of targets for the establishment of protected areas is often carried out at the national level. Decisions concerning the establishment of specific areas are carried out at local level. In practice, the decision-making layers are not so clearly separated. Decisions made at one layer will affect those take at the other levels and *vice versa*.

A socioeconomic analysis may be carried out at all levels by addressing questions concerning institutional structure, intergenerational and intragenerational equity, and efficiency. Participatory research is particularly appropriate at the national level, for example carried out with government officers, and at the local level undertaken in collaboration with the people in the areas of concern.

The implications of intergenerational equity for protected area assessment and establishment in those countries that have signed the Convention on Biodiversity and/or recognise the rights of future generations, such as Vanuatu, have been considered in detail in Chapter 4. That chapter concludes the development of the socioeconomic framework which may be summarised as follows:

- a system of protected areas should be established in order to achieve, at least partially, minimal intergenerational equity;
- the institutional features relevant to the successful implementation of the conservation program, and their eventual modification or creation, should be considered;
- the process of assessment and establishment of protected areas should be carried out with the participation of the stakeholders;
- the most cost-effective way of establishing both a protected area system and the individual areas should be investigated;
- the intragenerational outcomes should be assessed and eventually counterbalanced.

This framework was applied in Vanuatu. Some features of this application are summarised below.

10.3 Applying the Framework to Vanuatu

The overall process of assessment of protected areas has taken as given the fact that protected areas should be established in order to contribute to the partial achievement of intergenerational equity. For this reason, the decision to establish a system of protected areas was not subjected to the assessment of its costs and benefits.

The analysis of institutional features, and their eventual modification or creation, are significant components of the work carried out in Vanuatu. Understanding the existing land tenure, resource management arrangements, and local and national government powers, was fundamental to the development and introduction of three new conservation-oriented institutions: a protected areas by-law; the lease agreement for the establishment of the protected area in Erromango (EKPA); and the deed for the trust fund. These institutional arrangements are important elements contributing to the long-term viability of the protected areas described in this monograph and to future conservation initiatives in Vanuatu. The lease agreement details the duties and rights of both the Government and the landowners in respect to the management of the EKPA. It may also be used as a model for developing similar agreements covering other protected areas that may be established in the future. The trust fund is designed to provide long-term financial sustainability to the EKPA. However, the structure of the trust fund is such that it could be expanded to cover protected areas other than the EKPA. Finally, the protected areas by-law can be used to enforce the findings and decisions arising from a participatory planning approach to the assessment and establishment of protected areas.

The process of participation in the assessment and establishment of protected areas differed between Erromango and Malekula.

In Malekula, some of the protected areas had been first identified by the LGC. However, the decision on whether to establish them and the determination of their boundaries were made by the landowners through a process of participatory planning that focused both on the requirements of ecosystem conservation and the economic needs of the local people. The assessment process was carried out with the participation of the landowners through all the stages: identification of areas to be targeted for conservation, assessment, and proposed establishment.

In Erromango the 'structure' of the process of participation was partly dictated by the events pre-dating the onset of the research presented here. Firstly, we invited the landowners to indicate their interest in pursuing the establishment of a protected area; their answer was positive. Then, we assessed whether the landowners would conserve the forest without external intervention. Given that the landowners had already been offered an agreement to lease, it would have not been in their interest to reveal whether they would protect the forest without government intervention. Therefore, the assessment of their conservation needs through participatory rural appraisal methodology was not considered appropriate. This assessment was essentially carried out with rapid rural appraisal tools. Once the need for compensation was established, the development of the compensation package and of the land lease agreement was carried out together with the landowners.

In terms of the cost-effectiveness of the establishment of the individual protected areas, the approach adopted in Malekula differs from that of Erromango. In Malekula, the attempt to achieve cost-effectiveness relied on identifying in conjunction with the landowners their needs for conservation and the establishment of protected areas without external financial support. No compensation payments were involved because the approach adopted for the identification of protected areas enabled the identification of cases in which the benefits of conservation where higher than the benefits of alternative extractive uses. In Erromango, it was doubtful that the landowners' would have established the protected area themselves. In that case, the cost-effectiveness of the initiative was based on providing compensation payments *limited* to potential losses suffered by landowners as a consequence of the establishment of the protected area. The provision of compensation is clearly linked to the question of intragenerational equity.

In Malekula, the landowners themselves expressed interest in establishing the protected areas. This fact suggests that the likelihood of generating negative intragenerational equity impacts is reduced. In Erromango, however, it seemed that the costs to be born by the landowners could have been higher than the benefits arising from the establishment of the protected area. Therefore, in order to maintain intragenerational equity, the landowners needed to be compensated.

The creation of protected areas can make people other than the landowners 'relatively' worse off. Three situations may be considered. Firstly, the establishment of a protected area enables the landowners to enforce their rights to resources. As a result, other people who previously used these resources may be prevented from continuing that use. If the resulting distribution of resources is not considered equitable, this is a case in which the question of intragenerational equity relates to the determination of rights to resources rather than to the establishment of the protected area. Secondly, there may be people other than the owners of the land who have *recognised* rights to resources. In this case, if compensation takes place, the potential losses suffered by all parties should be considered. Thirdly, compensation payments gained by landowners could induce the other members of the local community to feel that they have been 'left out' and are 'worse off'. This could generate conflicts within the community. Such a problem could be addressed by continuing the payment of compensation to landowners while providing support to the wider community with other suitable development initiatives.

Intragenerational equity should also be considered from an international perspective. In fact, a country that establishes a system of protected areas bears its costs and some of the benefits. Other countries, normally only stand to receive benefits from that initiative. It was shown in Chapter 9 that Australian residents may benefit from protected areas located in Vanuatu. This strengthens the argument that developed countries should provide financial support to developing countries for the conservation of biodiversity. To increase the long-term benefits generated by their financial contributions, developed countries should consider contributing to the establishment of Trust Funds.

10.4 A National Approach to the Identification, Assessment, and Establishment of Protected Areas

The approaches to conservation adopted in the cases of Malekula and the EKPA have their specific roles in a national forest and biodiversity conservation strategy in Vanuatu.

It is important to note that in Vanuatu there is a dearth of ecological information. In order to design an adequate system of protected areas, a biodiversity assessment of the whole country should be carried out. A detailed study of the biodiversity of a country is a long-term project. However, a rapid biodiversity assessment could be carried out as a first phase. This would provide an indication of the areas that should be given highest priority for conservation.

The first step towards the implementation of a system of protected areas may be to establish these areas through a process of participatory planning, such as that adopted in Malekula. This process may lead to the creation of protected areas that are consistent with local people's needs and wants in relation to ecosystem conservation. These protected areas should be regarded as the first component of a complete protected area system. The next step would be a 'biodiversity conservation gap' assessment.[1] Such a study would identify ecosystems that should be granted protected status on the basis of ecological criteria, but that have not been covered by the protected areas established in the participatory planning phase. If gaps exist, these should be filled by creating further protected areas. If the establishment of these latter areas conflicts with landowners' interests, then protected areas should be established by following the approach adopted in the case of the EKPA. That is, compensation should be provided to the parties that have been made worse off by the establishment of a protected area.

It was noted in Chapter 4 that the interests of the current and future generations tend to coalesce, at the level of critical natural capital. A positive aspect of the participatory approach to conservation presented here is that the establishment of protected areas, designed on the basis of landowners' needs, contributes to this convergence of interests between generations.

The participatory planning approach has proved to be beneficial in terms of helping the landowners' decision-making process. The participatory assessment, undertaken as a component of this research, appeared to provide the landowners with a better understanding of the issues involved in conservation and development activities. This has implications for the 'mode' that could be adopted in further implementing, throughout Vanuatu, the approach to conservation suggested here. An *active* mode and a *responsive* mode may be distinguished.

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1. If the biodiversity assessment noted above has been carried out, the biodiversity conservation gap assessment does not require further field studies. If the biodiversity assessment has not been carried out, the biodiversity conservation gap assessment has to include fieldwork to assess, on a rapid basis, the biodiversity features that deserve consideration for protected status. The proposed system of protected areas thus derived would be compared with the existing system of protected areas. Thus, the gaps existing between the 'optimal' protected area system and the existing one could be indicated. For example, see Scott et al. (1991).

In the responsive mode, the central government departments and the local governments wait for the landowners to come forward asking for assistance in establishing conservation projects. In the active mode, exemplified by the work presented in Chapters 6 and 8, the local and central government agents do not simply wait for the landowners to come forward. They also initiate and organise participatory assessments in specific rural areas. The active mode should be favoured because, at times, landowners may not be fully aware of ecological, social, and economic aspects relating to conservation and development issues. Alternatively, they may be aware of them, but not have the means to address them fully. In these cases, they might not approach external organisations in order to seek support in solving the specific problems.

In concluding, it should be noted that the socioeconomic framework for the assessment and establishment of protected areas presented in this monograph is relevant for application both by other countries, developing and developed. The specific details of the application of the proposed framework will no doubt vary from country to country to reflect the specific social, economic, and environmental conditions. For example, the institutions to be considered and the structure of the participatory process will be to a certain degree specific to each country. However, the five guiding principles that characterise the framework have wide applicability.

