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Electronic version

URL: <http://journals.openedition.org/ethnoecologie/1905>
DOI: 10.4000/ethnoecologie.1905
ISSN: 2267-2419

Publisher

Laboratoire Eco-anthropologie et Ethnobiologie

Electronic reference

Paul Sillitoe, « Local perceptions of forest, conservation and logging in Papua New Guinea », *Revue d'ethnoécologie* [Online], 6 | 2014, Online since 31 December 2014, connection on 19 April 2019. URL : <http://journals.openedition.org/ethnoecologie/1905> ; DOI : 10.4000/ethnoecologie.1905

This text was automatically generated on 19 April 2019.

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Local perceptions of forest, conservation and logging in Papua New Guinea¹

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Paul Sillitoe

- 1 There is widespread concern about the future of Papua New Guinea's forests, dating from events in the 1980s that triggered the Barnett Enquiry (1989)² into the logging industry (Roberts 2006 ; Filer *et al.* 2009 ; Shearman *et al.* 2009). Stories about Asian loggers roaming parts of the country with suitcases of cash covertly to buy off landowners exacerbate fears for the future of the country's forests, which recent destructive logging in some regions further fuels (Greenpeace 2002 ; CELCOR & ACF 2006). There is not only international apprehension over dubious official interpretation of logging legislation and downright corruption, but also worries about the attitudes of rural communities to their forests (Ellis 2000). The fear is that local landowners will readily sell logging rights to timber companies, the trees on their land comprising a natural resource from which they can apparently earn an easy income. The money they receive comprises development in their minds, spent on various desirable commodities (Filer 2004 ; Wagner 2007).
- 2 These concerns relate to a number of issues, some contentious. For example, are they more a reflection of western than indigenous concerns, intensified by the destruction of forests in Asia and Amazonia over the last few decades? Is the desire to protect the country's forest resources and conserve their biodiversity a manifestation of latter day First World imperialism (Alcorn & Beehler 1993 ; Bird *et al.* 2007b ; Shearman *et al.* 2008)? Or do Papua New Guineans share these concerns? Can we assume that people perceive the destruction of forests as undesirable regardless of culture, in depriving current and future generations of potentially valuable resources and a biological heritage of untold worth (Mitio 1984 ; West 2006)? Perhaps we have a complex combination of both, one informing the other in this global age. This complexity and contrariety extends to

attitudes about the exploitation of forest resources, people keen to realise their monetary value but ruining the subsequent destruction.

- 3 This ambivalence may also characterise the traditional attitudes of some people to conservation. Some think that local communities may hold the key to forest conservation, or at least their sustainable exploitation (Dwyer 1994). If people have some notion of managing their forest resources, maybe even protecting them in some measure, then these local practices and ideas might be built upon to further sustainable use. Nonetheless, according to some commentators, Papua New Guinean cultures do not traditionally have a conservation ethic. Whether they do or not demands investigation. It is possible that they express it in ways that are difficult to access and assess, maybe in rituals, myths and other symbolic contexts (Morauta *et al.* 1982).
- 4 Local communities may hold the key to forest conservation in other ways too, having reasserted their autonomy since independence. The Papua New Guinea (PNG) state is weak and its capacity to enforce any legislation on forestry or other issues is markedly limited. It puts the advocacy of grass-roots consultation and participation in development in an intriguing light. It is not the case of seeking to include the poor and marginalised in the process but of informing and negotiating with those who in many senses hold the political power, albeit diffused in uncentralised communities with which a state finds it difficult to cope.

The Indigenous Knowledge Approach

- 5 In order to formulate a policy that might work for both forests and people, it is clearly necessary to understand local people's practices, attitudes and ideas. It relates to the adoption of a bottom-up participation as opposed to top-down modernisation approach, which has opened up challenging opportunities for ethnobotanists, notably with calls for research into indigenous knowledge (IK) to facilitate interventions by promoting partnership and an awareness of local perspectives. It augurs a profound change in research strategies, informants becoming collaborators and their communities participating user-groups (Sillitoe 2012). It touches upon many contemporary issues such as the crisis of representation, intellectual property rights, demands for action research, and interdisciplinary co-operation (Sillitoe 2004).
- 6 In recent years, IK is increasingly seen in the acronym thicket of development discourse. There are several studies that seek to encourage a better understanding of what it is and its potential uses in development (Richards 1985 ; Williams & Baines 1993 ; Warren *et al.* 1995 ; Sillitoe 1998 ; Briggs 2005). But what we mean by IK is by no means clear, particularly as its use grows rapidly in development circles (Ellen & Harris 1997 ; Agrawal 2009 ; Sillitoe in press). Whatever, it is indisputable that local people are well qualified to define problems, and will be 'experts' on their forests: ecology, flora, wildlife etc. Furthermore, western globalised knowledge may not be relevant to some problems, and may even make matters worse by overlooking local issues. Sympathetic investigation has revealed that far from being stagnant and closed-minded, IK is flexible, adaptive and innovative. This has led to demands for a partnership-focused future to improve relations between hegemonic western science and complex, culturally-embedded IK (Sillitoe 2007 ; Jacobson & Stephens 2009). The implication is that western development 'experts' – foresters, conservationists or whoever – cannot remain ignorant of IK if they want their

own work not only to be practically effective but also less open to manipulation at the expense of those they seek to assist.

- 7 Grass-roots research seeks to promote facilitatory methods and a coherent intellectual local knowledge framework for people to interface effectively with international agencies, scientists, policy makers, state bureaucrats and politicians (Sillitoe *et al.* 2005). It seeks to accommodate to knowledge as continually under negotiation between stakeholders, part of on-going change. This involves continual revision of knowledge and understanding, people interpreting and modifying for themselves any information that reaches them, for example about the consequences of logging and conservation of biodiversity, in the light of their socio-cultural tradition and experience. This negotiation is difficult because of not only cross-cultural communication and understanding difficulties, but also its inevitable political aspects. Local knowledge is not homogenous. Differences exist along gender, age, class, occupational and other lines, and between individuals of similar social status, and the interpretation they put on shared knowledge may differ, depending on how it affects their interests. Whose knowledge are we going to privilege, or can we represent everyone's knowledge, as attempted here, and if so, what is the intellectual status of such all-encompassing knowledge?
- 8 A problem with the IK approach, particularly of the indigenous technical knowledge variety, is that western science and development discourse define it (Sillitoe 2007). The imposition of western categories and priorities threatens to limit analysis and possibly misrepresent IK by taking it out of cultural context (Hobart 1994 ; Brosius 2006). They predispose us to take certain issues as important and disregard others that may be significant to understand local understanding and experience, such as cosmology, ritual, and other cultural symbolic factors that might crucially inform others' environmental understandings in ways quite alien to science (Posey 1999 ; Berkes 1999). It is arguable that failure to consider all aspects of any knowledge system and their interconnections is to achieve at best a limited understanding and at worst a fundamentally flawed one. It is necessary to accommodate to the notion of the 'cultural construction of the environment', that is people's cultures inform their understanding of their natural worlds (Croll & Parkin 1992).
- 9 But research into such knowledge takes much time and can only deal with small numbers of people. Development demands quick results applicable to large populations (Sillitoe *et al.* 2005 : 56-58). How can we achieve this, particularly in a country as culturally varied as Papua New Guinea, and so ensure grass-roots' knowledge and opinion inform policy debates and development interventions, such as management of logging and promotion of forest conservation?

The Survey as an Indigenous Knowledge Tool

- 10 One way quickly to assess local knowledge and aspirations nationally or regionally is to use surveys (De Vaus 2001 ; Dillman 2006 ; Groves *et al.* 2009 ; Andres 2012). In some senses, this takes us back to the emergence of anthropology, when Victorian scholars sent questions to colonial officers, missionaries and others with firsthand experience of 'primitive' communities (Stocking 1991 : 258-59). Eclipsed by deep-immersion participant-observation fieldwork (which proved itself superior for sophisticated ethnographic investigations), it is perhaps time that the discipline looked again at such survey methods to access widely dispersed information for targeted policy issues, such as

forestry and conservation. A survey requires the design of a questionnaire (e.g. on forestry and conservation) that a team of trained enumerators might administer to a sample of people at different locations around the country (e.g. after Jenkins' *et al.* 1994 survey of sexual knowledge and behaviour). Alternatively, it may be sent to persons who know particular regions (e.g. researchers, administrators, local officials etc.) requesting that they record what they know of local knowledge and ideas (e.g. after Strathern's 1975 survey of attitudes to sexual offences). The survey reported on here is of the second kind. Both are relatively blunt instruments for assessing the subtleties of IK, and have methodological problems (Groves 1989), including the generic and well discussed drawbacks of surveys (e.g. respondent interest, superficiality, rigidity of questionnaires, sample errors etc.). We have yet to devise a more effective way of assessing understanding and ideas nation-wide at the grass-roots in a short time frame, a topic for future research.

