HOTSPOTS AND HANDOUTS:

ILLUSIONS OF CONSERVATION AND DEVELOPMENT IN PAPUA NEW GUINEA

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> *Once upon a time in the not too distant past an international NGO decided to do nature conservation in the Wasi river basin. This was [an] understandable idea. The place was the environmentalist's dream. Lots and lots of bush filled with a multitude of flying and biting things. A diverse bunch of unwashed and scabrous savages leading traditional lives that they punctuated with stories and wars to give it some meaning. No industry, no logging or mining, just a virginal tract of scrub… One must ask why the Wasis have not stuffed the place up themselves? Are they, as some of our NGO friends suspected, the possessors of native wisdom that has allowed them to live in harmony with nature for an interminably long time? Unfortunately not… The distressing fact is the Wasis would have destroyed the place were it not for the malaria and other parasites that kill most of their kids, sap their energy and make them mad. In essence, their population has not been able to get to the level where it can push the resources to the point of scarcity… The best thing the international NGO … could do would be to simply leave the Wasis alone while doing what they could to deter the nastier industries from entering the region… IF they could bring health, education and awareness to the villages, only then would there be a need to talk conservation* (People Against Foreign NGO Neocolonialism 2003).

Introduction

The relationship between conservation and development in Papua New Guinea (and in other parts of Melanesia) contains a rather odd mixture of illusion and reality. On the one hand, a growing number of formal organisations pursue the conservation of a high degree of biological diversity which is apparently associated with a high degree of cultural diversity, a seemingly excessive degree of social and political fragmentation, and the customary ownership of most natural resources. On the other hand, the customary resource owners seem commonly to be obsessed with dreams of extractive development which pose an obvious threat to the maintenance of both biological and cultural diversity, and therefore seem to wish to cut the ground from under their own feet.

The conservation organisations are obliged to fund their own pursuits by demonstrating that they can make a difference to a situation in which biodiversity values are not only very high, but also seriously threatened. These are the 'hotspots' to which their funding gravitates. But if they offer to purchase conservation from the customary owners of the spaces which contain these precious values, they seem to promote the 'handout mentality' which motivates the dreams of extractive development, and sometimes find themselves engaged in a real competition with developers which they can hardly hope to win (Hviding 2003; Filer 2004).

Yet the dreams themselves are not always realised, and are seldom realised for very long. So conservation organisations often find that they are dealing with local clients who do not seem to desire the conservation of biodiversity, but cannot actually get the development which they really do seem to want. If their dreams are not realised, they do not constitute the sort of threat which would seem to warrant the spending of a hard-earned conservation dollar. But even if their dreams are realised, the extraction of specific resources for a limited period of time may still not lead to a long-term process of capital accumulation which makes a lasting impression on the landscape.

In some cases, it can even be argued that local custom and practice is responsible for the production and reproduction of both biological and cultural diversity, even in the face of extractive industry, because it not only helped to create the environment which is being plundered, but will also help to reconstitute that environment after the plunderers have moved on to fresh pastures. But it seems that this feature of local custom and practice is not accompanied by a form of consciousness or 'local knowledge' which is amenable to dialogue or partnership with the conservation organisations which would prefer to prevent the process of extraction or dampen local enthusiasm for it. If anything, conservation organisations are liable to construe the 'handout mentality' as evidence that local subsistence practices are themselves potential threats to the maintenance of biodiversity values under circumstances of rapid population growth and the decline of traditional institutions.

Such general statements must and do admit of many exceptions, because the reproduction of cultural diversity and social fragmentation on a large scale entails a continual divergence between the real or imaginary 'roads' pursued by different local groups or communities under different local circumstances. But how should we assess this variation in different zones or at different scales? The context in which I pose this question is the conduct of a sub-global assessment of coastal, small island and coral reef ecosystems in PNG which, in its second phase, will be one component of a 'community-based coastal and marine conservation project' executed by one of the international organisations whose actions are anathema to the critics of environmental 'neocolonialism'.

Mapping Papua New Guinea

We are now accustomed to the idea that national maps can be read as instruments of political domination (Scott 1998). PNG looks like a country that has been mapped as thoroughly as any former colony. But there is one map which is missing from its

voluminous collection. While 98 percent of its land area, 99 percent of its forests, and a very large but unmeasured proportion of its coral reefs remain under customary ownership, there is no national record of which communities or groups own which parts of this resource base.

The persistence of this uncharted domain in PNG and some of the other countries of island Melanesia is the fact of life which ought to colour all debate about the conservation and management of both biological and cultural diversity (Sekhran 1996), just as it colours most of the debate about the problems of economic and social development (Sack 1974; Larmour 1991; Sullivan 2002). Indeed, PNG has sometimes been included in comparative studies of environmental issues in developing countries precisely because it represents an extreme case in the variable balance of power between nation-states and local communities in the business of resource management (Filer 1998, 2000). But because the country also has a global reputation as the 'last great place' for scientists to study every aspect of biological and cultural diversity, and because scientists have been so tenacious in mapping all the things which they have found there, it looks as if it should be possible to plan and manage the protection of this great laboratory for the benefit of all mankind. So the maps breed illusions of knowledge and control which occasionally cloud, but cannot actually change, the intractable social and political fragmentation which accounts for the non-existence of the missing map.

Aside from the usual collection of maps showing the divisions of PNG's political space, there are three sets of scientific maps which have some bearing on the subject of my present discussion. The first of these is a family of maps derived from the work of a team of scientists employed by the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) during the 1970s.