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Appendixes

Appendix 1 Description of Forest Vegetation Types

Vegetation type	Description
Fme	Midheight forest with emergents
FmeAgCl	Midheight forest with *Agathis* and *Calophyllum*
FmeCl	Midheight forest with *Calophyllum*
FmeClAg	Midheight forest with *Calophyllum* and *Agathis*
FmKh	Midheight forest with *Kleinhovia hospita*
Fmm	Midheight forest with small to medium crowns
Fmm1	Midheight forest with small to medium crowns; dense remnants
Fmm2	Midheight forest with small to medium crowns; medium dense remnants
Fmm3	Midheight forest with small to medium crowns; sparse remnants
Fmo	Midheight forest with an open canopy
Fmo1	Midheight forest with an open canopy; dense remnants
Fmo2	Midheight forest with an open canopy; medium dense remnants
Fmo3	Midheight forest with an open canopy; sparse remnants
FmoCl	Midheight forest, open canopy, with *Calophyllum*; local *Agathis*
Fmoe	Midheight forest, moderately open canopy, with emergents
Fms	Midheight forest with small crowns
FmW	Midheight forest with *Metrosideros* and *Weinmannia*
Fl	Low forest
FlAs	Low forest with *Acacia spirobis*
FlBa	Low forest with *Barringtonia asiatica*
FlCe	Low forest dominated by *Casuarina equisetifolia*
FlCl	Low forest with *Calophyllum neo-ebudicum*
FlM	Low forest with *Metrosideros*
FlMW	Low forest with *Metrosideros* and *Weinmannia*
FlMx	Low forest of mixed species composition
Fld	Low forest with a high proportion of deciduous trees
Fle	Low forest with emergents
FlKh	Low forest with *Kleinhovia hospita*
Flm	Low forest with medium crowns
Flme	Low forest with medium crowns and emergents
Flo	Low forest with an open canopy
Flo2	Low forest with an open canopy; medium dense remnants
FloAs	Low forest, open canopy, dominated by *Acacia spirorbis*
Fls	Low forest with small crowns
Flsw	Low forest; swampy

Source: Bellamy (1993).

Appendix 2

Deed for Establishment of the Vanuatu Biodiversity Conservation Trust Fund

DATED THE DAY OF 19

BETWEEN

Settlor of the One Part

AND

PACIFIC INTERNATIONAL TRUST COMPANY LIMITED

Trustee of the Other Part

DEED OF SETTLEMENT

VANUATU BIODIVERSITY CONSERVATION TRUST FUND

IRREVOCABLE TRUST

THIS DEED OF SETTLEMENT is made on the date set out in the Schedule A hereto as the date of the making of this Deed between the person therein named as the Settlor of the one part and the person therein names as the Trustee of the other part.

WHEREAS the Settlor has paid to the Trustee the Settled Sum set out in Schedule A to be held by the Trustee upon the Trusts set out in this Deed and the Trustee has agreed to hold the Trust Fund (the name of which is contained in Schedule A) upon the following Trusts, powers, convenants and conditions.

NOW THIS DEED WITNESSETH

ARTICLE 1

DEFINITIONS AND CONSTRUCTION

1.1 DEFINITION

In this Deed the following words and expressions shall have the following meaning:-

"Assets" include all such things as are from time to time the property of the Trust Fund.

"Accumulation Period" means

(a) if any law applicable to this Settlement prescribes for the time being one or more periods for the accumulation of income, the maximum allowable of such period(s), or the period from the date of this Deed until the Perpetuity Date whichever is the shorter one, or

(b) if there is no such law applicable to this Settlement for the time being, the period from the date of this Deed until the Perpetuity Date.

"Appointer" means the person or persons named as such in the Schedule A or other Appointer or Appointors for the time being of this Settlement appointed in accordance with this Deed.

"Beneficiary" means a person who is appointed a beneficiary of this Settlement pursuant to clause 5.1 of this Deed or who becomes a beneficiary of this settlement pursuant to clause 6.8 of this Deed, or who is named as a Beneficiary in Schedule A.

"Date of the Deed" means the date set out in Schedule A as the date of making of this Deed.

"Perpetuity Date" means the last day of the perpetuity period.

"Perpetuity Period" means the maximum duration prescribed for the time being by the law applicable from time to time to this settlement or a period ending on such date as the Trustee may determine pursuant to the right conferred upon it under Clause 6.7 of this Deed whichever shall first occur.

"Person" includes a corporation wherever incorporated or domiciled, a government or government instrumentality or a multigovernment organization.

"Property" includes real and personal property, any estate or interest in any property real or personal, cash, any debt, any chose in action and any other right or interest, wheresoever situate in the world.

'Securities" includes shares, stock units, bonds, mortgages secured or unsecured, debentures or debenture stock, obligations or securities of any corporation, governmental or semi-governmental body or authority anywhere in the world.

"Settled Sum" means the sum of money set out in Schedule A as the Settled Sum.

"This Settlement" means the Settlement constituted by this Deed as it may be added to, amended or varied from time to time as provided for in Article 14 of this Deed.

"Trustee" means the person named as Trustee in Schedule A or other Trustee or Trustees for the time being of this Settlement appointed in accordance with the terms of this Deed.

'Trust Fund" means the property for the time being the subject of the Trusts of this Settlement, including the Settled sum and all other moneys or property hereafter transferred to and accepted by the Trustee as additions to the Trust Fund and all accumulations of income thereto and the accretions to the capital of the Trust Fund and the investments and property from time to time representing the same.

Words importing the singular number shall also import the plural number of words importing any gender shall also import each other gender and covenants by or on the part of two or more parties shall bind them jointly and each of them severally.

1.2 CERTIFIED COPY OF DEED VALID

Any person dealing with this Trust may rely upon a copy of these presents and of the notices endorsed thereon or attached thereto certified by the Trustee or the Trustee's Solicitor before a Notary Public or Commissioner of Oaths to the same extent as he might rely on the original.

1.3 TRUSTEE AND SETTLOR PRECLUDED FROM BENEFITING

Notwithstanding anything to the contrary hereinafter expressed or implied no discretion or power by this Settlement conferred on any person or on the Trustee shall be exercised by such person or Trustee and no provisions of this Settlement shall operate so as to confer on or reserve to or be capable of conferring on or reserving any interest in or benefit out of or connected with the Trust fund, to the Settlor or (other than remuneration in accordance with Clauses 9.4 and 9.5 hereof) the Trustee or any person who has donated to or vested in the Trustee any property to be held on the Trusts created by this Settlement, as from the time when such latter person donates or vests property aforesaid.

1.4 HEADING FOR CONVENIENCE ONLY

The headings of Clauses and paragraphs appearing herein are for convenience only and shall have no significance in the construction or interpretation of this Agreement.

1.5 SEVERABILITY OF CLAUSES

Should any of the provisions of this Agreement be for any reason invalid, the invalidity thereof shall not affect any other provisions of this Agreement and all invalid provisions hereof shall be wholly disregarded.

1.6 PRINCIPAL PURPOSE OF THIS TRUST

This trust is principally established to provide a continuous source of financial assistance for the retention of forests in Vanuatu and related biological conservation.

ARTICLE 2

TRUST IS IRREVOCABLE

2.1 This is an irrevocable Trust, and effective with the signing of this Deed, the Settlor shall have relinquished all rights in connection with the Trust Fund, including any separate Trusts created hereunder.

ARTICLE 3

INITIAL TRUST CAPITAL AND SUBSEQUENT SETTLEMENTS

3.1 FUND HELD UPON TRUST

The Trustee shall and the Trustee hereby declares that it will hold the Trust Fund upon the Trusts and with and subject to the discretions, authorities and powers as are hereinafter contained in this Settlement.

3.2 ADDITIONAL SETTLEMENTS

The Trustee shall have the right in its absolute discretion at any time during the continuance of this Settlement to accept such further or additional property which any person (other than a Beneficiary) may donate or settle upon or vest in the Trustee to be held upon the Trusts of this settlement and upon such acceptance all such property shall thereupon become part of the Trust Fund and shall be held by the Trustee accordingly.

ARTICLE 4

PROVISIONS REGARDING APPOINTOR

4.1 GENERAL POWERS

The holders of the offices names in Schedule A as Appointors shall be the Appointors of the Trust. Each of such Office Holders shall act as Appointors for the period during which they hold office and any reference to an Appointor or the Appointors shall be to the holder for the time being of such office at the time any act or decision is made.

4.2 MULTIPLE APPOINTORS

Any act or decision of the Appointors must be by majority decision unless this deed otherwise specifically provides.

4.3 PRECLUDED AS TRUSTEE

The Appointor is hereby expressly precluded from ever becoming a Trustee of this Settlement and any purported appointment of the Appointor as Trustee shall be void.

4.4 TRUSTEE'S DEALING WITH APPOINTOR

The Trustee is authorised to deal with the Appointor or any one of them to purchase property from the Appointor, or sell property to the Appointor, but always at the fair market value of such property and for an adequate and full consideration in money or money's worth. Under no circumstances shall this paragraph be construed as conferring any power upon the Appointor to require the Trustee of this Trust or any separate Trust created hereunder to deal with the Appointor in any manner, or to give the Appointor any power to acquire or reacquire the Trust Fund, or any part thereof.