- 11 The 'Rural Community Survey on Attitudes to Forestry, Logging and Conservation', comprised part of a larger global project entitled *Policy That Works for Forests and People* (involving six countries: PNG, India, Pakistan, Zimbabwe, Ghana and Costa Rica)³. The project sought to improve the sustainability of forest management and optimise stakeholder benefits (see Filer 1997, 1998). A planning workshop finalised the design of the research programme. It defined six stakeholder groups – politicians, public servants, industry, NGOs, donors, and local landowners – and agreed a number of key issues to explore with each. Researchers directly interviewed individual members of the first five groups on forest policy issues of which they had experience. The planning workshop decided on a questionnaire survey as the most cost-effective way of canvassing indirectly the diverse range of landowner knowledge and opinion relevant to the forest policy process⁴.
- 12 The Survey comprised a two-part schedule. The first asked for background data on the community (location etc.) and information on 'development indicators', especially those that bear directly or indirectly on local forest management. The second part asked respondents to provide an assessment of community attitudes and behaviour to twelve listed issues (Table 1). It included questions under each topic as a guide to the information sought, while stressing that their relevance would depend on the community.

Table 1 : Questionnaire part 2 topics

Local Classification of Forest Land
Hunting of Wild Animals and Birds
Harvesting of Wild Plants and Other Natural Raw Materials
Other Activities in Areas of Primary Forest
Traditional Forest Management
Commercial Values of the Forest
Major Land Use Decisions
Generational Differences in Attitude and Practice
Gender Differences in Attitude and Practice
Concepts of Sustainable Development
Impact of Government Policy
Incentives for Conservation

The Survey Sample and Response Rate

- 13 We mailed and personally distributed questionnaires to a range of individuals thought to have knowledge of forest and biodiversity issues in local communities across the country (Table 2). Today we should use email and Web based questionnaire schedules, which returned electronically greatly facilitate data analysis (Dillman 2006 ; Vehovar & Manfreda 2008 ; Bethlehem & Biffignandi 2012 ; Mesch 2012). Nonetheless, many of the issues regarding surveys, as discussed here, remain the same, and merit investigation in respect of IK research methodology, as a topic not yet to my knowledge discussed in this context.
- 14 We distributed 114 questionnaires to researchers (largely social scientists) who had spent a substantial and recent (if not current) period in a rural community, whose interests covered the issues addressed. We thought it unwise to sample persons whose information related to several years previously⁵, when the issues of logging and forest conservation change rapidly. We attempted to stratify the sample by selecting equal numbers of respondents from each of PNG's several bio-geographical regions⁶, aiming to secure responses from between two and four researchers in each of thirty regions.
- 15 We also distributed questionnaires to 50 PNG university students by region taking courses covering « environment and development », some including forest management, thought to have an interest in the survey's aims. Only those who could claim to have a reasonable knowledge of their home community were asked to complete the survey form. Three national research staff at the National Research Institute also completed questionnaires for areas where they were currently engaged in projects. When the rate of returns was lower than anticipated, we despatched a further 20 questionnaires to the Summer Institute of Linguistics at Ukarumpa for distribution to field staff engaged in evangelical translation work around the country. The sample of students, national researchers and SIL staff was non-stratified, but we intended to allocate their responses to bio-geographic regions for analysis.
- 16 The total number of completed questionnaire schedules received was 58, of which 51 were in sufficient detail for analytical purposes. In respect of the total population of Papua New Guinea, the percentage surveyed is 0.2% at the community level, is 2.6%⁷ at the census division level, and is 33%⁸ at the open electorate level.

Table 2 : Distribution of questionnaires

	Questionnaires distributed	Questionnaires returned	Incomplete	% valid returns
Overseas researchers	114	27	2	22%
UPNG students	50	16	3	26%
SIL staff	20	12	2	50%
NRI staff	3	3	0	100%
Totals	187	58	7	27%

- 17 The aim was for the survey sample to cover all PNG regions. While the low response rate affected negatively the sample's intended spread, it nonetheless covers much of the country (Table 3).

Table 3 : Percentage spread of returns by province (n = 58)

Bougainville	5	Madang	5	Sandaun	8.5
Central	3.5	Manus	3.5	Simbu	3.5
East New Britain	3.5	Milne Bay	8.5	Southern Highlands	14
East Sepik	8.5	Morobe	7	West New Britain	1.7
Eastern Highlands	3.5	New Ireland	3.5	Western Highlands	1.7
Gulf	3.5	Oro	7	Western	8.5

- 18 A wide spread is necessary to give any survey credibility. A perennial problem with survey data that purports to represent PNG is the nation's well-known cultural and linguistic diversity (Filer 1998 : 308-12). New Guinea is home to perhaps one-sixth of the world's languages. Today people increasingly speak Pidgin and English, bringing the country together. The intrusion of market economy and nation state into peoples' lives, together with Christian churches, is gradually leading to increased conformity across the country. Greatly increased travel and communication within, and to countries overseas are contributing to this effect. While the rate of social change has been dramatic, it would be erroneous to overlook the profound and complex differences that remain between people of different regions. Some now consciously maintain these to secure their cultural identity in a rapidly changing world, continuing with ceremonial exchanges, ritual performances, traditional art styles and other cultural arrangements. It is a manifestation of the paradox of globalisation, a coming together on some levels combined with a quest for keeping apart on others.
- 19 The natural environment, like the people who live there, displays considerable, and sometimes sensational, diversity over short distances. It is particularly significant in a survey concerning the exploitation and conservation of forest resources (Saunders 1993). A useful initial distinction is between small and large islands. The small ones range from coral atolls to volcanic peaks; usually with a limited range of ecological habitats. The large islands are characterised by rugged mountain chains running along their interiors: the most spectacular being the central cordillera running spine-like through New Guinea. These support montane forest, some alpine grassland, and extensive cane grass and secondary regrowth due to human cultivation disturbance. The coastal areas vary from inviting beaches to raised coral reefs and impenetrable mangrove. The lowland river basins comprise largely featureless floodplains with some of the world's most extensive swamps, relieved by some savannah, grassland and forest.
- 20 The low level of questionnaire returns obliged us to modify the data analysis, sample stratification depending on adequate responses (De Vaus 2002). We sought to accommodate the cultural and natural variety by considering the survey returns according to three parameters, thought likely to correlate with attitudes to forest: culture, forest and demography (Bellamy & McAlpine 1995). We divided the country up into eighteen cultural areas, sixteen represented in the survey (Map 1 ; Table 4); twelve forest types, eight represented in the survey (Map 2 ; Table 5); and nine population density classes, again eight represented in the survey (Map 3 ; Table 6).

Map 1 : Cultural areas

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Table 4 : Number of questionnaires returned by cultural areas

Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
2	2	9	5	2	5	1	3
North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
3	3	5	4	3	2	3	4

Map 2 : Forest types

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Table 5 : Number of questionnaires returned by forest types

Large crown hill forest	Medium crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
1	26	2	15	2	2	3	5

Map 3 : Population densities

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Table 6 : Number of questionnaires returned by population densities

100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
3	11	9	7	9	4	8	5

[Persons.km⁻²]

- 21 After locating the surveyed communities on the maps, we arranged the questionnaire responses three ways according to culture zone, forest type and population density. Firstly, we reviewed the sample according to the part 1 « development indicators » of the schedule, using descriptive statistics where appropriate to characterise communities. This comprised a digest of the socio-economic position of communities, with reference to data thought relevant to local forest management. We used the same approach for data on land use and forest resources. Secondly, we investigated the responses to part 2 of the survey for any patterns, giving descriptive summaries according to the culture area, forest type and population density categories.

The « Development Indicators » (Part 1.1 of Survey Schedule)

- 22 The data on « development indicators » – education, communication, migration and income – hold no surprises for anyone who knows Papua New Guinea.

Education

- 23 The mean percentage of children attending primary school for the sample is 58%, ranging from a high of 97% for Manus to a low of 13% for the Gulf region (Table 7)⁹. There is a tendency overall for the islands to have more children attending school than mainland New Guinea. The numbers of persons holding university degrees affirmed this trend (Table 8).

Table 7 : Percentage of school age children attending school by cultural areas

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean %	88	13	48	50	97	67	80	48
% Range	15	23	80	50	7	97	-	65
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean %	78	63	73	31	55	28	88	56
% Range	40	60	70	60	70	5	5	75

(STANDARD DEVIATION [ALL REGIONS] 31.73)**Table 8 : Number of university educated individuals by cultural areas**

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean	1	0	4	1	6	4	20	5
Range	2	-	12	1	-	15	-	14
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean	15	1	2	3	0	5	15	0
Range	11	4	7	10	-	10	34	-

(STANDARD DEVIATION [ALL REGIONS] 6.90)

- 24 Educational attainment shows no correlation with forest type. There is no suggestion that communities better endowed with commercial species are investing logging remuneration in education. If we amalgamate the small hill and plains forest samples, the

range of children attending school goes from 78% in plains forests down to 45% under montane forest, hill forest occurring midway at 61% (Table 9). The number of graduates is similar across forest types, ranging from four graduates per community under hill forest, through five under montane forest to six under plains forest (Table 10).