The leading member of this family inhabits a database known as the PNG Resource Information System (PNGRIS), which is meant to inform the process of planning for small-scale agricultural development in PNG. This map divides the country into 4,566 'Resource Mapping Units' distinguished by landform, rock type, altitude, relief, inundation, and mean annual rainfall. Since the database has been expanded to include information on a number of other variables, including land use and human population, it enables us to map the distribution of the population between areas of 'land in use' in different altitudinal zones (see Table 1).

It should be noted in passing that this table misrepresents the distribution of the human population in one significant respect, because two thirds of the people in the lowest altitudinal zone (0-600m), and therefore one third of the total national population, living within 10 kilometres of the coastline. This means that population densities within this coastal zone, which contains about 10 percent of the country's total land mass, match those of the central highland zone (above 1200m), while the lowland and mid-montane interior is far more sparsely populated.

Table 1: Total land area, area of land in use, estimated population and population density, by altitudinal zone.

Altitudinal zone (m)	Land area (km^2)	% total land area	Land in use (km^2)	% total land in use	2000 population	% total population	Pop. density on land in use

0-600	303,844	66.1	73,531	62.4	2,654,521	49.0	36
600-1200	69,505	15.1	16,766	14.2	354,262	7.0	21
1200-1800	43,416	9.4	18,844	16.0	1,471,042	29.7	78
1800-2400	25,359	5.5	7,126	6.0	590,928	11.9	83
Over 2400	17,930	3.9	1,591	1.3	120,033	2.4	75
Total	**459,854**	**100.0**	**117,858**	**100.0**	**5,190,786**	**100.0**	**44**

Source: McAlpine and Quigley n.d., updated with 2000 National Census figures by B.J. Allen.

A second member of the PNGRIS family is a map of 'Agricultural Land Use' which is based on the analysis of aerial photographs taken in the late colonial period (Saunders 1993a). This map shows all the areas of 'cultivated land', including forest fallows, and some distinctive types of 'uncultivated land' (grassland, sago groves, savanna woodland, and urban settlements) which do not fall into the residual category of 'uncultivated forest'. Different types of cultivated land are distinguished only by reference to degrees of 'land use intensity', except that a distinction is made within the 'very high intensity' class between land dominated by tree crops (coffee, cocoa, coconut or oil palm) and land planted primarily with food crops (such as sweet potato or taro).

A group of scientists at the Australian National University has undertaken a detailed field survey of all the local 'agricultural systems' devoted to the production of food crops on these areas of cultivated land, and has come up with another map which distinguishes 287 of these food-cropping systems as unique combinations of six variables related to the measurement of 'agricultural intensity' (Allen et al. 1993-98). As in the case of PNGRIS, this map inhabits a database which contains information on a number of other variables, such as estimates of cash income or ease of access to government services, and its architects are therefore able to produce other maps which show how these other variables are distributed between the different food-cropping systems. One such map has been incorporated into a 'Rural Development Handbook' which applies five of these additional indicators to the assessment of rural poverty and food security (Hanson et al. 2001).

A third member of this family inhabits a database known as the Forest Inventory Mapping System, which uses the same sequence of aerial photographs from the late colonial period to divide the country into 'Forest Mapping Units' and allocate each of these units to one of 59 vegetation types, of which 36 are classified as forest types (Hammermeister and Saunders 1995). A combination of satellite imagery with rapid air and ground surveys undertaken in 1996 was then used to map the extent of change in the extent and composition of forest cover in each of these units since 1975. This map shows, amongst other things, that roughly 8 percent of PNG's total forest area had been subjected to some form of selective logging in a 21-year period, and another 3 percent had been permanently converted to other forms of land use, primarily commercial and subsistence agriculture (McAlpine and Quigley 1998).

The second mapping stream that bears on my topic is one which sprang from the back of a proverbial beer mat during a meeting convened by the World Bank to initiate PNG's belated version of the Tropical Forest Action Plan in 1990. Its source was a list of 'priority forest areas' constructed by some of the conservationists present at the meeting.

These were areas thought to contain exceptional biodiversity values which were under immediate threat by commercial logging ventures (Filer 1991). The mapping of these values at a national scale was first attempted through a 'Conservation Needs Assessment' implemented by the Biodiversity Support Program at the request of the national government (Alcorn and Beehler 1993). Three maps were produced as a result of this exercise – one showing 'biologically important' terrestrial and wetland areas, a second showing 'marine priority areas' and 'critical watersheds', and a third showing 'major unknown areas'. The first two maps still decorate the walls of most conservation organisations in PNG.

These maps also served as the springboard for a more sophisticated attempt to model the distribution of PNG's biodiversity values by scientists at the CSIRO and the Australian National University. In contrast to the databases which house the family of maps related to PNGRIS, this is a raster-based geographical information system which allows for the matching of environmental and biological information at different scales. Information about the physical environment was mapped onto a digital elevation model, which was then used to predict the distribution of selected plant and animal taxa from knowledge of the sites where specimens had previously been collected. The point of this exercise was to determine a flexible scheme of 'trade-offs' between the spatial distribution of biodiversity values, the temporal change in patterns of land use which threaten the conservation of these values (especially commercial logging), and the policy choice of which areas to conserve in order to maximise the conservation of biodiversity values within a fixed proportion (say 10 percent) of the country's total surface area (Nix et al. 2000; Faith et al. 2001).