4.5 POWER TO REMOVE AND REPLACE TRUSTEES

The Appointor and if there shall be more than one Appointor, then all Appointors if acting unanimously shall have the power at any time and from time to time to be exercisable in writing and signature attested by a Notary Public, Commissioner for Oaths or Justice of the Peace –

(a) to remove the Trustee or Trustees and simultaneously to appoint a new Trustee or new Trustees of this Settlement within the jurisdiction or in any other jurisdiction;

(b) to appoint additional Trustees of this Settlement;

(c) to appoint a replacement Trustee pursuant to clause 7.2 hereof.

ARTICLE 5

PROVISIONS REGARDING BENEFICIARIES AND ELIGIBLE BENEFICIARIES

5.1 BENEFICIARIES

With the written consent of the Appointor the Trustee may, at any time and from time to time prior to the Perpetuity Date, appoint any Vanuatu charitable body corporate or statutory body to be an income beneficiary with rights to income on such terms and conditions as the appointment may specify.

5.2 ELIGIBLE BENEFICIARIES—APPOINTMENT & REVOCATION

(a) The first Beneficiary shall be the Republic of Vanuatu.

(b) The Trustee may, with the written consent of the Appointor, at any time and from time to time prior to the Perpetuity Date revoke the appointment of any beneficiary and such power of revocation shall extend to the persons named as Beneficiary in Schedule A hereto.

5.3 CORPUS NOT HELD FOR BENEFICIARY

The Trustee shall not hold the relevant parts or shares of the corpus of the Trust Fund UPON TRUST for the Beneficiaries but rather as a perpetual fund provided however the corpus of the Trust Fund may be used to meet an income distribution obligation of the Trust if there is insufficient income.

5.4 INCOME HELD FOR BENEFICIARY, OR CAPITALISED

(a) Subject to any applicable law and subject to the other provisions of this Deed, the income of the Trust Fund shall be as determined by the Trustee and shall be appropriated by the Trustee for only the following purposes:

(i) For the purpose of paying the expenses and fees of the Trust in accordance with Articles 9.3, 9.4 and 9.5 of this Deed.

(ii) For the purpose of paying the Beneficiary's liabilities for rent due under Land Titles No.14/0524/002 and No.14/0524/003 being the titles constituting the Erromango Kauri Protected Area and such other titles as may be added by the Trustee, having first obtained the written consent of the Appointor.

(b) If the custom ownership of the land titles set out in (a)(ii) above are under dispute, the amount that would have been paid to the Vanuatu Government for the annual rent will be held in a separate trust until the ownership is definitively establish by a decision of the court or by agreement of the claimants, at which time the unpaid rent plus the earnings thereon (less administrative expenses) shall be paid to the land owner.

(c) The residual income remaining after the above appropriations shall be capitalised at least once in each financial year and shall thereupon be and be dealt with as an accretion to the capital of the Trust Fund and shall follow the destination thereof.

ARTICLE 6

PROVISIONS REGARDING ACCUMULATION AND DUSTRIBUTION

6.1 ACCUMULATION

All income of the Trust Fund accruing during the accumulation period which is not paid nor applied to nor on account of nor set aside for the Beneficiaries or any one or more of them nor paid assigned nor transferred as provided for in Clause 6.6 of this Deed shall be accumulated and form part of the Trust Fund as provided in Clause 5.4.

6.2 INCOME AFTER ACCUMULATION PERIOD

If the Accumulation period ends before the Perpetuity Date all income of the Trust Fund accruing after the end of the Accumulation Period and before the Perpetuity Date which has not been paid, set aside, transferred as provided for in Clause 5.4, or 6.6 of this Deed shall be paid to or on account of or set aside for or alienated in favour of a company limited by guarantee that has been incorporated in Vanuatu for the purpose of preserving the forests of Vanuatu by any means directly or indirectly.

6.3 DISCRETIONARY INCOME DISTRIBUTIONS

The Trustee may only pay or apply the whole or any part of the Fund's income to any Beneficiary hereunder pursuant to Clause 5.4.

6.4 DISCRETIONARY CAPITAL DISTRIBUTIONS

The Trustee may pay or apply the whole or any part of the capital to any Beneficiary hereunder for its benefit to cover the shortfall if there is in any year insufficient income to meet a Beneficiary's rent obligations pursuant to Clause 5.4(a)(ii).

6.5 WAIVER OF DISTRIBUTIONS BY BENEFICIARIES OR ELIGIBLE BENEFICIARIES

Any Beneficiary may waive until further notice its right or expectancy to future distributions under this Trust or any separate Trust created hereunder by written declaration of such waiver delivered to the Trustee of such Trust. Said declaration of waiver shall be deemed effective from the day following receipt by the Trustee, and no distributions shall be made thereafter to the said Beneficiary. Any Beneficiary who has waived his or her right or expectancy to future distributions in the manner provided herein and has not specifically made such waiver irrevocable either for all times or not specifically made such waiver irrevocable either for all times or for some fixed period or until the happening of some stated event or occurrence, may at any time subsequent to the said waiver, or following the expiration of the said period during which the waiver is made irrevocable, notify the Trustee by written declaration that it again wishes to receive any future distributions made in its favour under this Trust Deed in which case such declaration shall be deemed effective from the day following receipt by the Trustee and shall apply to all distributions made thereafter.

6.6 EARLY DETERMINATION

The Trustee may at any time prior to the Perpetuity Date and after the expiry of all leases whose annual rental is being indirectly paid by the Trust determine an earlier date to be the Perpetuity Date PROVIDED THAT if at such time there is still an Appointor the Trustee shall not make any such determination without first giving three month's notice of the intention to that effect to the Appointor, unless the Appointor shall in the meantime have concurred in writing to the proposes determination.

6.7 VESTING

On and from the Perpetuity Date the Trustee shall stand possessed of the Trust Fund, to the extend that the same has not then previously vested pursuant to any appointment made under Clause 5.1 of this Deed, UPON TRUST for such one or more charitable body corporate(s) whose objects shall include the pres-

ervation of the forests of Vanuatu as the Trustee shall determine, any resulting Trust to the Settlor being hereby expressly precluded.

6.8 MANNER OF DISTRIBUTION

Upon any division, or partial or final distribution of the Trust Fund as herein provided, the Trustee may divide or distribute the same in kind, including undivided interests therein. In its absolute discretion, the Trustee may sell all or any part of the Trust Fund, but only for adequate consideration, and may make such division or distribution in cash, or partly in cash and partly in kind. The decision of the Trustee as to what constitutes a proper division of the Trust Fund, either prior to or upon distribution thereof, shall be binding.

6.9 CREATION OF SEPARATE TRUSTS

Notwithstanding anything to the contrary herein contained the Trustee may (subject however to giving not less than one month's prior notice in writing to the Appointor (if any) which notice may be waived by consent) at any time and from time to time prior to the Perpetuity Date in its discretion settle and transfer to one or more separate Trusts the whole or any part of the Trust Fund (freed and discharged from the Trusts, powers and provisions of this settlement) and such separate Trust or Trusts shall be governed by the law applicable to such separate Trust or Trusts as the case may be PROVIDED THAT one or more of the Beneficiaries of this Trust are Beneficiaries of such separate Trust or Trusts as the case may be and FURTHER PROVIDED THAT no part of this Trust Fund shall be settled on any other Trust under which any person or corporation who or which is or has been a Trustee of these presents or who is the Settlor of these presents, is a Beneficiary nor shall any power conferred by this Clause be exercised in such manner as to infringe any applicable law against perpetuities.

ARTICLE 7

RESIGNATION, REPLACEMENT OR MERGER OF TRUSTEE

7.1 RIGHT OF TRUSTEE TO RESIGN

(a) Any Trustee may at any time resign the Trusteeship of this Settlement on giving no less than two months' notice (which may be withdrawn by the Trustee) addressed to the Appointor or person in whom the power of appointing a new Trustee or new Trustees of this Settlement is then vested provided that if such person or persons do not appoint a new Trustee prior to the expiration of the notice of resignation, such power shall vest in the Trustee who shall not resign without first appointing a new Trustee of this Settlement in its stead.

(b) If there shall be no existing Appointor the powers of appointment of a new Trustee, or Trustees and of additional Trustees aforesaid shall be exercisable by the Trustee or if there be no Trustee, in such other manner as shall be permitted by law.

7.2 VACATION OF TRUSTEE OFFICE

The office of a Trustee shall be ipso facto determined and vacated if such Trustee being a company shall enter into liquidation whether voluntary or compulsory (not being merely a voluntary liquidation for the purposes of amalgamation or reconstruction). Upon the office of Trustee being vacated for any of the aforesaid reasons, the appointors shall by majority decision appoint a new Trustee of this Trust. In the event that there is no majority, the first appointed of the then serving Appointors shall have a casting vote.

7.3 EFFECT OF RESIGNATION OR REPLACEMENT OF TRUSTEE

The resignation or replacement of a trustee of this trust or any separate Trust created hereunder shall neither prevent nor limit in any way the ability of the said Trustee to continue to act or be appointed as Trustee of any other separate Trust or Trusts created hereunder.