Table 9 : Percentage school age children attending school

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean %	95	57	95	45	78	78	77	54
% Range	-	100	10	95	45	5	35	92

(STANDARD DEVIATION [ALL TYPES] 31.73)

Table 10 : Number of university educated individuals

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean	2	4	3.5	5	12	0	3	11
Range	-	35	1	12	10	0	9	20

(STANDARD DEVIATION [ALL TYPES] 8.07)

- 25 There is again no evident correlation between the percentage of children attending primary school and population density. While the highest density populations have the largest percentage of children attending school at 85%, the next largest at 65% occurs in the two lowest density population classes. It is not apparently that there are either proportionally more or fewer educational facilities in the most densely or sparsely populated areas (Table 11). The number of university educated individuals evidences some correlation with demography, particularly where above 50 persons to the square kilometre; the higher the population density the more graduates (Table 12).

Table 11 : Percentage of school age children attending school

Persons km ²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean %	85	59	43	64	58	35	65	65
% Range	20	60	85	97	85	99	95	66

(STANDARD DEVIATION [ALL DENSITIES] 31.65)

Table 12 : Number of university educated individuals

Persons km ²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean %	15	10	3	2	1	4	5	0.5
% Range	11	35	10	7	3	15	14	1

(STANDARD DEVIATION [ALL DENSITIES] 6.89)

Travel to Town

- 26 The time it takes to travel to the nearest town, calculated for the total sample, is on average twelve hours but the range of variation is large, from no time (adjacent to an urban centre) to five days. The differences between cultural regions reflect this variation, from forty-five minutes on the South Coast to two days in the Fly region (Table 13). The information on town travel times is difficult to evaluate comparatively because of the different means of transport people use. These predictably reflect geography with boats featuring in coastal and island regions, and on larger rivers too. Extent of vehicle use

indicates level of road development, which is quite extensive in the Highlands and some coastal locales, albeit poorly maintained.

Table 13 : Hours to nearest town

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean	48	8	6.9	7	3.25	15.5	4	1.77
Range	0	8	47.5	9	2.5	71	-	5
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean	2.33	45.66	13.9	19.25	4.5	0.75	3.38	13.5
Range	3	115.5	70	47	1	0.5	4.84	26

(STANDARD DEVIATION [ALL REGIONS] 21.57)

- 27 There is some variation when we look at the time it takes to reach the nearest town according to forest type (Table 14). Those with no extensive forests have the shortest journey times, on average two hours, the absence of forest resources probably relating to nearness to urban centres. Those living under hill forest have the longest journeys, on average just over sixteen hours (all hill forest types combined). Other forest types average between six and seven hours. There is no obvious forest-related explanation.

Table 14 : Hours to nearest town

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean	48	16	3	6	7	5	7	2
Range	-	120	3.5	47.5	11	-	9	3

(STANDARD DEVIATION [ALL TYPES] 21.63)

- 28 The time it takes to travel to the nearest town shows some correlation viewed according to population densities (Table 15). There is predictably some tendency for the higher populations to occur nearer to towns.

Table 15 : Hours to nearest town

Persons km ²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean	12	2	3	5	16	15.5	12	50
Range	28	5.5	6.5	11	47.5	47.5	47.7	116

(STANDARD DEVIATION [ALL DENSITIES] 21.64)

Migration

- 29 The percentage of the population of communities living elsewhere is 14% for the entire sample, but the range is considerable, as the differences between cultural regions shows (Table 16). The highest is Manus with 43% of the population living outside the home area, and the lowest is Vitiaz and the Sepik Hills and Plains both with only 6% on average. The majority of regions (eleven out of sixteen) fall within 4% either side of the average.

Table 16 : Percentage of population living elsewhere

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean %	10	14	17	18	43	10	12	18
% Range	0	26	38	13	13	19	0.5	20
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean %	14	18	14	6	13	25	7	6
% Range	25	30	25	20	19	-	14	8

(STANDARD DEVIATION [ALL REGIONS] 11.41)

- 30 When arranged according to forest type the range in migration is small, falling within a 5% band, from 13% under the various hill and plains forests to 18% under montane forest (the wetland exception is based on too small a sample to interpret). It suggests that there is no connection between migration and forest type back home (Table 17).

Table 17 : Percentage of population living elsewhere

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean %	10	13	19	18	18	3	7	17
% Range	-	37	28	48	25	-	2.5	29

(STANDARD DEVIATION [ALL TYPES] 11.41)

- 31 When viewed according to population density there is no apparent correlation with migration (Table 18). The more heavily populated places are not experiencing higher rates of out migration to ease any pressure on land and local resources. (Many of those living elsewhere are migrant workers, the majority of Papua New Guineans keeping up ties with their home communities).

Table 18 : Percentage of population living elsewhere

Persons km ²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean %	13	14	20	21	10	4	13	11
% Range	28	25	37	49	28	10	37	26

(STANDARD DEVIATION [ALL DENSITIES] 11.41)

Income

- 32 Migration rates only correlate weakly with annual rural household income, where remittances feature sometimes as a significant source of cash income. The mean annual rural household income for the entire survey sample is K545, but again the range of variation is large, from zero through to K4660¹⁰. There is considerable variation between different cultural regions (Table 19). Manus households enjoy the highest mean cash incomes at K2750. The Sepik Hills and Plains and Massim regions have the lowest at K140 and K142 per annum respectively. Most regions (twelve of the sixteen) fall below the total mean; six have mean household incomes of less than K300 a year.

Table 19 : Average annual household income

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean	200	650	785	175	2750	142	325	325
Range	-	1200	4645	50	-	250	250	50
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean	500	225	460	140	150	500	333	985
Range	300	350	700	280	150	-	200	2060

(Kina.yr⁻¹) (Standard deviation [all regions] 802.50)

- 33 When viewed according to forest types, average household incomes exceed the overall mean where communities are under lower montane and wetland forest (Table 20). Why is not evident, neither forest type attracts more commercial logging than others.

Table 20 : Average annual household income

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean	200	428	238	856	550	150	867	360
Range	-	2730	325	4645	500	300	1000	550

(Kina.yr⁻¹) (Standard deviation [all types] 802.50)

- 34 When looked at according to population densities there is no pattern evident regarding the average household income (Table 21). The communities of both highest density and lowest density occur about the mean, with no pattern to the spread. Prosperity does not seem to correlate with demography.

Table 21 : Average annual income

Persons km ⁻²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean	500	846	481	710	173	123	643	567
Range	300	4460	1150	2050	500	280	2650	1200

(Kina.yr⁻¹) (Standard deviation [all densities] 802.50)

- 35 There is a certain patterning to the sources of income by cultural region. Marketing local produce features prominently in the Highlands, occurring in 75% of surveyed communities, wage labour in 58%, coffee production in 42%, and remittances from elsewhere in 33%. Marketing and coffee likewise feature in the Highlands Fringe region. The two Sepik regions evidence considerable variability between communities, although marketing of local produce is common, cited for 57% of communities and trade store enterprises for 43%. The Vitiaz communities show some similarities with the Sepik ones, with cash crops prominent, notably copra and coffee production. In the Oro region marketing local produce, particularly betelnut, features in all communities, and remittances occur in 60% of them. In the Massim, South Coast and Gulf regions the sale of various artefacts is noteworthy, occurring in 63% of communities, and so is marketing of local produce at 50%; fishing and marine products are prominent in the first two of these regions, occurring in 66% of communities. The sale of crocodile skins is important in the Fly region, as is local labouring. In the Ok region mining payments are prominent and remittances too. Remittances are significant in the islands regions of New Britain, New Ireland and Manus, cited in 71% of communities; otherwise sources of income are variable with various cash crops cultivated in several of the communities. Cash crops are important in all of the North Solomons communities, as is marketing local produce.
- 36 There is less patterning to sources of income by forest type. The marketing of local produce predominates in all forest categories, featuring in 60% of montane forest communities, 75% of plains forest ones, 66% of wetland ones, 43% of hill forest ones and all of those communities without extensive forest. Remittances are significant in hill forest and lower montane forest communities (32% and 40%) and coffee in the latter too (47%). Otherwise, there is scant correlation between income source and forest type.
- 37 There is little correlation between population density and source of income. The marketing of local produce features in nearly all density classes. There is a trend for cash crops to feature where the population is heavier (between 30 to 500 persons per square kilometre), declining from 100% in the highest density class to 56% in the lowest. The trend with remittances is the reverse, with these more evident in the lower density groups of communities (from 2 through to 30 persons per square kilometre), where they

comprise 66% of community income. These trends support the suggestion made on the basis of the aggregated development indicators that the higher density regions show more local cash economic activity.