The third and final stream of maps of relevance to this discussion is the one which culminated in the publication of an atlas of Pacific languages in 1981 (Wurm and Hattori 1981). The vernacular languages of the region are represented in this atlas as a set of discrete and bounded spaces, with different colours to show the 'phylum' to which they belong, and different patterns overlaid on these colours to distinguish lower-level groupings of languages within a single phylum. The maps covering different parts of PNG, which make up roughly half of the maps in the whole atlas, show that it has more than 750 languages divided between five major phyla and four minor phyla, with a few odd languages shown as 'isolates' because their relationship to the rest has not been established. The space assigned to each language is a cartographer's approximation of the area which contains the villages or settlements whose inhabitants speak (or spoke) that language. Indeed, the most problematic feature of these maps is the existence of numerous grey areas which look as if they are not 'occupied' by any language at all, because they are in fact areas of low population density in which the cartographer did not even dare to imagine the territorial boundaries between neighbouring language groups. One of the main reasons why the atlas has not been updated and digitised is because a map of vernacular languages, with or without the grey areas, can easily be read as if it were a substitute for the missing map of traditional territorial boundaries between local communities (Andrew Pawley and Darrell Tryon, pers. comm.).

All of the maps in these three bodies of scientific and spatial knowledge have been produced at scales of between 100,000 and a million to one. The standard scale, which is the PNGRIS scale, is 500,000 to one. There are maps of equivalent sophistication at

considerably smaller scales, most of which have been produced at the expense of major mining and petroleum companies engaged in the exploration and development of specific mineral deposits. Some of these local maps show the territorial boundaries of customary group domains, and thus fill the gap which yawns so widely at the national level. However, these maps of landed property have not been placed in the public arena because they do not count as part of any legal process of registration, nor is there any obvious sense in which they function as instruments of social control, because local landowners are free to behave as if they did not exist (Filer 1999). Since these 'project' maps are generally hidden under a veil of commercial or political secrecy, no systematic effort has been made to link them to the national maps which shown the spatial distribution of natural resources, biodiversity values, indigenous food-cropping systems, and vernacular languages.

Conservationists can refer to all these national maps when deciding which parts of the customary landscape ought to be included in a national network of protected areas, but their capacity to modify this landscape depends on a process of negotiation with individual landowners whose attitudes and assets are both unknown quantities before the process begins.

The Two Mentalities

The word 'hotspot' is widely recognised as one of the words with which Conservation International brands its own products in the global marketplace, just as the word 'ecoregion' is recognised as part of the brand marketed by the World Wide Fund for Nature. In this paper, however, I use the phrase 'hotspot mentality' to refer to the general idea that money spent on the conservation of biodiversity should not only be spent in places which contain a great deal of it in the first place, but also in places where people are likely to make a horrible mess of it if they are left to their own devices. In other words, the hotspot mentality is simply a view of the world which applies a value-for-money principle to a map of biodiversity values, and in this sense, it is one of the epistemological foundations of the biodiversity business as a whole.

If the 'hotspot mentality' is disconnected from the jargon of any specific conservation organisation, the 'handout mentality' may likewise be disconnected from any specific national or regional culture. This phrase does feature quite prominently in the national political discourse of PNG, where it is used to deplore the tendency of *other* Papua New Guineans, *most* Papua New Guineans, or even *we* Papua New Guineans, to demand 'development' in the form of free goods, services and money. This way of talking about the national culture is one which connects a fairly recent discourse of resource compensation, in which customary landowners charge developers for the right to extract natural resources from their customary land, with the earlier colonial discourse of the cargo cult, in which the native tried to get the white man's wealth by modernising his own magic (Lindstrom 1993; Filer 1997a). But if Papua New Guineans still want to talk about their culture in this way, it does not mean that they really do have some kind of cultural monopoly on what economists would simply describe as rent-seeking behaviour. Who on earth would turn down the chance to get money for old rope, or the prospect of a regular income without the need to work for it?

In PNG at least, conservation organisations are no less tempted by the prospect of an easy life than the local custodians of the stuff which they want to conserve. In their case, the temptation is to spend lots of money on the conservation of biodiversity in places which are not really hotspots at all, because their biodiversity values are not really under threat by current patterns of human activity. In this respect, it could be argued that the whole of PNG counts as a rather cool place, and that is precisely why it now counts as one of the world's 'last great places' for the conservation of biodiversity (Robles Gil 2002).

While large amounts of money have been spent on conservation projects in specific parts of the country, these projects have not in themselves had much impact on the behaviour of the companies engaged in various forms of extractive industry. Conservation projects only seem to succeed in places where local landowners have not yet had the opportunity to extract rent from a developer (West 2000), or (more rarely) where they have already decided to turn down an offer of 'development' because it does not meet their expectations (Martin 1999). In both cases, local landowners appear to support conservation projects because they offer *another kind of development*, but the conservationists are then left with the task of explaining why biodiversity values would suffer if *this* kind of development were not on offer at all, and the local custodians of biodiversity were indeed left to their own devices (Filer 2004).

One explanation claims that local landowners lack the knowledge or the motivation to resist an external menace which has yet to materialise, and money therefore needs to be spent on the fortification of their hearts and minds as a precautionary measure. Another says that local landowners will make a mess of their own property, even if – or especially if – there is no 'developer' to do it for them, and money therefore needs to be spent to train them in the practice of sustainable resource management. If taken to their logical extreme, these lines of argument end in the proposition that local landowners are either idiots or pests. Needless to say, this is not a proposition which the landowners are normally willing to accept.