7.4 SUCCESSOR TRUSTEE

(a) Any successor Trustee of this Trust or any separate Trust created hereunder shall succeed to all of the retiring Trustee's titles to the Trust Fund and all powers, rights, discretions, obligations and immunities of the Trustee hereunder with the same effect as though such successor Trustee were originally named herein as Trustees of such Trust and any and all attorneys-in-fact agents custodians or depositaries of the property comprising the Trust fund or income thereof shall be authorised to accept instructions from the said successor Trustee or Trustees as to the disposition thereof. Upon the appointment of successor Trustees pursuant to this Deed any attorneys-in-fact agents custodians or depositaries of the property comprising the Trust fund or income thereof shall forthwith become the same for such successor Trustees without the necessity for the execution or filing of any paper or any further act.

(b) Any resigning Trustee or Trustees removed under the powers of Article 4.5 shall execute all instruments and do all acts necessary to vest such title in any successor Trustee without prior Court approval. No successor Trustee shall be obliged to examine the accounts, records and acts of the previous Trustee or Trustees, nor shall such successor Trustee in any way or manner be responsible for any act or omission to act on the part of any previous Trustee.

(c) any outgoing Trustee who is liable as the Trustee of this Settlement or who may on the death of any person be liable as a former Trustee of this Settlement for any taxes which may be imposed in any country or territory in the world shall not be bound to transfer the Trust Fund unless reasonable security is provided for indemnifying such outgoing Trustee against such liability.

7.5 NOTICE OF TRUSTEE CHANGE

Notice of all changes in the Trusteeship shall be endorsed on or attached to these presents signed by the surviving or continuing Trustee and every such notice shall be sufficient evidence to any person having dealings with this Trust as to the facts to which it relates.

7.6 MERGER OF TRUSTEE

If any Trustee of this Settlement or any separate Settlement created hereunder shall be merged or consolidated with, or shall sell or transfer all or substantially all of its assets and business to another corporation, or shall be reorganised or reincorporate in any manner, the corporation to which such sale or transfer shall be made, or the successor corporation resulting therefrom shall thereupon become Trustee of such Trust or Trusts without any further act on the part of any then existing Trustee, Settlor, Appointor, of Beneficiaries of such Settlement, and shall succeed to all rights and liabilities of the previous Trustee.

ARTICLE 8

TRUSTEE'S RELATIONSHIP WITH SETTLOR AND ELIGIBLE BENEFICIARIES

8.1 RELATIONSHIP WITH SETTLOR

Under no circumstances shall the Settlor have any interest in any investment made by the Trustee of this Trust or any separate Trust created hereunder, other than such legal interest as would a stranger to the Trust or Trusts in the particular transaction in question. Under no circumstances shall this paragraph be construed as conferring any power upon the Settlor to require the Trustee of this Trust or any separate Trust created hereunder to deal with the Settlor in any manner, or to give the Settlor any power to re-acquire the Trust Fund, or any part thereof, by substituting other property of an equivalent value.

8.2 CONFLICT OF INTEREST

The Trustee may exercise or concur in exercising, providing that the Trustee shall not benefit either directly or indirectly, all of its power authorities and discretions notwithstanding that the Trustee of the Trust has or may have a direct or indirect interest (whether as Trustee of any other Settlement or in the capacity as a Shareholder of any corporation or otherwise) in the mode or result of exercising such power authority or discretion.

8.3 SPENDTHRIFT PROVISIONS

(a) In keeping with the nature of this Trust and all separate Trusts created hereunder, no Beneficiary EXCEPT as regards any irrevocable vesting in his favour, shall have any ascertainable proportionate, actuarial or otherwise fixed or definable right to or interest in all or any portion of the income of the Trust Fund. It is further provided that in no case shall any Beneficiary have any right to alienate, transfer, assign, encumber or hypothecate its expected interest therein, either present or future, nor shall any interest of any Beneficiary be subject to claims of its creditors, or liable to attachment, execution or other process of law.

(b) The income of this Trust or any separate Trusts created hereunder may not be pledged, assigned, transferred, sold, or in any manner whatsoever accelerated, anticipated, nor encum-

bered by any Beneficiary nor shall any income of this Trust be in any manner subject to or liable in the hands of the Trustee for the debts, contracts, or encroachments of any Beneficiary prior to the actual distribution of all or part of the said income to that Beneficiary.

ARTICLE 9

ADMINISTRATIVE PROVISIONS

9.1 DETERMINATION OF CAPITAL AND INCOME

The Trustee is empowered to determine whether any property forming part of the Trust Fund or any increase or decrease in amount number or value of any such property or any receipts or payments from for or in connection with any such property shall be treated as credited or debited to capital or to income and to transfer accumulated income or part thereof to capital and generally to determine all matters as to which any doubt difficulty or question may arise under or in relation to the Trusts and the provisions of this Settlement and every determination of the Trustee in relation to capitalisation of income aforesaid whether actually realised or implied shall bind all parties to add any and all amounts of accumulated income of this Trust (or any separate Trust created hereunder) to the capital of such Trust to be held, administered and distributed as part thereof. This shall also include full power and authority to establish such reasonable reserve as it may in its discretion deem advisable to take into account, to determine the depreciation of tangible property and to amortise amounts paid for the purchase of securities or other property as authorised herein.

9.2 RECEIVE AND RECEIPT FUNDS

The Trustee of this Trust for the time being is hereby authorised notwithstanding that it may be the sole Trustee, to receive capital, property and money and to give valid and effectual receipts and discharges thereof for all purposes.

9.3 PAYMENT OF TAXES AND EXPENSES

Except as otherwise provided herein, the Trustee shall pay all property taxes, assessments, fees, charges and other expenses incurred by it in the administration or protection of this Trust or any separate Trust created hereunder, and all such payments shall be charged against the Trust Fund and shall be paid by the Trustee out of the income therefrom, or, in the event and to the extent that the income may be insufficient, then out of the capital of the Trust Fund, at any time prior to final distribution of the Trust Fund. The determination of the Trustee with respect to all such matters shall be binding upon all Beneficiaries howsoever interested in this Trust or any separate Trust created hereunder.

9.4 TRUSTEE FEES

Any Trustee being a corporation authorised by law to take in its own name a Grant of Probate of the Will of a deceased person may charge and shall be paid remuneration (which of the purposes of this and the succeeding such clause includes fees and commission) in accordance with its scale of fees or charges for

the time being as set out in the Schedule B AND IT IS HEREBY AGREED that the Trustee accepts the Trusts constituted by this Settlement on the terms and conditions as to remuneration and the incidence thereof in force at the date hereof as if such terms and conditions were fully set out and incorporated herein PROVIDED ALWAYS that if and so often as the Trustee shall after the date hereof publish and distribute to the Appointor (and in this regard forwarding same by prepaid post to the last known address of the Appointor shall be sufficient publication and distribution) new Terms and Conditions in which rates and modes of charging remuneration or both shall be different from those of the Terms and Conditions in force at the date hereof, the Trustee shall three months thereafter be entitled to remuneration in accordance with such new Terms and Conditions in substitution (only so far as concerns remuneration) for those previously in force.

9.5 CHARGES FOR OTHER SERVICES

The Trustee hereof (whether original or substituted) may transact in its own office on behalf of the Trust or of any Beneficiary any business which by its constitution it is authorised to undertake upon the same terms and conditions as it would for the time being make with an ordinary customer and may retain on current or deposit account or advance at interest all moneys which are required to be or can conveniently be retained or advanced in connection with the Trust premises without accounting for any profit made thereby.

9.6 PROVISIONS PROTECTIVE OF TRUSTEE

Once any distribution or allocation of income made in accordance with this Trust Deed has taken place, the Trustee shall have no further responsibility in connection with such income, except as would a stranger to the Trust. If the Trustee shall be compelled at any time during the existence of this Trust or any time thereafter to pay any tax or penalty with respect thereto for any reason, the Trustee shall be entitled to be reimbursed from the Trust Fund. If the Trust Fund be then insufficient or if it be then terminated, the Trustee shall be reimbursed by the Beneficiaries to whom the Trust Fund shall have been distributed, or for whose account income from the Trust Fund have been allocated, to the extend of the amount received by or allocated to the account of each. The Trustee, before making any distribution or allocation of income may accordingly require a refunding agreement or may withhold distribution or allocation pending determination or release of any tax lien.

9.7 LIABILITY FOR ACTS LIMITED

(a) Notwithstanding anything in this Deed expressed or implied to the contrary or otherwise by law, the Trustee shall not be liable or answerable or accountable for any loss not attributable to :

(i) its own dishonesty; or

(ii) the wilful commission by it of an act known by it to be a breach of Trust that may be suffered or incurred in exercising any of the directions, authorities or discretions given to or

conferred upon the Trustee under this Deed or in investing moneys available for investment hereunder.

(b) A Trustee shall be chargeable only for such moneys, stock, funds, shares and securities as it shall actually receive notwithstanding it signing any receipts for the sake or conformity and shall be answerable and responsible only for its own acts, receipts, commissions, neglects and defaults respectively and not of those of any broker, banker, auctioneer, attorney or other persons with whom or into whose hands any Trust moneys or securities shall be deposited or come nor for otherwise accepting less than a marketable title on the purchase, taking in exchange, partition or lending of money on the security of any hereditaments purchased, taken in exchange or partition or on mortgage nor the insufficiency or deficiency of any stocks, funds, shares or securities nor for any loss or any breach of duty or Trusts unless such loss of breach is occasioned by or results from the Trustee's own wilful neglect or default or dishonesty.