Development Indicators Rank Order

- 38 The average income of households is probably the single indicator that most closely reflects level of economic development, albeit crudely. Another way to compare all the regions is to calculate an aggregate rank order from all of the numerical data collected in the Survey¹¹.
- 39 According to this aggregate measure the Manus communities are the most developed, and the North Solomons ones the second, notwithstanding the insurrection problems at the time of the survey (Table 22). The third most developed communities are on the South Coast, followed by the North Coast, New Ireland and New Britain. The Sepik Hills and Plains are the least developed according to this aggregate score, followed by the Massim, Fly and Sepik-Ramu regions, all of which have scores broadly comparable to the Gulf, Highland Fringe, Ok and Oro regions.

Table 22 : Rank scores by cultural areas

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Rank Score	2.2	2.4	3.4	2.6	5.3	2.0	3.8	3.8
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Rank Score	4.4	2.7	2.9	1.0	2.3	4.1	3.7	2.4

- 40 The rank scores are considerably closer together when calculated according to forest type (Table 23). This suggests that the development indicators measured in this survey do not discriminate between communities living under different types of forest; they appear independent of one another, as already pointed out.

Table 23 : Rank scores by forest types

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Rank Score	1.1	1.5	2.0	1.9	2.2	1.0	1.5	1.9

- 41 When arranged into overall rank order according to population density, the communities show something of a trend (Table 24). The more heavily populated ones tend to be more developed than others according to the survey's indicators. It is perhaps expectable that more investment has occurred in heavily settled regions and development is more advanced there, although this trend is not consistent.

Table 24 : Rank scores by population density

Persons km ⁻²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean	2.5	2.8	1.9	2.5	1.0	1.0	2.4	1.5

Forest and Land Use (Part 1.2 of Survey Schedule)

- 42 The data on forest resources and land use confirm what is widely known for Papua New Guinea.

Land Under Forest

- 43 The percentage of community land under « primary » forest averages 63% for all regions, but with a large spread between communities from 1% to 100%. The Fly communities have most territory under forest at 97%, followed by the Gulf and Manus (Table 25). The lowest are the North Solomons (38%), followed by the Highlands, Vitiaz and North Coast (51%-53%).

Table 25 : Percentage of territory forested

	Fly	Gulf	Highland	Highland fringe	Manus	Massim	New Ireland	North coast
Mean %	97	83	51	58	80	63	75	53
% Range	3	25	89	60	40	70	-	10
	North Solomons	Ok	Oro	Sepik hills & plains	Sepik-Ramu	South coast	South New Britain	Vitiaz
Mean %	38	74	67	74	67	75	73	51
% Range	25	48	80	60	40	10	45	80

(STANDARD DEVIATION [ALL REGIONS] 29.12)

- 44 According to forest types, the variation in territory under forest is relatively small, suggesting that there is little correlation between forest type and area under forest (Table 26). Where forested areas are less, 53% of mean territory has tree cover (which compares with montane forest [55%] and plains forests [57%]), and where it is higher, 69% of mean territory is forested (under the different hill forest communities).

Table 26 : Percentage of territory forested

	Large crown hill forest	Med crown hill forest	Small crown hill forest	Lower Montane	Large medium crown plains forest	Open plains forest	Wetland forest	No large forest
Mean %	95	68	65	55	53	60	75	53
% Range	-	90	30	99	45	40	35	70

(STANDARD DEVIATION [ALL TYPES] 29.12)

- 45 The percentage area under « primary » forest evidences some inverse correlation with population density (Table 27). It declines as population increases; predictably, as numbers of people increase so pressure on forest resources increases. Regions with densities between 30 and 500 persons per square kilometre have on average less than 60% of their territories forested, whereas those between zero and ten have over 70% under forest.

Table 27 : Percentage of territory forested

Persons km ²	100-500	50-100	30-40	20-30	10-20	5-10	2-5	0-2
Mean %	58	47	57	61	62	89	72	79
% Range	60	89	80	90	80	20	55	48

(STANDARD DEVIATION [ALL DENSITIES] 29.12)

Forest Use

- 46 The uses to which people put their forest is similar nationwide, it evidences little patterning by cultural region. In the Highlands and Highland Fringe regions hunting and gathering predominate as the major use (83% and 100% respectively of communities in each category), followed by supply of house construction materials (both 66%) and swidden sites (42% and 66%). In the Sepik regions hunting and gathering predominate (100%) again followed by supply of housing materials (71%). The same pattern

characterises the North Coast, Vitiaz and Oro regions, hunting and gathering reported for all communities and house construction for many (66%, 50% and 80%), the supply of medicines is also noteworthy in Oro (60%). Similarly in the South Coast, Gulf and Fly regions hunting and/or gathering is evident everywhere, followed by collection of house construction materials. All of the island regions follow the same trend with regards hunting and/or gathering (Massim 75%, South New Britain 66%, North Solomons and Manus 100%), but no other uses occur consistently (house construction materials in the Massim and North Solomons at 75% and 66% and medicines in the North Solomons at 66%).

- 47 There is again little patterning evident to forest resource use according to forest type, with the same few uses recurring in all forest classes. People hunt in 89% of hill forests, 80% of montane forests, 75% of plains forests and where no large forests occur, and 66% of wetland forests. They rely on the forest to supply them with house construction materials in 61% of hill forests, 67% of montane forests, 75% of plains forests and where no large forests occur, and in all wetland forests. Gathering features in 39% of hill forest communities, 50% of those with no large forest reserves, and all plains and wetland forests. They use forest sites for new swidden sites in 32% of hill forests and 47% of lower montane forests.
- 48 There is some patterning to forest use and density of populations. The likelihood of hunting increases where population is lower: 92% of communities between zero and 20 persons to a square kilometre engage in hunting compared to 73% between 20 and 500 persons. There is scant correlation with other significant uses. According to these two broad density classes, 33% and 30% respectively clear forest for new gardens, 63% and 69% collect house construction materials there, and 50% and 42% gather wild plant foods.

Cultivation

- 49 The crops cultivated in different cultural regions evidence a certain expected pattern, crops correlating to some extent with culture. Sweet potato is the staple throughout the Highlands region, although other significant crops vary considerably (with bananas in 42% of communities, green vegetables in 33% and taro in 25%). Sweet potato is the North Bougainville staple too. Sago is the staple in the majority of Sepik communities (71%) and all North Coast ones (100%), with bananas second in occurrence (71% and 66%), and taro third (43% and 66%). Sago is the Fly staple too. Tubers predominate in the Vitiaz and Oro regions with taro (75% and 80%) and sweet potato (75% and 80%) more or less of equal importance, followed by bananas (50% and 80%). In the Massim tubers also dominate with yams, taro and sweet potato listed for all communities. In the Gulf, Chinese taro is the staple, followed by sweet potato. The crops listed for the other regions evidence no patterning of occurrence.
- 50 Crops also show a certain correlation with forest type. The sweet potato predominates under lower montane forest (93% of communities), with various green vegetables next (43%) followed by bananas (36%). Taro is the commonest crop under the various hill forest successions (69%, including Chinese taro), followed by sweet potato (55%) and then sago and bananas (both 45%). Bananas occur in all communities under plains forest and wetland forest, followed by sweet potato (75% and 66%). People depend heavily on tubers where they have no large forests, all such communities cultivating sweet potato, followed by yams and taro (both 80%).

- 51 Crops also show a certain patterning according to population density. The sweet potato, while it occurs across the range, declines in prominence with population. It occurs in 87% of communities with 30 to 500 persons per square kilometre and 58% of those between zero and 20 persons. Sago is the reverse, not occurring in communities with densities above thirty persons to a square kilometre, whereas it features in the diets of 50% of those between zero and twenty. There is scant patterning with any other major crops; bananas and taro occur in communities across the demographic range, bananas occur in about 50% of communities in each class and taro between 50-75%. All other crops evidence a random spread.

Commercial Logging

- 52 Experience of commercial logging evidences no patterning when viewed according to cultural regions. In seven of the fifteen regions, no communities have any experience of timber exploitation. In the other eight, only one or two communities in any region have experience of logging operations. Only ten of these communities had commercial logging occurring on their territories (eight more were at the discussion stage).
- 53 The occurrence of large-scale logging evidences a certain patterning according to forest type. It is largely concentrated in the hill forests where 42% of communities report some experience of commercial timber operations (19% at the discussion stage). Only 13% of communities in lower montane forests have any experience of logging, and none in the plains forests nor, predictably, where there are no large areas of forest.
- 54 There is also a certain trend evident between commercial logging activities and density of population. The lower it is the more likely logging is to occur; 44% of communities with between zero and ten persons to a square kilometre report some logging activity, compared to 28% with between ten and five hundred persons (some at discussion stage only). This suggests that sizeable areas of commercially exploitable forest are more likely to occur where there are fewer people, which may indicate less human interference with the forest.

Figure 1 : Temporary access road through logged medium crown hill forest

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Figure 2 : A pile of logs awaiting transport

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Figure 3 : A logging camp, Bewani region, West Sepik Province

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Figure 4 : A tractor loading an articulated timber transporter

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Figure 5 : Transporting logs to docks for shipment

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Figure 6 : Piles of logs awaiting shipment, Vanimu docks

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Forest Management Issues (Part 2 of Survey Schedule)

- 55 This part of the questionnaire invited comments and discussion of topics relating to community attitudes to forests, resources use, conservation and logging (Table 1); as commentaries, they do not lend themselves to statistical analysis.