The Language of Dependency

One of the epistemological foundations of the Millennium Ecosystem Assessment is the idea that some decision-makers are more likely to participate in a conversation about the maintenance of ecosystem services than a conversation about the conservation of biological diversity. That is because most people in this world are more interested in sustaining their own livelihoods than sustaining those of other species. Papua New Guineans are no exception to this rule. It is very difficult to have a sensible conversation about biodiversity in the version of Melanesian Pidgin English that is normally used when rural villagers are talking to other people who do not speak the local vernacular. That is not just because the villagers are thinking with their stomachs, but also because, like most US citizens, they are creationists, not evolutionists. So what is likely to happen if the outsiders divert the conversation to the topic of 'ecosystem services' instead?

There are three commonplace terms in Tok Pisin which are available for the purpose of translating this concept – *sistem* ('system'), *sevis* ('service'), and *risos* ('resource'). Although they sound like the English words from which they are derived, these terms have quite specific connotations in Tok Pisin, and certainly do not embrace the range of meanings to be found in a standard English dictionary. The word *risos*, which might sound like the best way of translating the whole concept of an ecosystem service, is normally only applied to those 'resources' which can be 'developed' by extractive industry, and not to those which provide the villagers with their daily sustenance. The word *sevis* is generally applied to those public 'services' which the government ought to provide, but has often failed to provide, and which resource developers (or even conservation organisations) might provide instead. Both words are thus tied to the discourse of dependency which English-speaking Papua New Guineans characterise as the 'handout mentality'. People want free 'services', but if they cannot get them for nothing, they might still get them in exchange for the 'resources' which are already the free gifts of nature (Filer 1997a).

When people talk about the 'system', they are not talking about the ecosystems which provide these services, but about the 'one-talk system' (*wantok sistem*) whose operation explains the government's failure to provide the 'services' whose absence is driving the sale of 'resources' to the private sector. Papua New Guineans talk about this 'system' in much the same way that Sicilians talk about *cosa nostra*, 'our thing', in other words the mafia. This 'system' is the informal, subterranean and mysterious network of primordial personal relationships which threatens to undermine all principles of good governance. It might actually function as a social safety net, or even qualify as a form of resistance to Western hegemony, but there is still a feeling that it has to be condemned as a wound which 'we' Papua New Guineans have inflicted on our own body politic (de Renzio and Kavanamur 1999). The 'one-talk system' and the 'handout mentality' are thus two sides of the same coin in the currency of public self-reproach.

A Bridge Too Far

If conservationists paid more attention to local or indigenous knowledge, would they find a way to get around the national (or neo-colonial) discourse of resource dependency and have a more productive dialogue with the local custodians of biodiversity? Or would they just add to the impression that they are patronising people who believe that Western knowledge is the key to economic growth (Filer 1998: 331)?

The title of this conference invites us to ask if there are some people in PNG who have an 'epistemology' which has not been captured by the language of dependency or swallowed by the hunger for 'development'. Some of the anthropologists who specialise in the study of 'Melanesian cultures' are more than willing to assert the presence of this alternative perspective (Gegeo and Watson-Gegeo 2002). Yet there is still something rather odd about the idea of building a 'bridge' between the epistemology of modern science and a collection of indigenous Melanesian epistemologies which occupy another space on the other side of some notional gap. That is because the metaphor implies some basic equivalence between the things which exist on either side of this gap, a lack of prior connection between them, and the absence

of any third kind of 'epistemology' which might be relevant to the assessment of Melanesian ecosystems.

Strictly speaking, an 'epistemology' is a theory of knowledge, rather than a body of knowledge. We could ask whether there is any such thing as an indigenous *theory* of knowledge which is unique to Melanesian cultures as a whole, or whether each of the world's languages contain its own epistemology, and the Melanesian 'culture area' therefore contains hundreds of these things. We could ask the same question about indigenous 'cosmologies', 'ecologies', or even 'anthropologies', but in each case, we risk making assumptions about the relationship between race, language and culture which professional anthropologists have been questioning for several decades. In the context of an ecosystem assessment, we also risk making the assumption that anything which does not belong to an ecosystem must still belong to a system of some sort – an economic system, a social system, or a system of knowledge – and in our grand vision of the world, each bounded space defined at any given scale contains one system of each sort, piled on top of each like the layers in a club sandwich. This also strikes the professional anthropologist as a very old-fashioned way of thinking about the world, however much it might appeal to the architects of geographical information systems.

Insofar as anthropologists still feel that they can get away with making general statements about the nature of indigenous knowledge in the space which contains the whole of PNG, they are liable to say that it elides the conventional Western distinctions between 'nature' and 'culture', or 'environment' and 'society', and cannot therefore make much sense of the idea that 'ecosystems' are separate from the people (or even the spirits) who manage or consume their services (de Coppet and Iteanu 1995). That is one of the reasons why anthropologists have had occasion to remark on the absence of an 'environmental ethic' in traditional Melanesian societies (Bulmer 1982; Dwyer 1994; Sillitoe 2001). But what is perhaps more significant for the present discussion is the common observation that this kind of knowledge is pragmatic rather than systematic, which means that its truth is primarily revealed in the context of its performance, and not in any act of conscious reflection on the meaning of life. That is why Melanesians talk about 'custom' as something which they produce or exchange, rather than something which they think about or believe in (Otto 1992; Schwartz 1993; Foster 1995). And that would also explain why anthropologists who work in countries like PNG are reluctant to recognise the existence of an indigenous 'epistemology' or any other body of theory which has the same logical status as a branch of modern scientific knowledge.