(c) A Trustee shall not be liable for any loss or damage resulting from the exercise or non-exercise of any of its powers authorities or discretions hereunder. All persons having or claiming any beneficial interest in the Trust Fund or any part thereof shall be deemed to take with notice of and subject to the protection hereby conferred on the Trustee.

9.8 INDEMNIFICATION

The Trustee shall be indemnified out of the assets of the Trust Fund against any liability incurred by it in defending or bringing any proceedings whether civil or criminal other than in relation to circumstances in which the Trustee is not protected as in the last preceding Clause provided and the Settlor and each Trustee shall be held harmless against any claims, losses, death duties, taxes or impositions arising in 'connection with the Trust Fund or any part thereof, including failure to comply with legal requirements other than those applicable to the trust under the law in the country where the trust is, for the time being, resident.

9.9 ACCOUNTS

(a) The Trustee shall keep accurate accounts of its Trusteeship and may have them audited annually by a qualified accountant selected by the Trustee at the expense of the Trust Fund or the income thereof as the Trustee shall determine.

(b) The Trustee shall have the power to select a calendar or any other annual accounting period.

(c) The accounts shall be provided to the Appointors at annual interval and when requested.

9.10 HOLD PROPERTY IN REGISTERED OR BEARER FORM

The Trustee may hold securities or other property, real or personal comprising the Trust Fund in its name as Trustee, or in the name of its nominee. The Trustee may hold securities or other property unregistered, in bearer form, or in any other condition that will permit ownership to pass by delivery, and shall like-

wise be authorised to enter into any land Trust, real property holding agreement or similar arrangement with respect to real property. Trust records shall at all times disclose how all the property of the Trust is held.

9.11 DECISIONS OF MULTIPLE TRUSTEES

When there is more than one Trustee the Trustees shall act only by majority vote but in the event of no majority the Trustee first appointed shall have a second or casting vote.

9.12 VALIDITY OF APPOINTMENTS

No appointment made in exercise of any power hereinbefore contained shall be invalid on the ground that :-

(a) an insubstantial, illusory or nominal share is appointed to any one or more objects of such power or left unappointed or

(b) any one or more objects of such power is thereby altogether excluded

but every such appointment shall be valid notwithstanding that any one or more objects of the power is or are deprived under the appointment or in default of appointment to take any share in the Trust Fund.

9.13 DECISIONS TO BE WRITTEN

Any determination or resolution of the Trustee under any of the provisions hereof shall be recorded in a written Minute and such Minutes shall be signed by a director of the Trustee or person(s) nominated for the purpose by the Director(s) thereof and kept with the accounts and records of the Trust fund.

9.14 BONDS AND SECURITY

The Trustee shall not be required to give any bond or security for its due and faithful administration of the Trust Fund or for the discharge of the trusts created by this Settlement unless required under any relevant laws and then only to the minimum extent required by such laws.

ARTICLE 10

INVESTMENT POWERS

10.1 INVESTMENT POWERS

The Trustee of this Trust or any separate Trust created hereunder shall have broad investment powers with respect to the acquisition, holding and disposition of all assets comprising the Trust Fund or any part thereof, which powers may be exercised on such terms and in such manner as it may deem advisable, and the specific powers described below shall be without prejudice to the generality of such powers.

10. 2 DEALING WITH TRUST ASSETS

(a) The Trustee may retain any or all assets forming part of the Trust Fund in the same state of investment and condition in which it is received by the Trustee for such period as the Trustee

in its discretion deems fit and may deal with such asset or assets as if the Trustee were in all respects beneficially entitled thereto.

(b) The Trustee may exchange, vary or transpose any asset forming part of the Trust into or for any other asset or assets of a like or different nature for such consideration and on such terms and conditions as the Trustee in its absolute discretion deems fit.

(c) The Trustee may sell at public or private sale, or exchange, alienate, gift, grant or otherwise dispose of, any asset or assets, whether real or personal, of the Trust fund for such consideration (if any) and on such terms (if any) as the Trustee in its absolute discretion deems fit. The foregoing provision shall be deemed to include without limitation sales or exchanges on credit, with or without security, and shall include the power to abandon any property, either real or personal, which the Trustee deems worthless or not of sufficient value to warrant keeping or protecting, by refraining from paying taxes, water charges, rents, assessments, repairs, maintenance costs and upkeep of such property for nominal consideration or without consideration in lieu of foreclosure.

(c) The Trustee shall not be bound to have regard to the diversification of investments.

10.3 REAL AND OTHER PROPERTY

(a) The Trustee may invest all or any money at any time forming part of the Trust Fund in any property whether involving liabilities or not and whether in possession or reversion and whether producing income or not and whether secured or unsecured and upon such terms and considerations as the Trustee in its discretion deems fit.

(b) The Trustee may sell, alienate, otherwise dispose of, mortgage, charge, lease for any period, grant options, and otherwise deal with all or any property forming part of the Trust Fund on such terms and conditions in such manner and at such time or times as the Trustee in its discretion deems fit.

10.4 SECURITIES AND COMMODITIES INVESTMENTS

In addition to the broad investment powers granted hereunder, and without in any way limiting said powers, the Trustee is hereby specifically authorised to purchase or otherwise acquire and to sell or otherwise dispose of for cash, credit or instalments; common stock, both listed and unlisted, publicly or privately held, any other type or types of securities or commodities investment, including but not limited to bonds, notes, debentures mortgages, bank acceptances, preferred stocks, warrants, interests in common or unit Trust Funds, mutual funds, "open-end" or "closed-end" investment funds or Trusts, real estate investment Trusts, beneficial interest in land Trusts, or savings and loan or building and loan associations, oil, gas, or other mineral interests metals (including gold and silver), commodities, including security or commodity futures, hedges, short positions, options, puts, calls, straddles, and any other form of securities or commodities position, interest or contract.

10.5 CURRENCY TRADING

The Trustee may hold accounts comprising the entire Trust Fund or any part or parts thereof in any currency it may in its sole discretion deem advisable, and is hereby specifically authorised to trade or deal in any currency or foreign exchange in any manner it may deem advisable.

10.6 PAYMENT BY CASH OR TERMS

The Trustee may make or purchase any investment for cash or in consideration of an annuity or otherwise and upon such terms and conditions as the Trustee in its discretion deems fit and it may make or purchase any investment for an amount greater than the amount of the Trust Funds and it may agree to pay for any such investment wholly or in part from any future money which may come into its hands, including dividends, profits, interest or other income payable in respect of any such investment.

10.7 INSURANCE

(a) The Trustee may, in connection with any property obligation or transaction related to the purposes of this Trust Deed, insure, co-insure, reinsure, guarantee or (and) otherwise assume risks or indemnify for liability thereof and may purchase insurance or refrain from purchasing or renewing insurance of such kinds and in such amounts as the Trustee may deem advisable at the expense of the Trust.

(b) Subject to the terms and limitations set forth below, the Trustee may pay from income or capital insurance premiums or other charges and may control all rights or incidents of ownership in connection therewith.

ARTICLE 11

MANAGEMENT POWERS

11.1 MANAGEMENT POWERS

The Trustee of this Trust or any separate Trust created hereunder shall have broad management powers with respect to all assets comprising the Trust Fund or any part thereof, which powers may be exercised on such terms and in such manner as it may deem advisable, and the specific powers described below shall be without prejudice to the generality of such powers.

11.2 DISCRETION POWERS

The Trustee may in its discretion exercise all or any of its powers at any time and from time to time and in any part of the world.

11.3 DISCRETIONS ABSOLUTE

Subject always to express provisions to the contrary in this Deed every discretion vested in the Trustee shall be absolute and uncontrolled and every power and authority vested in it shall be an absolute

and uncontrolled discretion and the Trustee shall have the like discretion in deciding whether or not to exercise any such power or authority.

11.4 TRUST AS SHAREHOLDER

In the event of the Trustee investing the Trust Fund or any portion thereof in the purchase of securities the following provisions shall have effect;

(a) The Trustee shall be responsible only for so much of the shares and the dividends and income therefrom as shall be actually transferred and paid to it and nothing herein contained shall cast any obligation upon the Trustee to investigate the accounts or management or control of any such company and no neglect or omission in this respect shall be chargeable as a breach of Trust.

(b) The Trustee may exercise its voting or other rights attaching to any securities for the time being of the Trust Fund at any meeting of Directors or shareholders of the company or any wholly owned subsidiary thereof as it may think fit notwithstanding that it may have personal or other interest in the manner in which such vote is exercised.

(c) The Trustee may consent to any re-organisation re-construction or amalgamation of any corporation (in which the Trustee has investments which form part of the Trust Fund) and may consent to any reduction of capital or other dealings with such securities as the Trustee in its discretion deems fit and on any such reductions of capital to surrender any such securities for such consideration and on such terms and conditions as the Trustee in its discretion shall approve.

(d) The Trustee shall not be obliged:

(i) To enquire into or in any manner, question or bring any action suit or proceedings or in any other manner whatsoever seek to interfere with the management government and control of any such company by the Director or Directors for the time being of such company.

(ii) To take any steps or bring any action suit or proceedings or in any other manner whatsoever seek to vary, alter, amend or add to the Articles of Association of any such company.