Local Classification of Forest Land

- 56 There is, predictably, considerable variation in local classification of forest. There is a continuum, broadly speaking, from those who do not apparently differentiate between forest communities. Through to those who have a straightforward classification, distinguishing for example, between primary and secondary forest. To people who have elaborate classifications of forest vegetation.

Hunting of Wild Animals and Birds

- 57 Hunting features in the lives of people throughout PNG. But nowhere is hunting and gathering the primary means of subsistence; not even in low-density population regions, where residence has some semi-nomadic aspects to it. The extent to which hunting occurs varies, as do the species hunted, largely by region. There is some cultural patterning to the animals that are highly valued, which may supply items for making valued objects such head-dresses and other decorations. Regardless of these variations, there is an underlying similarity to hunting regardless of culture, forest type and population.

Harvesting of Wild Plants and Other Raw Materials

- 58 The harvest and use of wild plant materials from forests features prominently throughout PNG. Their use falls into four principal categories: food, medicines, firewood and raw materials (used to make artefacts, including house construction).

Other Activities in Areas of Primary Forest

- 59 Other activities undertaken in forests include clearing areas for swidden gardens and tending trees that yield edible fruits and nuts. Some people also perform rituals (such as initiations on young men), practice magic and undertake other secret activities in parts of their forest.

Traditional Forest Management

- 60 Intentional forest management is uncommon in PNG. In many regions, people treat the forest as an abundant source of resources that they exploit with little regard to its management. The related idea of forest conservation is undeveloped too.

Commercial Value of Forest

- 61 The principal commercial value of forest is timber, notably valuable tropical hardwoods. Other marketable materials include rattan and consumables such as betel. The forest may also potentially yield compounds of medicinal value with pharmacological research. Animals offer commercial opportunities too, both for locally valued products such as plumes, and for internationally valuable species such as rare butterflies. There is also a potential for tourism, notably eco-tourism with international travellers wishing to visit unspoilt rainforests such as currently cover large areas of PNG. In many places, people are unaware that they might commercially exploit their forest resources in any of these ways. The ignorance is not restricted to certain regions, even those with considerable outside links and experience of the wider world may be ill informed.

Major Land Use Decisions

- 62 Varyingly constituted local social groups make decisions about the use of forested land throughout PNG. The commonest group cited in survey returns is the clan, sometimes the family. The clan comprises a group of kinsfolk, usually defined preferentially as patrilocal (comprising kin related through males), although in some places there is a matrilineal preference (related through females). Whatever the ideological preference, these groups typically comprise a bilateral mix of kin (fathers' and mothers' kin, plus probably some affines). There is no regional patterning to the dominance of the clan as the decision making group, although there is an anthropologically well-documented cultural patterning to the variation in the kin ideology underwriting clan composition. It is unusual for individuals alone to have the authority to make land use decisions, particularly over extensive forested tracts. The decision making process is frequently fractious; particularly when it involves many persons, as frequently happens with large areas of forest. Disputes often occur. In many regions, reaching decisions about the commercial exploitation of large forested tracts is difficult because they overextend customary decision-making processes, people never previously having to agree to such exploitation of extensive areas of forest.

Generational Differences in Attitude and Practice

- 63 There is considerable variation reported across PNG in attitudes to conservation and development by generation, both between communities in different places and within communities, underlining again the recurring theme of the country's cultural heterogeneity that makes generalisation on forestry, conservation and other issues hazardous. In some places, people give no thought to conservation whereas in others they are acutely aware of it, although frequently at a loss as to how to achieve it. In some communities, there are generational differences in attitudes to conservation and development giving rise to some tension between younger and older people. It is not the same generation, young or old, that favours conservation everywhere. The one theme on which there appears to be near unanimity is the desire for development, expressed largely as a wish for better access to manufactured goods. While people talk about urgently needing development, they are often unaware that some of the effects may be negative.

Gender Differences in Attitude and Practice

- 64 There is also wide variation in differences between men's and women's attitudes and practices towards conservation and development. In some places, there is little or no gender difference. Where differences occur they are sometimes attributable to cultural arrangements of long-standing, such as the sexual division of labour that structures production throughout PNG. The part women play in making decisions about use of forest resources varies from marginal through equal partners to being pivotal, even dominating discussions. They commonly exert a degree of influence, albeit often informal, over male dominated decision-making, and in some places have recently organised themselves into women's groups to exert leverage. The questionnaire returns indicate that differences between women and men are not so pronounced in many places as those between younger and older generations.

Concepts of Sustainable Development

- 65 The idea of sustainable development, as a western notion, is uncommon in PNG. Nevertheless, the idea that the exploitation of natural resources should be measured and not overly destructive is widespread, with notions of sustainability implicit in customary lore. People become acutely aware of sustainable development issues and talk of threats to their environment where damaging developments have occurred, such as commercial logging or mining. In some places they are also aware of the threat their activities pose to the environment, particularly where populations or cash crop cultivation are putting pressure on land resources. While the environmental debate is mute throughout much of the country, outside agencies, including evangelising NGOs, local radio and television are increasingly raising awareness of related issues.

Impact of Government Policy

- 66 The impact of government forest and environment policy is minimal throughout most of PNG. People know little about such policy, and where they do know something, it is frequently confused and ill informed. In many regions, they do not regret or worry about this ignorance, taking the view that the government has no right anyway to legislate about the use of natural resources on their land. They believe that local landowners should make decisions about their forests without government interference. If they know of government legislation and its conflicts with their locally perceived interests, they usually ignore it. In places where they acknowledge the government has some role, it is as defender of their rights as landowners, against what they think are duplicitous and corrupt foreign timber companies. But the experience many have of central government makes them unoptimistic. There is a widespread impression that it is either weak and incapable or self-seeking and corrupt, a reflection of the virtual collapse of the state evident across much of the country.

Incentives for Conservation

- 67 The over-riding impression from the questionnaires is that the issue of conservation incentives is largely academic. Several respondents point out that until communities are approached to gazette land for protection no one can know what their responses might be towards conservation proposals, and what might induce them to set forested land aside as conservation areas. Again, in keeping with PNG's socio-cultural variety, some think that communities will readily embrace such ideas, while others argue the reverse. There is some correlation, as pointed out, with experience or knowledge of large-scale logging operations. It is widely agreed that rural people are largely unaware of conservation issues, and campaigns to raise awareness should be seriously considered. Another common theme in responses is that people will need to be adequately compensated with alternative commercial and infrastructure developments for giving up forested land for conservation. But buying landowners off is likely to be fraught with problems, demanding education and painstaking negotiations to establish long-term agreements over giving up control of access to forest resources.

Forest Use, Conservation and Development

- 68 A review of the points discussed under forest use, management and development in the Survey suggests that attitudes to, and understanding of issues pertaining to the sustainable exploitation and conservation of forest resources vary along two principal axes. One is the extent to which communities have direct or indirect experience of logging activities on their land, and the second is the extent to which exposed to debates about commercial forestry, primarily through some members having higher education or entering occupations that raise awareness of these issues.
- 69 At the one extreme, there are those communities with little or no exposure to commercial forestry (through either logging or education), which we may gloss as subscribing largely to intact local views of forest resource use and conservation. These views remain pertinent even where people have had exposure to market driven logging, for they comprise the cultural background that informs their responses. The Survey responses are striking in uniformly declaring that overt notions of forest conservation are traditionally absent. As one respondent put it for the Kela speakers of the Huon Peninsula:
- « the term 'sustainable development' elicits no recognition among village people. However, the concept of a perpetual forest resource that in some ways can attract cash income and community benefits and improve their quality of life has been established. This has come mainly from awareness raising interventions by officers of the Village Development Trust. [...] Underlying concepts implied by sustainable development such as the notion of current human behaviours not compromising opportunities of future generations to enjoy similar or improved quality of life is not embodied in villagers understanding of the development/conservation coupling ».
- 70 The implication is not that people are reckless in their exploitation of forest resources. A regard for their sustainable use is evident in various customary expressions. On the Trobriand Islands, for example:

« there is no definition of sustainable development but it is implicit in the livelihood of people. There are several phrases/words/idioms which may suggest it too. These include **simwamwa** – something left for later; **kuleya** – food left over for the next day's use; and **kobwaga** – part left/part used. What characterises these words is the idea that something is partly used, not all of it. Hence sustainability exists within indigenous cultural precepts ».