There is no reason to assume that the Melanesian race or space has a monopoly on this pragmatic form of indigenous knowledge. But how does this form of knowledge relate to the appearance of excessive biological and cultural diversity?

If each body of indigenous knowledge belongs to a specific language, and each natural language has evolved in a unique natural environment, then it could still be argued that cultural and biological diversity are simply two sides of the same coin (Maffi 2001). If linguistic diversity is a sign of cultural diversity, then it is obviously true that PNG contains an awful lot of all three things. But if we go back to our mapping table, we cannot see a simple linear relationship between them. While the spatial distribution of

biodiversity values appears to be an inverse function of human population density, the number and diversity of endemic languages in different parts of the country does not have any obvious relationship with either of these variables. It is possible to explain this mismatch by reference to various cultural or environmental factors which might have enabled some 'language groups' to grow at the expense of others within an area where the density of human population is fairly constant. But it is also possible to argue that some 'local cultures' place a higher premium on linguistic differentiation than others do, or that linguistic diversity is only one of several possible forms of cultural diversity which are unevenly distributed around the country (Schwartz 1978; Filer 1990).

We can come at the same point from another direction by observing that the inverse relationship between biodiversity values and human population density, which might seem perfectly natural, may partly be a function of the fact that biologists attribute particular 'biological importance' to the large animals and beautiful birds which are the traditional prey of indigenous human hunters. But what happens if we recognise that PNG is primarily a nation of gardeners, rather than a nation of hunters, and one of the most significant forms of cultural diversity, aside from linguistic diversity, is *agri*cultural diversity?

We then find that 48 percent of the country's food-cropping systems, but only 3 percent of the 'Resource Mapping Units', include some portion of the coastal zone where one third of the population lives, but the boundaries of food-cropping systems do not match the boundaries of 'language groups' in this or any other part of the country. And we find that the central highland zone, which contains another 44 percent of the population, is a space in which indigenous gardeners have contrived to generate a remarkable variety of sweet potato cultivars during the few centuries which have elapsed since the plant was first introduced to the country (Yen 1974; Feil 1987). While the introduction of the sweet potato facilitated the rapid growth of the highland population, and thus led to the creation of the largest 'language groups' in PNG, we can find another key to the country's cultural diversity in the observation that members of *the* largest language group (almost 300,000 at the last count) are 'almost compulsive innovators' in their agricultural practices (Waddell 1972: 132).

So what happens if we take away the assumption that each language contains a unique 'culture', and hence a unique body of indigenous knowledge, or the assumption that people who speak a common language are in some sense members of a single social group?

Once these assumptions are removed, we find that the distinctive 'Melanesian cultures' represented in the ethnographic literature have been distilled by Western authors from the stories told, or the opinions held, by a small number of local expert informants in any given community. Furthermore, experience suggests that each of these local experts, even within a single community, will have a quite distinctive body of knowledge, and even (sometimes) a distinct epistemology. This means that it is often very hard for anthropologists to figure out which bits of knowledge belong to the 'custom' of one social group or another, which bits have been borrowed or imported from some other place, or which bits have been made up by their current owners to replace the bits which dead experts failed to pass on to their successors.

If this can be construed as a rather messy Melanesian form of indigenous knowledge, we do not have to treat it as the cultural reflection of a diverse natural environment, but could just as well say that this is how Melanesians exaggerate and refine the 'natural' qualities of the landscape by branding them with their own personal identities. We could then attribute the remarkable botanical diversity of indigenous food-cropping systems to the same cultural impulse as the diversity of indigenous responses to Christian missionary teachings, or even the apparent gullibility which nowadays leads so many Papua New Guineans to invest their meagre savings in fast money schemes.

Now it could be argued that this is a transitional phenomenon, nicely exemplified in the 'cargo cult', which reflects the multiple social disruptions of the colonial encounter. It would certainly be foolish to deny that the rate of cultural attrition and mutation was massively accelerated by the advent of colonial administration and the subsequent creation of an independent nation state. On the other hand, this pragmatic and experimental form of indigenous knowledge might still be the positive force which counteracts the public language of dependency. How then do we reconcile this portrait of indigenous knowledge with the conduct of an ecosystem assessment?

Regimes and Networks

In our assessment of PNG's coastal ecosystems, we do not assume the existence of a single body of 'traditional ecological knowledge' which is opposed to 'scientific' forms of ecology. That is not because we wish to posit the existence of multiple bodies of knowledge locked up in different coastal cultures or communities, but because the characteristic national form of indigenous knowledge is not dedicated to the maintenance of 'tradition', nor does it have branches which mimic the conceptual architecture of modern science.

Of course, this does not prevent Papua New Guineans from thinking about the conceptual architecture of modern science or debating the relevance of traditional ecological knowledge to the management of local ecosystems (Saulei and Ellis 1998). But when they do so, they already stand on the scientific side of the bridge. So when public statements are made, in English, about the substance or value of traditional ecological knowledge in PNG, these may well be statements of *policy*, which tell us what ought to be true or what people ought to be doing, or even examples of *ideology*, which are normative statements disguised as statements about what really is true or what people actually do, rather than statements of fact or expressions of common sense.