(iii) To take any steps or bring any action suit or proceedings for the purpose of winding up any such company voluntarily.

(iv) To attend any general or other meeting of any such company meetings of Directors thereof.

(e) The Trustee may become a Director or other officer of any corporation, any property, security or capital which forms part of the Trust Fund or may appoint any person to act as such Director or Officer and may receive for its own use the benefit or remuneration attached to any office without being liable to account therefor.

11.5 LITIGATION

The Trustee may commence or defend litigation with respect to the Trust, or any property included in the Trust Fund, as it may deem advisable, at the expense of the Trust. The Trustee may litigate, compromise, compound, adjust, submit to arbitration and be bound thereby, release or otherwise settle or dispose of any claim or demands of the Trust against others , or of others against the Trust, in such manner and upon such terms as is deemed proper by the Trustee, and this shall include extending the time for payment or abandoning any claims or demands in favour of or against the Trust fund or any part thereof.

11.6 COMPROMISE/SETTLE ALL MATTERS

The Trustee may compromise and settle for such consideration and upon such terms and conditions as the Trustee in its discretion deems fit all matters arising in relation to the Trusts of this Settlement or the Trust Fund and all such compromises and Settlements shall be binding on all the Beneficiaries.

11.7 INVEST BEYOND DURATION OF TRUST

The Trustee may make such contracts and enter into such undertaking relating to the Trust Fund, or any part thereof, as the Trustee considers advantageous to the Trust without regard to the duration of the Trust as defined herein.

11.8 ACT AS IF BENEFICIAL OWNER

The Trustee shall exercise all such powers, rights and privileges and do all such acts, matters and things in relation to any investment made or held by the Trustee as the Trustee could exercise or do if it was the Beneficial Owner of such investment.

11.9 FORMATION OF COMPANIES

The Trustee may establish promote or acquire any corporation wherever incorporated or domiciled and either with limited or unlimited liability (whether by shares, guarantee or otherwise) or with no liability and may sell assign and transfer to such corporation the whole or any part of the Trust Fund and so that the consideration of any such sales assignment or transfer may consist wholly or partly of securities of such corporation which may be credited as fully paid or partly paid and be issued allotted to or otherwise vested in the Trustee and become part of the capital of the Trust Fund if it is a company limited by shares.

11.10 BANK ACCOUNTS

The Trustee may open and maintain one or more savings accounts, cheque accounts, term accounts, or current accounts with any bank, savings and loan, or building and loan association wherever located, in any currency and may deposit to the credit of such account or accounts all of any part of the funds belonging to the Trust Fund that may at any time be in the possession of the Trustee as Trustee whether or not such funds may earn interest, and may authorise withdrawal therefrom by cheque or other instrument by such person or persons as the Trustee may from time to time authorise. Any such bank or such association is hereby authorised to pay such cheque or other instrument of withdrawal and also to receive the same for deposit to the credit of any holder when so signed and properly endorsed without enquiry of any kind. Pay-

ments so made by such bank or such association shall not be subject to objection by any person concerned or interested in any way in the Trust. Where the Trustee is also a corporation authorised by law to carry on banking business, the Trustee may also, without accounting for any resultant profit, act as banker and perform banking services on behalf of the Trust on the same terms as for any other customer provided this will not result in lower returns or higher fees to the Trust.

11.11 JOINT INVESTMENTS

The Trustee is hereby authorised to make joint investments for or on behalf of any or all separate Trusts created hereunder or of any other trust of which the Trustee is Trustee, and to hold such investments as a common fund for the purposes of administration and divide the net income therefrom in the same proportion as the respect interests of such Trusts therein.

11.12 ACT AS PRINCIPAL OF OTHER TRUSTS

The Trustee may accept any appointment as the Principal, Appointor, Manager or Controller of other Trusts whenever and wherever formed and to deal with the rights arising therefrom in such manner as the Trustee may in its discretion determine.

11.13 RETENTION OF EXPERTS

(a) The Trustee may obtain without requiring any consent except as required by law, and pay for such professional expert or other assistance as the Trustee in its discretion deems desirable in the discharge of the duties of the Trustee including assistance from any person who is a Director or a Shareholder of the Trustee.

(b) The Trustee may act on the opinion of or on information obtained from any financial adviser, lawyer, accountant, valuer, surveyor, broker, auctioneer or other experts or professional person and the Trustee shall not be responsible for any loss, depreciation or damage occasioned by acting in accordance therewith.

ARTICLE 12

JURISDICTION OF TRUST

12.1 This Deed is executed, delivered and accepted by the Trustee in the Republic of Vanuatu, and, subject to the provisions of Articles 13 hereof, and except as otherwise provided herein, shall be administered under English Law or its legal successor law as applicable from time to time in the Republic of Vanuatu. The rights of all parties and all the Beneficiaries herein, and the construction and effect of each and every provision hereof, shall accordingly be subject to the exclusive jurisdiction of, and construed only according to English Law or its legal successor as applicable from time to time in the Republic of Vanuatu, which shall also be the forum for the administration hereof. The parties hereto submit to the jurisdiction of the Supreme Court of the Republic of Vanuatu or its successor Court in respect of all disputes which may

arise in respect of this Deed. If any of the provisions of the Trust Deed should be invalid or unenforceable, the remaining provisions thereof shall continue to be fully effective.

ARTICLE 13

CHANGE OF JURISDICTION OF TRUST

13.1 CHANGE OF JURISDICTION UPON POSSIBILITY OF FORCE MAJEURE

Upon the possibility of the occurrence of force majeure as defined in Article 13.5, which in the opinion of the Trustee or Appointor might frustrate the purpose of this Trust Deed or hamper the proper administration and management of the Trust hereunder, the Trustee or Appointor may in their sole individual discretion at any time or times declare by Deed or writing that the administration of this Trust Deed shall, with respect to such Trust and as of the date of such declaration be governed by the laws of some other jurisdiction.

13.2 CHANGE OF JURISDICTION UPON OCCURRENCE OF FORCE MAJEURE

Upon Force Majeure as defined in Article 13.3 occurring in the jurisdiction of this Settlement for the time being, the Trust shall automatically take effect and be administer in, and its administration governed by the laws of the Fiji by the Trustee Corporation Limited and the forum for administration shall be the Courts of the new jurisdiction PROVIDED THAT the Trustee (or in the event of the inability of the Trustee to do so, then the Appointor or the person (s) who has the right to appoint a successor Trustee in the manner provided herein) by Deed or writing may specify some other jurisdiction under which the Trust shall take effect and be administered in and governed by as at the date of occurrence of such force majeure as aforesaid and FURTHER PROVIDED THAT, notwithstanding anything to the contrary contained herein, the Trustee may by Deed or writing declare that the Trust shall remain in its then jurisdiction if it is the opinion of the Trustee that such declaration is in the best interests of the Trust.

13.3 FORCE MAJEURE DEFINED

For purpose of this Article, the events or circumstances constituting force majeure shall be defined as :

(a) The suspension of any contract relating to the Trust or of any Trusts, covenants, conditions, or any powers hereby conferred on the Trustee whether by exchange control or other governmental authorities of any kind, or the happening of any act or event whereby the same shall cease to be effective;

(b) The acquisition, expropriation or confiscation of any of the property or assets comprising the Trust Fund, including the compulsory conversion of the property and assets comprising the Trust Fund;

(c) The levy of any excessive tax or duty on the Trust Fund as determined by the Trustee;

(d) The declaration or existence of a state of war in consequence whereof the citizens or nationals or residents of or corporations organized under the laws of jurisdiction where the Trust is then located are deemed to be enemy aliens of the Republic of Vanuatu;

(e) The invasion of the territory of the jurisdiction where the Trust is then located by hostile military forces.

13.4 CONSEQUENTIAL CHANGES IN TRUST INDENTURE

Upon a change in the jurisdiction of the Trust for any of the reasons and in the manner specified in Article 13, and until further declaration is made hereunder, the Trustee or any successor Trustee may at any time or times thereafter by Deed make such consequential changes in or additions to or deletions from the powers and provisions of this Trust Deed with respect to such Trust as such Trustee may consider necessary or desirable to ensure so far as may be possible that the powers and provisions of such Trust Deed shall, mutatis mutandis, be as valid and effective under the laws of such new jurisdiction in the same manner and with the same effect as under the laws of the jurisdiction where the Trust was most recently located PROVIDED HOWEVER that any such change or addition or deletion shall have as its principal purpose the continued existence and administration of the Trust in the manner intended herein in accordance with the terms and provisions contained in this Trust Deed, and shall in no case be deemed to permit the Trustee or any successor Trustee to add to, delete from, or change in any way the Beneficiaries named or described in this Trust Deed, or to give the Trustee the power to make any changes in or additions to or deletions from the provisions governing the powers of the Trustee with respect to the Appointor. In drafting said Deed making such changes or additions, the Trustee shall be required to seek the advise of counsel, and shall be entitled to rely and act upon the opinion of Counsel in determining whether the foregoing conditions are met.

ARTICLE 14

PROVISIONS DEALING WITH VARYING THE DEED

14.1 PREREQUISITE

Subject to Article 14.2, the Trustee may from time to time with the consent in writing of a majority of the Appointors may vary or amend any of the provisions contained in this Deed.