- 71 The use of forest resources also shows a respect for sustainability. It comprises three classes of activity: clearing for food gardens, hunting and gathering, and collecting raw materials for making artefacts and constructing houses. Shifting cultivation is the norm throughout PNG for subsistence crop production. There are many references to people farming in a way that ensures rapid re-establishment of forest cover upon abandonment. Among the Orokaiva:

« the most important traditional practice, with the unintended effect of conserving forest resources, was the periodic shifting of garden and settlement areas. Shifting agriculture requires considerable land for a given population, and does not encourage conservation of primary forest, but it allows fallow areas to mature until the understory naturally thins (when the land is easier to clear), and this preserves habitats for many wild plants and animals in a rotating way. Where gardens are permanent, as they are with cash crops, there is no forest at all, the land ceases to support a cycle of forest clearance and regeneration ».

- 72 Also notable are references, particularly among national respondents, to beliefs in supernatural denizens of forests and sacred sites acting to effect a measure of forest conservation. The Wola people of the Southern Highlands Province (see also Sillitoe 1993) say that:

« two kinds of demon inhabit the forests of their region, one at lower altitudes called **iybtit** and the other at higher altitudes called **saem**. They may attack human-beings and cause sickness, even death, and so prompt people to act with some circumspection, particularly in remote forested places where there has been little interference, which could be dangerous. But these beliefs reveal an ambivalence that warns against a simple equation with western conservation concerns. They may prompt in people a desire simultaneously to keep the forest at bay, and hence the spirits too, which they may do through clearing it for cultivation and settlement, further encouraging piecemeal encroachment upon forest as population expands ».

- 73 The apparent capacity to throw to the winds traditional expressions of sustainability and practices that promote conservation is evident when, and if, the opportunity comes to cash in on forest resources with logging projects. Several respondents referred to local peoples' willingness to see logging developments in their regions. For example the Kubo of the western Province:

« have heard that timber has commercial value. They talked of making contact with individuals at Kiunga who they believed had the 'knowledge' to encourage timber companies to develop 'business' within their area; they spoke of raising funds that would be used to bring in a 'company' into their area. At the present time the members of Kubo communities would be far more attracted to offering land to logging companies in the expectation that the monetary return to them would be high than in setting aside land for conservation purposes. They have little idea of, and as yet little need for, western notions of conservation ».

- 74 When such developments occur we move to the opposite end of our continuum regarding perceptions of sustainability and conservation. People predictably are acutely aware of the benefits and costs of logging, and the implications of unsustainable development (see also De'Ath 1980). In the Vanimo region:

« after logging operations people now recognise the threat to the maintenance of their land and forest resources. They are now concerned that the exploitation of their forest is destructive. It has resulted in the loss of game and despoliation of hunting grounds. The benefits were substantially less than anticipated from the project. They wish to see their forest land left alone and not logged anymore ».

- 75 The survey return for the Wawoi Falls, where considerable logging has occurred, elaborates on these views:

« concern with reforestation is expressed in phrases that highlight the fact the logging company will 'finish' all the landowners trees and then, as they have seen happen elsewhere, they will have no 'way' or 'path to get money'. Talked about in this context there is strong concern that the loggers plant new trees. These ideas do not come from any understanding derived from the traditional subsistence economy, nor do they correspond to ideas associated with sustainable development. They reflect a concern with maintaining continuous access to previously unparalleled amounts of money, a fundamentally different notion to small scale sustainable development ».

- 76 The survey evidence suggests that education about conservation and sustainable development issues has a limited impact, restricted largely to those who experience the education and have a predisposition to internalise its message (perhaps manifest in their selection of courses with a conservation component). Otherwise, the evidence suggests that people only learn by direct experience of logging, when lured into granting leases by the promise of large financial payments. On Woodlark Island, where such logging has occurred:

« during a 1994 Student Awareness Campaign, many local people realised the existence of particular threats to the maintenance or reproduction of their forest resources. During the Awareness Campaign, the people were introduced to the modern idea of 'sustainable development'. One problem is that the local people see university students as smart, up to clever tricks that will stop the loggers and miners so that they will lose their cash earnings from royalties. The people know that government policy requires loggers, when logging begins, to pay them royalties ».

Survey Conclusions and Recommendations

- 77 The survey confirmed that the cultural variability that characterises PNG, for which it is renowned in the ethnographic literature, continues currently, even with extensive social change during the last century, to shape contemporary responses to issues, both old and new, such as forest use, conservation and sustainable development. This variability has considerable implications when considering policy issues at a national level because in some senses this demands a degree of generalisation that may unacceptably distort and reify, vitiating any policy recommendations. Policies on forests, conservation and sustainability that are applicable to all of PNG are consequently likely to be the exception not the rule and any attempt to impose policies across PNG, even if politically feasible, will probably be unsuccessful – the current weak state may be an advantage here. It would be unwise to invest large resources in seeking general solutions to regional problems. What may seem sensible policy initiatives in one region could prove inappropriate, even disastrous elsewhere. This reaffirms a general message of IK research regarding socio-cultural specificity and relativity, one that gives considerable problems in development contexts that expect nationally if not globally relevant generic answers to policy questions (Sillitoe *et al.* 2005 : 22).

- 78 The attempt to disaggregate the data according to cultural regions, forest types and population densities proved largely fruitless (see Sillitoe & Filer 2014 for an attempt further to correlate findings with farming systems survey data). While there are some correlations, many of these are obvious and there are no systematic patterns overall. Awareness of conservation issues and sustainable exploitation of forest resources is understandably sharpened, for instance, where people have experience of commercial logging, and such logging occurs in certain forest types that have substantial stands of marketable timber, and not in others. But this correlation is analytically insubstantial, telling us little more than people living in regions where forests contain little marketable timber are unlikely to be troubled by logging companies in the foreseeable future, and that any threat posed to the forests in these regions will come from the people living there. This is evident in places with high population densities, such as parts of the Highlands, where forest resources are under considerable pressure with increasingly large numbers of people. Beyond correlations of this kind, no others, more thoroughgoing, are evident. It is not apparently the case, for example, that people classify or use their forest resources systematically in different ways according to their culture, forest or demography, nor respond differently to logging opportunities.
- 79 There is little evidence of a traditional conservation ethic nationally, comparable to western notions of conservation and sustainability that might be built upon to advance protection of forests and biodiversity (see also Bulmer 1982 ; Dwyer 1982 ; Waiko & Jiregari 1982 ; Sillitoe 2001 ; West 2006). While there is evidence of conservation concerns in some traditional ideas and practices, many of these have been abandoned in the face of Christian missionary evangelism (i.e. those associated with traditional spirit beliefs, rituals and sacred locales). Others remain extant and might usefully be explored with a view to building on them in the changing world (e.g. local land management and agricultural practices). In many regions, people are ignorant of the long-term consequences of logging on forests.
- 80 In the absence of any conservation and biodiversity ethic that may counter the pressures of logging, awareness programmes are necessary. These should address both the costs and benefits of commercial timber extraction, to give people an even-handed view from which they may make their own informed decisions (balancing environmental damage with financial gains, infrastructure developments etc.). The best use of limited financial resources is likely to be through investing in education and not policies of centralised protection and conservation programmes that the administration is unlikely to be able to police effectively given the weakness of government in several regions of the country. Local landowners control access to natural resources on their land and are the ones education should target, as the effective decision makers. However, informing the entire nation about logging and conservation would be expensive. The government might contemplate devising a targeted programme, perhaps establishing extension teams to educate people in regions liable to logging about the implications.
- 81 Any policy that addresses conservation and biodiversity concerns alone, not in association with development, is unlikely to meet with success. There is a widespread desire for development across PNG – which equates with access to manufactured goods and built infrastructure – and an increasing perception that it is failing to happen, which may prompt people to spurn conservation concerns if they think these conflict with development (Filer 2004). Consequently, agencies should give attention to devising projects that combine development with a conservation ethic, such as eco-tourism,

sustainable resource extraction etc. (Ellis & West 2004 ; Wagner 2007). But eco-tourism will only be possible in a few locales and is unlikely to prove successful currently with the country's international image as a lawless and dangerous place.