But that is not the end of the matter. We have already said that the national form of indigenous knowledge is one that thrives on the assimilation of new ideas to meet a localised cultural purpose. Modern science is one source of these ideas, so some of the expert owners of indigenous knowledge should be quite capable of branding their own landscapes with their own versions of modern ecology. Indeed, some have already qualified as brilliant practitioners of 'ethnoscience' even in the absence of a formal scientific education (Majnep and Bulmer 1977, 2004). It surely makes no sense to say that their knowledge does not count as indigenous or traditional ecological knowledge,

even if they do not participate in public debate about the value or significance of such knowledge at a national level.

There are two points at issue here. One is the nature of the *public forum* in which items of indigenous knowledge are expressed or displayed. The other is the *pragmatic form* of indigenous knowledge, which may be twisted out of recognition by any discussion of 'knowledge' as an entity in its own right.

We propose to deal with these issues by treating all kinds of ecological or environmental knowledge as organic components of specific *resource management regimes*. We define a *resource management regime* as the set of values, policies, institutions and practices which are applied to the human consumption, management, conservation or exploitation of specific natural resources, landscapes or ecosystems. We then make a general distinction between *sectoral* and *indigenous* regimes, but we allow for the construction of links or 'bridges' between them.

A *sectoral* resource management regime is defined by reference to a national government agency that is responsible for one or more policies which are themselves potential drivers of ecosystem change. This does not mean that the national government agency has a monopoly over the design or implementation of the policies which belong to this regime, let alone the values, institutions or practices which are associated with them. It only functions as a point of reference because other actors or stakeholders recognise the power of a national government to establish general rules about the consumption, management, conservation or exploitation of specific natural resources, landscapes or ecosystems – even if these rules are often broken in practice.

An *indigenous* resource management regime is understood to operate only at a local scale or community scale, but the number of indigenous regimes greatly exceeds the number of sectoral regimes. That is because we assume, for the sake of argument, a one-to-one correspondence between these indigenous regimes and the 287 food-cropping systems which have been mapped at a national scale. Each indigenous regime is thus held to consist of a food-cropping system and a number of other practices, such as hunting, fishing, forest management, animal husbandry, or smallholder cash cropping practices, as well as the values, institutions and 'policies' which are associated with them.

To say that each food-cropping system is the central component of a single indigenous resource management regime is not to imply that each form of indigenous agricultural practice is accompanied by an equally distinctive form of indigenous fishing, hunting or forest management practice. Indigenous fishing, hunting or forest management practices have not, and probably cannot, be mapped as spatially discrete 'systems' in the same way as indigenous food-cropping practices, so it does not make sense to ask whether the boundaries of 'hunting systems' coincide with those of food-cropping systems.

There are certainly some communities settled on very small islands or along the banks of major rivers who have specialised in the production and exchange of fish in order to secure their supplies of vegetable food (Carrier 1982b; Gewertz 1983; Macintyre and Allen 1990), and there are many other groups scattered around the lowland and mid-

montane interior of the main island who could be described as 'hunter-gatherers' because of the extent of their dependence on the exploitation of wild sago palms (Roscoe 2002). However, the fishing communities participate in specific food-cropping systems as specialists in a local division of labour, while the 'hunter-gatherers' can be accommodated in the mapping of these systems as low-intensity gardeners, or else assigned to a number of discrete systems distinguished by the relative intensity of sago management practices (Townsend 2004).

If it makes sense to posit the existence of a distinctive body of traditional or indigenous ecological knowledge, we are inclined to treat this as a feature of indigenous resource management regimes. By contrast, *local* ecological knowledge is treated as a feature of *sectoral* resource management regimes, where it is mixed up with scientific, bureaucratic, and other sector-specific forms of knowledge. Each of the 287 food-cropping systems defined by 'Western science' thus contains a body of practical *agricultural* knowledge which is *also* ecological knowledge *and* indigenous knowledge *and* local knowledge. Each one therefore represents a point of intersection between traditional ecological knowledge and local agricultural knowledge. However, this does not mean that there are 287 discrete 'systems' of local or traditional agricultural knowledge, or 287 local or traditional ecologies.

We do not isolate 'knowledge' from the values, policies, institutions and practices which constitute a resource management regime. That is because, in the present context, we would prefer to stress the potential gap between *practical knowledge* and *landscape values*. In other words, we want to question the link between local practices and the 'cultural services' which ecosystems provide to local consumers, and to question the role of 'traditional ecological knowledge' in the *management* of traditional community domains or landscape elements.

Traditionally, specific forms of technical or magical knowledge were commonly regarded as the property of clans or individual experts within each local community (Malinowski 1966). Their practical effectiveness was not justified by reference to any collective vision or theory of landscapes or ecosystems. The people who knew garden magic, hunting magic, or fishing magic knew it because they had a *right to perform it*, not because they knew (or could say) *how it worked* (Lewis 1986). There is a very long tradition of debate about the relationship between Melanesian magic and modern science, but the relevance of this debate to the valuation and management of ecosystems by traditional communities has long been overlaid by a huge variety of Christian cosmologies (Carrier 1982a; Juvik 1993; Brunois 1999).

The secrecy of traditional technical knowledge, as well as traditional magical knowledge, means that all forms of traditional knowledge are at risk of extinction when experts do not make them public, and do not therefore make them part of the policy component of indigenous resource management regimes (Mogina 2002; Leach 2003). The role of the *expert* and the *manager* therefore seem to be separated, and either or both of these roles may not even seem to be occupied in some traditional communities. There is no reason to assume that traditional or indigenous knowledge of any kind can save local communities from the degradation or loss of ecosystem services within their traditional domains. Nor does it even seem likely that such knowledge can survive as a

practical component of indigenous resource management regimes unless it *also* becomes a form of *local* knowledge within a *sectoral* regime which is connected to institutions (and other forms of knowledge) at higher levels of social organisation.