14.2 RESTRICTIONS

No release revocation variation or amendment to this Deed shall:

(a) Be valid if such release revocation variation or amendment would have the effect of infringing any rule against perpetuities which may apply to the Trust from time to time or would entitle the Settlor or any person or company who or which is or has been a Trustee of these presents to receive any of the income or capital of the Trust Fund or any interest in or benefit out of or connected with the Trust Fund.

(b) Prejudicially affect any interest of a Beneficiary which has vested prior to such addition, amendment or variation.

(c) Permit or enable the Appointor to become a Trustee of this Deed.

14.3 RELEASE OR REVOCATION OF POWERS

(a) The Trustee may from time to time by Supplemental Deed release and revoke any power or powers conferred on the Trustee under this Deed.

(b) Any other person or persons upon whom any power is conferred by this Deed may by Supplemental Deed release and revoke any power or powers so conferred on him or them.

(c) On the execution of any Supplemental Deed pursuant to paragraphs (a) or (b) of this Clause:

(i) The power (if any) purported to be released or revoked pursuant to such Supplemental Deed shall be absolutely and irrevocably released or revoked;

(ii) The amendments to or variations of the provisions of this Deed purported to be effected thereby (if any) shall (subject as aforesaid) be deemed to be effective forthwith.

ARTICLE 15

EXECUTION OF TRUST DEED

SIGNED SEALED AND DELIVERED by the

said

being the said SETTLOR in the

presence of :

_____

THE COMMON SEAL of PACIFIC INTERNATIONAL

TRUST COMPANY LIMITED was hereunto affixed by

authority of the Board of Directors and in the presence of :

_____ _____

Secretary Director

SCHEDULE A

NAME OF SETTLEMENT TRUST : VANUATU BIODIVERSITY CONSERVATION (FUND)

DATE OF SETTLEMENT :

PERPETUITY DATE Perpetual Duration

SETTLED SUM: Ten Thousand Vatu (VT10,000)

SETTLOR:

TRUSTEE: Pacific International Trust Company Limited

1st Floor, International Building, Kumul Highway

Port Vila, Vanuatu.

APPOINTOR:

BENEFICIARY: The Republic of Vanuatu

Settlor: _____

Trustee: _____

Appendix 3 Protected Areas By-Law

REPUBLIC OF VANUATU

MALAMPA LOCAL GOVERNMENT (PROTECTED AREAS) BY-LAW NO. OF 1995

To provide for the establishment of protected areas.

IN EXERCISE of the powers conferred on the Council by section 20(a) of the Decentralization And Local Government Regions Act No. 1 of 1994, the MALAMPA LOCAL GOVERNMENT COUNCIL, makes the following By-laws:-

DEFINITIONS

1. In this By-law, unless the context otherwise requires –

"Council" means the MALAMPA Local Government Council;

"protected area" means an area established under By-law 4;

"customary land" means any land lawfully owned, used or occupied by a person or community in accordance with current customary usage;

"Executive" means the MALAMPA Provincial Executive or the Cabinet;

"land" includes land covered and uncovered by ordinary spring tides, reef areas and land covered by freshwater;

"owner" or "owners" in relation to a registered interest in land means the person or persons in whose name the interest is registered; in relation to customary land, means the person or persons who is or are according to current customary usage, regarded as the owner or owners of the land;

"person" means any person and includes any public body, company or association, or right holding group and any other body of persons whether incorporated or not;

"public officer" means any person from time to time posted to the MALAMPA Local government region and holding a paid position in the public service of the National Government;

"serve" means either:-

(a) delivering personally to the person; or

(b) delivering or sending by prepaid post to the usual or last known place of residence or business of the person;

"term" in relation to a protected area means the period of time during which the protected area status may not be amended or removed pursuant to By-law 4;

"village chief" means the person who according to custom is regarded as the head of the village or other local community concerned and where there is no such customary head of a village or local

community, means a person regarded by the people within such village or local community as their leader in relation to the matter concerned.

PURPOSE

2. The purpose of this By-law is to assist owners of marine resources and owners of land to protect and manage their marine resources, land and land based resources for conservation, custom, spiritual and amenity purposes.

MAKING AN APPLICATION

3. (1) Any owner of land may apply to the Executive for a declaration that part or all of the land the subject of the application be set aside as a protected area.

(2) An application under paragraph (1) must be in Form 1 in the Schedule 1, or to the like effect, and must –

(a) include a description of the boundaries of the land the subject of the application;

(b) include a copy of the rules which are proposed to apply to the use of the protected area;

(c) specify the term of the protected area.

(3) The application must be signed by –

(a) every owner of land within the proposed protected area, or person authorized to sign on behalf of such owner or owners;

(b) the Chairman of the Area Council of Chiefs certifying that to the best of his knowledge the application complies with paragraph (2) and subparagraph (a) of this paragraph.

(4) An application made under paragraph (1) shall be lodged at the Council Office and must be accompanied by a plan defining as accurately as practicable the boundaries of the proposed protected areas.

DECLARATION OF PROTECTED AREA

4. (1) After receipt of an application under By-law 3, the Executive may, subject to By-law 10, declare the land, or any part of the land, specified in the application to be a protected area.

(2) In deciding whether or not to make a declaration under paragraph (1), the Executive must take into account whether or not making the declaration will further the purposes of this By-law.

(3) A declaration under paragraph (1) must –

(a) state rules which are to apply to the use of the protected area;

(b) specify the term which is to apply to the protected area;

(c) be in Form A in Schedule 2.

(4) Any declaration made under this section must have no bearing whatsoever over the issue of ownership of any land.

AMENDMENTS TO OR REMOVAL OF, PROTECTED AREA STATUS

5. (1) Any owner of land which has been declared a protected area may apply to the Council to –

(a) amend the rules or term which apply to the protected area; or

(b) to declare part of the land to cease to be a protected area; or

(c) to declare additional land to be part of the protected area.

(2) Application under paragraph (1)(a) or (b) must be made within 6 months of the expiry of the term of a protected area.

(3) Where no application is made under paragraph (1)(a) or (b) within 6 months of the expiry of the term of a protected area, a further term will automatically apply to the protected area.

(4) An application under paragraph (1) must be in Form 2 in Schedule I, or to the like effect, and must contain –

(a) a description of the land declared to be a protected area; and

(b) where the application seeks an amendment to the rules or term applying to the protected area, the amendments sought; and

(c) where the application seeks to remove land from, or add land to, a protected area, a description of the land proposed to be removed or added; and

(d) the reasons why the application should be approved; and

(e) the signatures required under By-law 3(3).

(5) An application under paragraph (1) shall be lodged at the Council Office.

(6) On receipt of an application under paragraph (1), the Executive may, in accordance with the application, declare additional land to, or the removal of land from, a protected area.

(7) In deciding whether or not to make a declaration under paragraph (6), the Executive must have regard to –

(a) the reasons stated in support of the application; and

(b) the matters set out in By-law 4(3)(a) and (b).

(8) A declaration –

(a) under paragraph (1)(b) shall be in Form B in Schedule 2;

(b) under paragraph (1)(c) shall be in Form C in Schedule 2.

WHEN A PROTECTED AREA WILL COME INTO EFFECT

6. (1) A protected area will come into effect 1 month after a declaration is made under By-law 4(1), or at such later time as is stated in that declaration.

(2) Any amendments to, or removal of, a protected area will come into effect 1 month after a declaration is made under By-law 5(6), or at such time as is stated in that declaration.

NOTIFICATION OF DECLARATION

7. (1) Following the making of a declaration under By-law 4 or 5, the Executive must as soon as practicable –

(a) publish notice of the declaration in the Republic of Vanuatu Gazette; and

(b) serve a copy of the declaration on the applicant, a public officer or any other person whom the Executive considers proper to receive a copy.

(2) The Executive, shall, as soon as practicable –

(a) serve a copy of the notice on all Village chiefs within the Area Council of Chiefs area of jurisdiction and display a copy of the notice within such area, where it can be readily seen by members of the public; and

(b) hold a public meeting in the village closest to the protected area to describe the protected area and the rules applying to the use of it.

(3) A declaration made under By-laws 4 or 5 will have full legal force irrespective of any failure to carry out the notification required under paragraphs (1) and (2).

REGISTRY

8. (1) A register to be known as the "Register of Protected Areas" shall be established and maintained by the Council.

(2) There shall be entered in the Registry –

(a) the name of every protected area;

(b) the names of every custom owners of land in the protected area;

(c) date of establishment of each protected area;

(d) the term of each protected area;

(e) the location of each protected area;

(f) any easement or right to continue to be enjoyed by the custom owners or others authorized by custom owners in a protected area;

(g) the reasons for establishing each protected area;

(h) the date each protected area or part thereof ceases to be such;

(i) any other matters which the Council considers fit.

(3) The Registry shall be available for public inspection at the Council Offices during regular business hours.

RECORDS, ETC.

9. (1) The Council shall keep –

(a) records of each protected area that define as accurately as practicable the boundaries of such protected area; and

(b) a copy of the rules which are to apply to the use of each protected area; and

(c) maps marked with the places protected under this By-law.

(2) The matters referred to under paragraph (1) must be open for public inspection at the Council Offices during regular business hours.

(3) The Executive shall cause a copy of every declaration and any other information required to be furnished to the director of Land Records and the Environment Unit of the National Government within 3 months of each protected area being declared.