Problems with IK Surveys

- 82 These mundane conclusions and recommendations may convince advocates of IK research that the survey approach is not the route to take in seeking to gather information at a national level of the sort that could inform policy decisions. The Rural Community Survey highlights several further problems with this approach. They echo a number of well-rehearsed criticisms of surveys of this kind, such as the rigidity imposed on enquiries by a questionnaire; the manner in which the questions on a survey schedule call forth certain responses; the reliability of, and variability between respondents; the assumption that the designers of the survey know what questions to ask; and so on (Groves 1989 ; De Vaus 2001 ; Groves *et al.* 2009 ; Henninger & Sung 2012 ; Stalans 2012).
- 83 A problem with mailed, and today emailed, surveys is our inability to ensure that respondents complete the questionnaire properly and answer all questions (according to Craig & McCann 1978 this is not related to questionnaire length, a possible issue with our survey, but personal factors). They may misinterpret questions or not give them much thought if in a hurry to complete the schedule; for example, someone scribbling away on the train on the way home one evening is unlikely to give it the same concentration as someone who takes it to the library. Or respondents, keen to complete the questionnaire, may resort to guesswork, which can be a problem with surveys (Hawkins & Coney 1981 ; Schneider 1985). Some responses may consequently be difficult to evaluate: such as the answer « several » to the question « number of university graduates in community » or « fairly » in answer to the question « how important is hunting to the community? ». And it appears that respondents have interpreted the question about the percentage of a community's land covered by primary forest differently – or misunderstood it – with values ranging from less than 1% to 100%! (See Sillitoe & Filer 2014 for further discussion of discrepancies in responses). Furthermore, a questionnaire may lack sufficient flexibility to catch significant nuances of opinion, unlike when an interviewer is present and can ask further probing questions if the respondent's answer or manner suggests that there is something more to know.
- 84 The differing backgrounds of the respondents to the Survey call for some comment. There are some noticeable differences when reading the survey returns according to respondents' backgrounds whether overseas (largely western) researchers, PNG nationals (students or NRI research staff), or missionary translators (again Westerners). It would demand a separate and potentially fascinating study to analyse for systematic differences, and possibly others according to gender, age, nationality and so on (Ellis 2000). The differences could potentially be of some methodological significance.
- 85 There is an argument for restricting such a mail survey to certain « experts » to contain any systematic bias between the returns for different communities (Finn *et al.* 1983). The survey's original design partly reflected this with the main group of respondents compromising social scientists, notably anthropologists (or others who work in local communities using an anthropological approach whatever their nominal disciplinary allegiance) arranged as a stratified sample to ensure coverage of all regions. This strategy has a number of advantages (Strathern 1975 : 8-9). These include a focus on researchers

who can relate readily to IK issues on forest use and conservation of interest to the survey, and are likely to be aware of social change issues, such as induced by logging. They are also likely to be generally disinterested in the commercial and wider political forces behind logging. It is probable that respondents who all speak roughly the same academic language will interpret/misinterpret questions in similar ways so ensuring a consistent bias between returns. The experience they have of local communities is a sure way of effectively accessing grass-roots behaviour and attitudes quickly and bringing these formally to the attention of policymakers. In brief, it facilitates a degree of participation difficult to achieve for the same cost and in a short time scale.

- 86 The drawbacks to this approach include giving too much authority to one group of « experts » and their particular disciplinary views. It is arguable that their narrowness will reduce the pertinence of the data. The small-scale studies of anthropologists rarely extend to large-scale problems, such as forest conservation nationally; they usually have little interest consequently in policy related issues. Parochial matters more interest them, which, while a strength in assessing grass-roots opinion and ideas, is limiting in wider strategic planning contexts. They might place too much value on traditional ways, even to romanticise indigenous knowledge and practices. These assumptions are difficult to evaluate. If we take the last issue of romanticism, a review of the survey forms suggest that PNG nationals are as inclined to place a high value on their ancestors' ways; they talk, for example, in positive terms about ritual observances that had some conservation implications (e.g. tabooing the use of certain resources at some times). The missionary respondents, on the other hand, predictably overlook any practices that smack of non-Christian beliefs, even disparaging ideas about local spirits. This example illustrates the kinds of biases that respondents with several different backgrounds may introduce into a survey, which when applied irregularly to a sample results in unknown and uncontrolled bias.
- 87 Whatever, the low and skewed response rate derailed the original stratified design to canvas experts. The low response rate – a disappointing 24% for experts – is a frequently cited disadvantage with mailed questionnaires (Scott 1961 ; Bailey 1978 : 136 ; Babbie 1973). Response rates as low as 10% are known, and some commentators think that a response rate of 50% is adequate (Babbie 1973 : 165), or at least is the best that we can realistically expect without vigorous follow-up letters urging a response (Bailey 1978 : 153), which is more practicable with email (Fricker 2008 ; Mesch 2012 – so long as one is thick skinned enough to hound colleagues). We might perhaps anticipate a higher response rate than normal from a survey of professionals on a subject closely related to their work, than a survey of the wider population. The consensus is that the more interested persons are in the subject the more likely they are to respond (Scott 1961). Those who belong to special interest groups usually make good respondents not only because of their interest in the topic, but also because they feel loyalty to the group surveyed and may feel guilty if they default. If we discount those schedules that were mislaid in the mail (delivered to the wrong addresses etc.), the worry is that the non-responses are not random but are biased in some systematic manner.
- 88 The issue of non-response is a critical one in survey work, which can bias returns in difficult to assess ways (Armstrong & Overton 1977 ; Goodstadt *et al.* 1977 ; Billiet & Matsuo 2012). It is possible that the schedules reached over-burdened academics at a busy teaching time of the year and they put them to one side and failed to complete them when they may have some particularly rich data on the topics surveyed. Or maybe only

those who feel strongly about deforestation and conservation bothered to reply, giving an overly « green » aspect to responses. The poor response probably reflects in part the increased pressures that academics work under, many of them now lacking the time to co-operate in this kind of survey (Kaner *et al.* 1998), although the majority of researchers would doubtless like to assist the communities they know by supplying pertinent information. Some replied that they did not have sufficient information meaningfully to complete the schedules. Others may have had the reverse problem, namely too much knowledge, the simplified format of the survey preventing them from addressing issues as they thought fit and in sufficient depth to do them justice (although we did invite researchers to give references or send publications where they discuss the issues). They may have pondered and put off completing the form until too late. Yet others possibly saw no immediacy to filling in the schedule and so pushed it to the back of the queue of work, again until too late to co-operate. Nonetheless, if PNG research organisations are going to rely on surveys of this kind in the future to gather information for policy formulation purposes, the government might consider writing into research visa application procedures a strongly worded clause about the nation expecting those granted visas to co-operate in such surveys, if not making it mandatory for further research visas.

- 89 We should set against these disadvantages, the advantages of a mail survey (Bernard 1995 : 260-262). These include the cost: it is considerably less expensive to mail questionnaires than have interviewers travel to administer them. This would be prohibitively expensive with an international group of experts, as here. Furthermore, there is no danger of interviewer bias with voice inflection or whatever (a particular danger interviewing social scientists trained to identify these), and respondents face exactly the same wording in questions. They can complete the questionnaire at their own convenience, perhaps tackling different questions at different times, and they have the time to consult field notes and other records before replying. Furthermore, one « can ask more complex questions with a self-administered questionnaire [and] [...] long batteries of otherwise boring questions that you just couldn't get away with in a personal interview » (Bernard 1995 : 260).
- 90 An alternative, as mentioned previously, is to train a team of interviewers to visit communities directly, which would be even more expensive. In not only salary and travel costs but also in training interviewers, which can be expensive and time consuming, as Jenkins *et al.* 1994 report in their sexual behaviour survey. Such a survey is liable to all the well-documented shortcomings of rapid rural appraisal (Sillitoe *et al.* 2005 : 46-47); the results will be superficial compared to those possible approaching persons who have spent years living in communities researching environment related topics. Today, email and internet surveys can further increase some of the advantages of the mail survey; for instance they reduce costs considerably, not only in doing away with having physically to mail questionnaires but also greatly facilitating subsequent data analysis with web based electronic schedules disposing of the need for data input (Dillman 2006 ; Vehovar & Manfreda 2008 ; Bethlehem & Biffignandi 2012 ; Mesch 2012).
- 91 From these comments on the advantages and disadvantages of the methodology employed here, it is clear that the survey makes no pretence at an in-depth statement on the problems of forest exploitation and conservation in PNG from a grass-roots perspective.

Surveys and Distortions of IK

- 92 These comments on the survey methodology and its impact on the results relate to the issue of its relevance for assessing local knowledge and opinion. There are several contentious problems generally in accessing this knowledge that a survey approach may exacerbate. An overly academic approach to IK research, such as a formal survey, is contradictory, aiming to record systematically for policy and development purposes what is essentially fragmented, dynamic and discontinuous (Warren *et al.* 1995 ; Berkes & Berkes 2009). The management and storage of IK through surveys and in databases may be criticised for divorcing it from peoples' everyday lives, where it gains meaning, and being non-responsive to their needs (Agrawal 1995). The survey defines what is useful in an ethnocentric manner, threatening to disenfranchise the original owners from their knowledge and fuelling contemporary heated debates on indigenous intellectual property rights. This exacerbates the point that we “have no control over how people interpret questions on a self-administered instrument . . . the danger [is] that respondents will be forced into making culturally inappropriate choices in closed-ended questionnaires” (Bernard 1995 : 261-62)
- 93 Furthermore, such research is an attempt to archive and ‘essentialise’ for manipulation and transfer what is vital and dispersed. It is to immobilise and emasculate it, paralyzing the living system that comprises local knowledge. This approach has to beware of the danger of repeating the error of earlier ethnographic work that presented other cultures as bounded, static and timeless, overlooking how knowledge changes and progresses as people use and reflect on it. This is particularly so when they are confronted with rapidly changing contexts, as occurs when logging enterprises arrive and offer communities unheard of sums of money to fell trees, and people have then to cope with the sudden wealth and the aftermath of such activities. In other words, the data discussed here relate to a selection of communities for the mid-1990s and can be expected to change rapidly with continuing levels of current logging activity.
- 94 The documentation of knowledge that depends in large measure on experience and skill – such as that pertaining to the use and management of forest resources – threatens misplaced abstraction. It is intrinsically interactive, drawing on multiple domains environmentally and culturally (Richards 1985). The inevitable distortions that creep in with translation from one culture and language to another compound this, as do the further transformations that occur given researchers’ biases, their assumptions and agendas informing the answers they give to questions, particularly in development contexts (with their ideologically and politically influenced goals). It is probable, for example, that the majority of western respondents to this Survey have ‘green’ inclinations and think that conserving the rainforests of PNG is a positive goal. Whereas the behaviour of many local people, in accepting the financial inducements of the logging companies, apparently think otherwise, valuing more the ‘development opportunities’ that they think this cash will bring to them – in the short term anyway.
- 95 The tendency to reduce others' knowledge to packages of practices or ideas culturally out of context, whether derived indirectly from surveys as here or more directly through fieldwork, which can be passed on to various authorities to manipulate and draw on for policy ends, threatens to deprive it of creative agency and potential (Brosius 2006). It thwarts participation as it separates people from their knowledge, which others