In this way, we arrive at a distinction between indigenous and local knowledge which enables us to say that 'traditional' knowledge is that form of indigenous knowledge which fails to connect with any sectoral resource management regime. Traditional knowledge is therefore that form of knowledge which begins to disappear, and is *known to disappear*, when indigenous resource management regimes absorb a 'modern' classification of natural resources.

Now this may seem like a rather pessimistic line of argument, because it suggests that indigenous knowledge is doomed to die unless it is reconstructed as the 'merely local' form of knowledge which survives at the bottom of the corporate or bureaucratic hierarchy of values, policies, institutions and practices which constitutes a sectoral resource management regime. But there is no reason to assume that sectoral resource management regimes have the capacity to dominate or incorporate their indigenous counterparts when most of the resources which are being 'managed' are effectively controlled by customary social groups.

We should not be misled by PNG's public discourse of political corruption and resource dependency to the point of thinking that the supposed mismanagement of natural resources is a consequence of the unequal distribution of real power between decision-makers at different levels of the country's social and political organization. It is hard to find a rural community whose members do not believe that they are living at the margins of a 'system' which is quite beyond their comprehension and control, but this does not entail that there are other people at the centre of the system who are actually running it. The whole point about the 'one-talk system' is that decisions made at different 'levels' in the superficial hierarchy of political space are all equally personal decisions, as if they were in fact decisions made at different points in a one-dimensional network of personal relationships.

This is not to deny the existence of a national elite whose members bask in relative luxury and notoriety, while most of their compatriots languish in relative poverty and obscurity. The modern extremes of economic inequality and social injustice are the subject of intense political debate in all corners of the country (Gewertz and Errington 1999). But this does not entail a qualitative difference between vertical and horizontal forms of political communication, or between 'top-down' and 'bottom-up' forms of planning and management. Nearly all Papua New Guineans, whatever their standing in 'modern society', are still members of one or two traditional political communities. When they negotiate the interface between sectoral and indigenous resource management regimes, they will mostly do so as customary landowners dealing with other customary landowners with whom they have differing degrees of social connection.

Retreat to the Beach

If Papua New Guineans all tend to approach the business of resource management from the point of view of the 'customary landowner', we still need to ask why the relationship between indigenous and sectoral management regimes is negotiated in different ways, and with different outcomes, in different parts of the country. In the case of extractive industry, the location of the argument is primarily decided by the physical distribution of natural resources and the likely economic cost of their 'development' to the developer. Where these resources lie within the realm of customary ownership or control, local landowners will do what they can to maximise their own share of the proceeds or minimise the impact of commercial exploitation on their own subsistence economy. The process and the outcome will then depend on the way that these costs and benefits are perceived by the different parties at different moments in time (Filer 1997b).

Life is a bit more complex in the conservation sector. If biological diversity is the resource at issue, the argument should focus on those areas or ecosystems which contain a lot of it. The trouble is that scientists cannot agree a common standard of measurement, local landowners can rarely understand what they are talking about, there is barely any market to clarify the costs and benefits of doing one thing or another, and the state has no capacity to impose a solution of its own making. This is not a problem unique to PNG, but because PNG has so much of this treasured substance, it attracts a huge amount of foreign money which has to be spent somewhere, somehow, for the purpose of keeping it safe.

When these cash flows were enlarged in the context of the Rio Earth Summit, most of the money was directed towards the conservation of forest ecosystems. Since that time, more and more of it has been diverted to the conservation of coral reef ecosystems. This switch of emphasis may to some extent be due to a change in the global priorities of the funding agencies. In PNG, however, it also reflects a shift in their understanding of what constitutes a 'manageable hotspot' at the interface between indigenous and sectoral resource management regimes.

If we look at this story through the eyes of the Global Environment Facility, we see three distinct episodes or stages. In the first stage, some coastal communities were encouraged to resist the encroachment of the large-scale logging industry on the forested portions of their traditional domains, despite the fact that they made little use of those 'primary' forests which did not count as forest fallows in their food-cropping systems (McCallum and Sekhran 1997; Martin 1999). In the second stage, conservation projects were initiated or expanded in the heavily forested interior of the New Guinea mainland, in areas where, as we have seen, high biodiversity values seem to be associated with very low population densities, traditional community domains are therefore very large, and the threats posed by extractive industry are less immediate, or even non-existent (Ellis 1997; van Helden 1998, 2001; West 2000). In the third stage, the conservationists have moved back to the beaches and the small islands in order to plan the protection of coral reefs whose biodiversity values were threatened by a combination of climate change and commercial fishing, and whose customary owners were running out of terrestrial resources because of their high population densities and rapid rates of population growth (Kinch 2001).

This is the story which frames the focus of our sub-global assessment on the 'coastal, small island, and coral reef ecosystems' of PNG. It was a choice partly motivated by the availability of donor funding for this enterprise. But it also has an obvious rationale in the common observation that people will not see any reason to conserve something, or even to manage it 'sustainably', until they recognise that it is disappearing. This is one of the points made in the critique of the conservation industry which I quoted at the outset.