OWNERSHIP DISPUTES

10. (1) The Executive may not declare any land to be a protected area, if it has knowledge of any dispute over the ownership of the land, unless bona fide representatives for all disputing owners have signed the application under By-law 3(a).

(2) Where any customary land has been declared a protected area and it is subsequently established by agreement between the affected parties, or by a court order, that the correct owner or owners of the land, or representatives of such owners, did not sign the application under By-law 3(3) (a), one bona fide representative of each correct owner of the land may at any time, notwithstanding By-law 5(2), apply to remove, or make amendments to, the protected area under By-law 5(1).

OFFENCES

11. Subject to subsection (2), any person who contravenes, or permits a contravention of, any of the rules applying to the use of a protected area, is guilty of an offence against this By-law and will be liable to the penalties set out in By-law 12.

LIABILITY OF COMPANY OFFICERS

12. Where a company commits an offence against this By-law, every director and every person concerned in the management of the company, will be guilty of the same offence if it is proved –

(a) that the act that constituted the offence took place with his or her authority, permission, or consent, or

(b) that he or she knew, or could reasonably be expected to have known, that the offence was to be, or was being, committed and failed to take reasonable steps to prevent or stop it.

PENALTIES

13. (1) Where the person committing the offence –

(a) is an individual, that person shall be liable to imprisonment for a term not exceeding 6 months or to a fine not exceeding VT 50,000.

(b) is a company, that person is liable to a fine not exceeding VT 50,000 and the officers of the company are also liable to imprisonment for a term not exceeding 2 years.

(2) In addition to the penalties set out in paragraph (1), the Court may order that –

(a) any property used in the commission of an offence and any proceeds from the offence be forfeit to the Council;

(b) any business licence held by the offender, authorizing the carrying out of any business activity within the local government region, be suspended and that the offender be disqualified from obtaining a new licence for up to 5 years.

ENFORCEMENT

14. (1) The primary responsibility for enforcing the rules governing the use of a protected area is with the owner or owners of the land.

(2) It is lawful for any owner of the land, police officer, village chief, an employee of the Council or a public officer to make enquiries at a reasonable time to ascertain whether any offence under this By-law is being, or has been committed.

MANAGEMENT COMMITTEE

15. (1) The Council may appoint for every protected area a local management committee.

(2) (a) In respect of land in the protected area owned by one family only, the local management committee, shall be that family.

(b) In respect of land in the protected area owned by more than one family, the local management committee, shall consist of –

(i) 2 representatives of each owning family;

(ii) 2 chiefs whose area of authority includes land in the protected area.

(3) (a) A committee established under paragraph (2)(a) may appoint the head of the family to be the chairman.

(b) A committee established under paragraph (2)(b) shall appoint a custom owner to be the chairman.

(4) Every committee must, subject to this By-law, be responsible for the control and management of the protected area in relation to which it is appointed.

(5) Every committee must determine the quorum for and the procedure to be followed at the meetings of such committee.

(6) Every committee must, in relation to the protected area it is appointed for, submit a written report to the Council once a year on the management of the protected area.

(7) The term of office of the members of a committee shall, subject to By-laws 4 and 5 be such periods as is specified in the instrument of appointment.

JURISDICTION TO IMPOSE PENALTIES

16. The Magistrates Court will have full jurisdiction under this By-law to impose the penalties set out in By-law 13.

PAYMENT OF FINES

17. (1) Unless specified otherwise in this By-law, all fines must be paid to the Council.

(2) All fines imposed under this By-law are recoverable as a debt due to the Council.

(3) Where a Court imposes a fine under this By-law, it must direct that part of the fine be paid to the owner or owners of the affected land.

(4) When determining what portion of a fine will be paid to the owner or owners of the affected land under paragraph (3), the Court must take into account the extent of damage suffered by such owner or owners as a result of the offence.

Passed by the MALAMPA Provincial Council this day of 1995.

Clerk to Council

Assented to this day of 1995.

Minister of Home Affairs

Appendix 4 Sample Choice Modelling Set from First Survey

In an introductory statement, respondents were told that we had selected several rainforests from around the world that would be lost within the next two years unless money was found to conserve them. In the following scenario sets, we had "scrambled" the characteristics of those rainforests in order to offer people many choices. In this way, we could work out which characteristics made rainforests important to conserve. Respondents were asked to treat each choice as an independent event.

Scenario 1	*Scenario 2*
500 ha in Far North Queensland	10000 ha in Papua New Guinea
– extremely rare	– fairly rare
– easy to visit, full facilities	– difficult to visit, poor facilities
– no locals affected	– locals will be better off
– special plants and animals	– special landscapes
– $50 donation required	– $10 donation required
Please indicate your preferred choice:	
	Scenario 1
	Scenario 2
	I would not support either scenario

Appendix 5 Sample Choice Modelling Set from Second Survey

Respondents were given the same introductory information as in the first survey.

Scenario 1

100 ha in Vanuatu
- extremely rare
- easy to visit, full facilities
- locals will be better off
- no special features
- $50 donation required

Scenario 2

1000 ha in Far North Qld
- not rare at all
- no visits allowed
- no locals affected
- special landscapes
- $10 donation required

Scenario 3

10000 ha in PNG
- not rare at all
- difficult to visit, poor facilities
- locals will be worse off
- special landscapes and plants and animals
- $5 donation required

Scenario 4

100 ha in South America
- fairly rare
- no visits allowed
- no locals affected
- no special features
- $10 donation required

Scenario 5

1000 ha in Thailand
- extremely rare
- easy to visit
- locals will be better off
- no special features
- $50 donation required

Scenario 6

- 10000 ha in Indonesia
- extremely rare
- no visits allowed
- locals will be worse off
- special landscapes
- $5 donation required

Please indicate your preferred choice:

Scenario 1
Scenario 2
Scenario 3
Scenario 4
Scenario 5
Scenario 6
I would not support any scenario

Appendix 6 Multinomial Logit Results for First Survey

Variable	Coefficient	Std error	T
Intercpt	−.149849e+01	.234485e+00	−6.3906
Locations			
Vanuatu	−.161982e+00	.980987e−01	−1.6512
Far North Qld .	738807e+00	.104018e+00	7.1027
Qld/NSW Border	.558046e+00	.104985e+00	5.3155
Papua New Guinea	−.165136e+00	.106839e+00	−1.5457
South America	.118455e+00	.108047e+00	1.0963
Africa	−.162219e+00	.102575e+00	−1.5815
Thailand	−.599584e+00	.117226e+00	−5.1148
Indonesia	−.326407e+00	.105970+00	−3.6213
Area			
Larea	.147962e+00	.238158e−01	6.2128
Rarity			
Not rare at all	−.557608	.0712662	−7.8243
Somewhat rare	−.127279	.0653375	−1.9480
Fairly rare	.105086	.0684166	1.5360
Extremely rare	.535415	.0683401	8.2363
Visits			
No visits allowed	−.202140	.0708846	−2.8517
Visits allowed	−.00113105	.0651942	−.0173
Visits possible	.192025	.0702895	2.7319
Easy to visit	.011246	.0687894	.1371
Locals			
Locals worse off	−.652196	.0771546	−8.4531
No locals affected	−.0216819	.0642467	−.3375
Locals can stay	.249736	.0607821	4.1087
Locals better off	.424131	.0673945	4.6819
Special features			
No special features	−.38462	.0685934	−5.6073
Special landscapes	−.0136031	.0668037	−.2036
Special plants and animals	.156569	.0676558	2.3142
Special landscapes and plants and animals	.241655	.0676846	3.4967
Price			
Lprice	−.192839	.0436730	−4.4155

Statistics

L(ZERO):	−607.49	
L(BETA):	−264.15	
−2(L(0)−L(B)):	686.68	D.F.: 22
RHOSQ:	.56518	

Appendix 7 Multinomial Logit Results for Second Survey

Variable	Coefficient	Std Error	T
Locations			
Vanuatu	-.186950	.0703299	-2.6582
Far North Qld	1.47880	.0441086	33.5262
PNG	-.314573	.0738960	-4.2570
South America	-.134416	.0683391	-1.9669
Thailand	-.410580	.0760970	-5.3955
Indonesia	-.432281	.0665541	-19.2486
Area			
Logarea	.0534586	.0125476	4.2604
Rarity			
Not rare at all	-.600406	.0468383	-12.8187
Fairly rare	.0503901	.0413381	1.2192
Extremely rare	.5500159	.0440882	11.5995
Visits			
No visits	-.163558	.0420350	-3.8910
Visits possible	.0405035	.119937	2.9612
Easy to visit	.043621	.0809860	.9298
Locals			
Locals worse off	-.366360	.0441072	-8.3061
No locals	-.130999	.0429757	-3.0482
Locals better off	.497359	.0435415	11.3543
Special			
No special	-.105786	.0431886	-2.4494
Special land	-.019231	.0416975	-.4612
Special land and plants & animals	.125017	.0424431	2.9106
Price			
Logprice	-.220139	.0288974	-7.6179

Statistics

L(zero)	-1957.96
L(beta)	-1231.10
-2(L(0)-L(B)):	1453.72 DF. 15
RHOSQ:	.37123
Adjusted RHOSQ	.36357