represent and deposit beyond their reach in inaccessible survey reports. We must beware of development agencies legitimating their interventions by promoting the appropriation of others' resource management knowledge and practices to use (and possibly abuse or at least manipulate) in further disguising the imposition of top-down plans and control. Whether we agree with the aims of agencies, as they match our values, such as conserving the world's rainforests and biodiversity, or not, such as imposing capitalist market solutions on those who wish to maintain their subsistence independence, it amounts to the same thing. It perpetuates the current day development 'crisis', undermining radical empowerment alternatives.

- 96 The trend of this chapter is generally down beat and I am asking myself how I can finish on an upbeat note. We can see that we face considerable methodological challenges in getting grass-roots opinion into policy contexts, seriously challenging the idea that IK comprises a stock of knowledge that we can document and analyse, and manipulate locally, let alone transfer and use elsewhere. The question is how to understand and present IK, and relate it sympathetically to policy makers as they attempt to intervene positively and help with the problems facing rural populations, whether these relate to deforestation and conservation or other issues. There is a need to gather information at a national level to inform policy decisions with local knowledge – anecdotes about the practices of the Bonbobongo do not carry sufficient weight. How can we improve on the survey instrument and what other approaches might we advance? These are worthwhile challenges and interesting times if you believe in the value of IK, as I do, and that it should feature in policy-making that affects people's lives.

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NOTES

1. I presented a version of this paper as the 2007 Kew Global Diversity Foundation Lecture at Kew Botanical Gardens, London, and at the conference from which this book comes at the Musée de l'Homme, Paris, and I thank those at both events for their helpful comments.

2. The Barnett enquiry prompted the PNG Government to formulate a national forestry policy and introduce the Forestry 1991 Act (Barnett 1992), and there have been subsequent, largely ineffective, legislative attempts to stop illegal logging (Bird *et al.* 2007a ; Schloenhardt 2008 : 70-74).

3. It was managed by the Forestry and Land Use Programme of the London-based International Institute for Environment and Development (IIED) and was funded by the Netherland's Ministry of Foreign Affairs and the UK's Department for International Development. It was managed locally in Papua New Guinea by the National Research Institute.

4. The original design of the Papua New Guinea country case study was put together by a « core group » that comprised: Colin Filer (PNG National Research Institute), Nikhil Sekhran (PNG Conservation Resource Centre), Brian Brunton (Greenpeace) and Basil Peutalo (WWF-PNG). I am grateful to Colin Filer for inviting me to manage the survey and analyse the data – while a visiting professorial fellow at the National Research Institute, Waigani; see Sillitoe and Filer (2014) for further reflections on the survey. I wish also to thank National Research Institute researchers, Roselyn Kenneth and Rodney Kamisata for assistance with compiling tables, and secretaries Kani and Marilyn for help with typing. And Jacqueline Sillitoe for editorial assistance, and those respondents who took the time to complete and return the survey schedule (see Sillitoe 1999).

5. Prior to 1996, the year we sent out the questionnaires; I summarise the findings here (see Sillitoe 1999) as not only of some continuing interest but also as a vehicle to explore issues around using surveys to access IK on mass.

6. We followed Bruce Beehler's (1993) division of the country into thirty 'biogeographic districts' in preference to other classifications using other criteria (such as Carol Jenkin's *et al.* (1994) fifteen « culture areas » derived from the results of the 1983 National Nutrition Survey and used in their study of sexual behaviour) because it allows for greater diversity in those areas where logging and forest management issues are high on the local and national political agenda – albeit the disappointing response rate to the questionnaires vitiated the planned stratified research design, and we had to fall back on other criteria to divide up the country for analytical purposes, as described later.

7. Percentage calculated using 1990 Census, considered more reliable than subsequent ones (PNG National Statistical Office 1993).

8. Percentage estimation based on the votes cast in the 1997 Election in the Open Electorates included in the survey.

9. These statistics remain largely the same a decade later (National Research Institute 2010).

10. These figures had increased by about 50% a decade later (Bruett & Firpo 2009 : 6).

11. This involves ranking the communities for each indicator and assigning rank numbers, summing all of the rank numbers for each region and dividing by the lowest regional total to obtain an overall rank score.

ABSTRACTS

The future of Papua New Guinea's (PNG) extensive forests is of some concern. Local communities may readily sell logging rights to timber companies to fund elusive 'development'. Alternatively, they may hold the key to forest conservation. It may be possible, if landowners have some notion of managing forest resources, to build on these practices. But according to some commentators they traditionally lack a conservation ethic. In order to advise on forest policy, it is necessary to try and gauge the practices, attitudes and ideas of local people. This accords with current participatory development approaches to consult 'grassroots' opinion, as in indigenous knowledge (IK) research, which aims to facilitate interventions by promoting partnership and an awareness of local perspectives. It is indisputable that local people will be well qualified to define problems, and will be 'experts' on their forests. The difficulties encountered in formulating generalisations applicable on a large scale present a barrier to IK informing policy, as in the management of logging and promotion of forest conservation. The short-termism of development, politically driven for immediate returns, presents further problems. We need to evolve methods and formulate principles that will allow some reliable local inputs into policy debates. One way to assess local knowledge and aspirations quickly on a nation-wide level is to use surveys. This paper will discuss a rural community survey conducted in PNG to ascertain peoples' attitudes to forestry, logging and conservation, and inform policy debates. But a survey is a relatively blunt instrument for assessing the subtleties of IK, having well rehearsed drawbacks. It also glosses over contentious political issues. But what more effective way is there of assessing understanding and ideas widely at the grass-roots in a short time frame?

L'avenir des grandes forêts de Papouasie-Nouvelle-Guinée (PNG) est préoccupant. Les communautés locales risquent de vendre sans hésiter les droits d'exploitation aux compagnies forestières pour financer un 'développement' fugace. Mais elles pourraient aussi détenir la clé de la conservation des forêts. Si les propriétaires de ces terres avaient quelques notions de gestion des ressources forestières, il serait possible de s'appuyer sur leurs pratiques. Mais si l'on en croit certains commentateurs, elles n'ont pas le sens de cette conservation. Si l'on veut orienter la politique forestière, il est nécessaire de tester et d'évaluer les pratiques, les comportements et les idées des populations locales. C'est ce que font les approches actuelles de développement participatif pour interroger l'opinion populaire, comme dans la recherche sur les IK qui pour faciliter les interventions, développent un partenariat et prennent en compte le point de vue local. Il est indiscutable que les communautés locales seront les mieux placées pour cerner leurs problèmes et seront les 'expertes' de leurs forêts. Les difficultés à proposer des solutions généralisables, applicables sur une grande échelle, sont un obstacle à l'application des politiques prenant en compte les IK, comme c'est le cas pour la gestion de l'exploitation forestière et pour la promotion de la conservation des forêts. Le développement à court terme, politiquement préconisé pour des résultats immédiats, pose des problèmes à plus long terme. Nous devons inclure dans le débat politique des méthodes et des principes élaborés à partir de données locales fiables. L'une des méthodes qui permettrait d'appliquer les savoirs locaux à l'échelle nationale

serait le recours à des enquêtes. Cet article évoquera une enquête menée en PNG pour déterminer les positions des gens vis-à-vis de la forêt, de son exploitation et sa conservation et enrichir les débats politiques. Mais une enquête est un instrument un peu émoussé et ayant bien des inconvénients récurrents pour évaluer la finesse des IK. En outre, elle passe rapidement sur des sujets politiques litigieux. Mais de quel moyen plus efficace, à court terme, dispose-t-on pour évaluer la représentation et les idées largement répandues dans la population ?

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Keywords: Papua New Guinea, logging, conservation, indigenous (local) knowledge, expert survey

Geographical index: Papouasie-Nouvelle-Guinée

Mots-clés: exploitation forestière, conservation, savoirs locaux, expertise

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