If we construct or read our maps in a way which assumes that biodiversity values in tropical forest ecosystems are inversely correlated with the extent of human disturbance, then one is naturally led to seek the protection of those great swathes of 'undisturbed' forest which might as well be described as human population sinks, because they threaten to consume the small and scattered groups of 'forest people' who have taken refuge in them. People living these areas are far more interested in 'development' than in 'conservation', because they can reasonably say that they have been conserving their ecosystems for thousands of years, but are now lagging in their access to modern health and education services because they are so few and far between. If the government cannot afford to provide these services to remote and thinly populated areas, their inhabitants can only dream of the day when a logging company or mining company will deliver them from their state of backwardness. In the meantime, a donor-funded conservation project might seem like the next best thing, but if local communities pose no immediate threat to their own natural environment, there is no reason to suppose that biodiversity values would be diminished by the absence of the project (Filer 2004).

The relationship between ecosystem services and human wellbeing seems altogether different in those coastal areas where people have far more experience with the institutions of modernity, a reasonable rating on the standard indicators of social development, and an awareness of the fact that continued population growth will threaten the sustainability of indigenous resource management regimes if there is no increase in existing opportunities to participate in the formal economy. These are also the areas where people have come to appreciate the value of 'custom' as an alternative to the institutions of modernity, and can therefore make some sense of the idea that 'custom' has something to do with the management of scarce natural resources (Foster 1995). In these circumstances, poverty is not so much the result of an abiding failure to connect with the process of 'development', but a threat which looms if existing connections cannot be reproduced (Carrier and Carrier 1989; Smith 1994). The question then is how the conservation of coral reef ecosystems will serve to reproduce these connections.

Despite the apparent contrast between the folk who own the megadiverse reefs around the coastal fringe and those who own the megadiverse forests in the heart of darkness, it is still worth asking whether conservationists will get more value for their money if they spend it on the reef-owners rather than the forest-dwellers. There are at least seven reasons for sounding a note of caution on this score:

1. If the word 'custom' (*kastom*) refers primarily to certain types of ceremonial performance, rather than a body of traditional knowledge, people might treat it as something which exists apart from the mundane business of resource management,

and hence as a 'road' to be pursued after they have already taken care of their subsistence needs.

2. The greater sophistication of coastal communities might only mean that people in these communities have learnt to adopt a more strategic approach to the task of trading favours with other stakeholders who have competing interests in their resources. In which case, the 'handout mentality' might not be a function of poverty and isolation, but a function of familiarity with modern institutions.

3. In areas of high population density and rapid population growth, we might expect a reduction in the size of the territorial unit which any one group or community is willing to assign to a protected area. If these groups (or their leaders) are in competition with each other to decide the right way to go about the business of 'development', this could make it even harder for the conservationists to establish a protected area which is big enough to serve the purpose of biodiversity conservation.

4. The marine boundaries of coastal community domains may be disputed to a much higher degree than the terrestrial boundaries of all community domains, even in areas where population densities are relatively low. This in turn would suggest that the institutions of customary marine tenure may be less effective than the institutions of customary land tenure as a form of insurance against the tragedy of the commons.

5. The reef-owners may know less about the reproduction of marine organisms than the forest-dwellers know about the reproduction of terrestrial organisms. In other words, the gap between local and scientific knowledge may be more of an obstacle to the conservation of reef ecosystems than it is to the conservation of forest ecosystems.

6. Coral reefs may be less central or essential to indigenous resource management regimes in the coastal zone than primary forests are to those people of the hinterland whose food-cropping systems provide a much lower proportion of their total food intake. In that case, coastal communities may have less of an incentive to worry about the long-term maintenance of reef ecosystems than about the maintenance of their own food-cropping systems.

7. The services which reef ecosystems do provide to the reef-owners or their trading partners may be no more seriously damaged by a transient form of commercial exploitation than those which primary forests provide to all the communities whose traditional domains include this type of ecosystem. Or if the damage is more serious, the reef-owners may still fail to recognise this fact because they think that any form of transient commercial exploitation resembles the kind of human disturbance which is an integral feature of their own food-cropping systems.

Berkes and Folke (1998: 21) suggest that '*successful knowledge and resource management systems will allow disturbances to enter on a scale which does not disrupt the structure and functional performance of the ecosystem and the services it provides*'. It could be argued that indigenous resource management regimes in PNG have absorbed the impact of selective logging in a manner which is indeed successful by this criterion, and yet the managers of these regimes have secured this victory without having the

capacity or the need to engage in any fruitful dialogue with the conservationists who believe that the logging industry is the biggest single threat to the biodiversity values of PNG's lowland forest ecosystems (Leedom 1997).

The reef-owners might believe that the same principle applies to the intensive harvesting of a few reef organisms with a high commercial value, whether by themselves or by foreign fishing companies. But if they do, they could be making a mistake which is the opposite of that made by the conservationists who believe that primary forests are 'virgin' forests that have not yet been subject to any form of human disturbance.

A strong case can be made for the argument that PNG's terrestrial biodiversity, whether inside or outside of the space which is covered in 'forest' at any one moment of time, has been sustainably developed as an unintentional by-product of indigenous resource management regimes which have been evolving over a period of 40,000 years or more (Groube 1989; Kennedy and Clarke 2004). It is much harder to make the case that indigenous fishing or harvesting practices were responsible for the sustainable development of the country's marine biodiversity. In that sense, the conservationists may be closer to realising their own dreams of wilderness when they go diving around the country's coral reefs than when they go walking around in the bush. But since the reefs still belong to the territorial domains of traditional political communities, this does not make it any easier, and might even make it somewhat harder, for them to keep their dreams intact.

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