CHAPTER FIVE

Assessing People's Perceptions of Forests

Research in West Kalimantan, Indonesia

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To what degree do people who live in forests have a conservation ethic? How can we quickly and reliably assess how close people feel to the forest? How closely integrated are the lives of forest people with their environment? These are some of the value-laden but important questions that recurred throughout our research on human well-being. Previous experience with cognitive mapping (the Galileo method described in the Introduction) suggested that the approach might be helpful for dealing with these questions.

One issue we explicitly did not address in this research is the degree to which people's views of their environment and their place in it affect their behavior toward the environment. We view this issue as a variable link in both time and space. The Galileo method is designed to examine aspects of cognition only.

We conducted research in four villages, among two ethnic groups in and around the Danau Sentarum Wildlife Reserve (DSWR) in West Kalimantan, Indonesia[1]:

- *Wong Garai:* A 14-household longhouse lying along the northeastern periphery of the DSWR. In this fairly typical local Iban situation, rice is cultivated in long-fallowed hill swiddens and short-fallowed swamp swiddens, and households rely on nontimber forest product (NTFP) collec-

[1] This chapter is adapted from Colfer and others 1996a.

tion, supplementary cash crops of rubber, and long-term circular labor migration (see Wadley 1997; Colfer and others 2000a). These Dayak people are a mixture of Christian and animist.

- *Kelayang:* An Iban longhouse situated to the south of Wong Garai, just within the eastern boundary of the reserve. The 28-household community (including a 14-door longhouse and several separate houses) is situated on the banks of a major river and is heavily involved in fishing for both consumption and sale, but not at the expense of rice agriculture, which is primarily on swamp swiddens. Its Christian and animist residents collect NTFPs for consumption and cultivate some rubber, collect rattan, and perform wage labor to generate cash; however, most need to supplement their agricultural income by selling fish products (see Harwell 2000a).
- *Nanga Kedebu':* A small Melayu fishing community of 108 people (Colfer's 1992 census) located in the heart of the DSWR (also discussed, like Danau Seluang, in Chapter 16). These fisherfolk are integrated into a money economy, selling their fish (both processed and fresh) to buy rice and other staple foods. The inhabitants are formally registered as residents of the larger community, Selimbau, on the Kapuas River, from whence comes a yearly inundation of additional fisherfolk during the dry season (the de facto population increased to 199 in October 1992). They are Muslim and share significant common cultural features with related peoples described by Firth (1966), Harrisson (1970), Scott (1985), and Furukawa (1994).
- *Danau Seluang:* A Muslim Melayu fishing community, located near the southeastern border of the DSWR, roughly the same size as Nanga Kedebu'. However, situated closer to more dry land than Nanga Kedebu', agriculture plays a slightly more significant role in the natural resource management system. It is formally affiliated with the larger village of Jongkong, on the Kapuas River.

After describing the necessary site-specific implementation of the method, we provide examples of the variety of analyses that can be carried out on the results. In the concluding section, we discuss questions that have arisen and problems that remain for future research.

Method

The conditions we wanted to assess in this study include the presence or absence of a conservation ethic, a feeling of closeness to the forest, and an intimate link between local culture and the forest. (For a technical description of the Galileo method as applied in the DSWR, see Annex 5-1.)

We began by selecting locally appropriate concepts pertaining to people–forest interactions, based on our familiarity with the area. The concepts included **fish**, **wood**, **rattan**, **honey**, **garden**, **animal**, **food**, **earth/soil**,

water, I (the respondent), **man**, **woman**, **village/home**, and **money**. We also included several other concepts that we thought could help us with particular analytical questions: **price/value**, **good**, **future**, **spirit**, and **fire**. One of the strengths of this method is that local concepts are not defined by the researcher but rather reflect local usage and relationships among concepts. Research results simply show the positioning of locally important concepts on a *cognitive map*, a plot that results from averaging the cognitive measurements made by the local people.

At the DSWR, we selected four communities, two Iban and two Melayu, because we knew they followed different systems of resource use. We also tried to interview roughly equal numbers of male and female respondents to assess the magnitude of gender differences in perceptions of natural resources. Because the communities were small, our goal was to interview every teenager and adult; there were very few refusals.

Local assistants conducted the interviews under our supervision. Although both researchers and respondents found the task challenging, we were reasonably satisfied that the local people understood the process and its purpose. Besides explaining the measurement concept (which was easier for the Melayu to understand than for the Iban), we reassured people in all communities that there was no "right" answer, that their own perceptions were the important thing. Many actually enjoyed the intellectual challenge of the task.

The three kinds of conditions of interest to us (a conservation ethic, a feeling of proximity to the forest, and a forest–culture link) have been identified as related to sustainable forest management, though the exact causal links are not clear. Nor are the values (in terms of cognitive distances, in this case) that would indicate the degree to which these conditions apply. One of our goals, as we tried these methods in various contexts, has been to gain a better understanding of the range of variation (in people's feelings of closeness to the forest, for instance) and how this variation correlates with forest conditions and forest sustainability.

Results from West Kalimantan

The most fundamental output of the Galileo program is a *means matrix*, which is the mean response (from all the respondents) computed for every pair of concepts. Put another way, it reflects the mean distances perceived by the community in question between every concept and every other concept. The program provides extensive descriptive and inferential statistics, including standard deviations, standard errors, indices of skewness and kurtosis, sample size, maximum and minimum values, and other more global statistics; for our purposes, we were satisfied with fairly simple analyses. The statistical precision of the measures in this study was excellent, with mean distances ranging from about 5% for the full sample (277 cases)[2] to about 6–9% within

gender segments (about 100 females and 170 males) and about 10–15% within each village (roughly 70 cases per village).

One strength of the Galileo approach is the multitude of ways in which one can examine the data produced. We have selected three ways of analyzing the data. First, we provide cognitive or perceptual maps (plots) for each community, through a gender lens. Then, we look at the ethnic differences in perception. We conclude with a discussion of three concepts that we consider closely related to sustainability: **good**, **future**, and **forest**.

Cognitive Maps in Four Communities and for DSWR as a Whole

The Galileo plots[3] show a cognitive map for the total data set (DSWR; Figure 5-1), two maps disaggregated by gender (Figures 5-2 and 5-3), and two maps disaggregated by ethnic group (Figures 5-4 and 5-5). Although the plots can represent only 3 of the 20 dimensions in this multidimensional space (much as a photograph presents us with only two of the three dimensions our eyes normally see),[4] they provide an appealing visual representation of the (approximate) thinking of a group of people about forests and other natural resources.

Reading the plots involves first noticing the two dimensions represented by a particular concept's placement on the horizontal grid. The third dimension can be read by following the "X" on the grid up or down to the "O" at the other end of each vertical line. The "O" is the placement of the concept in the three-dimensional space. In Figure 5-1, for instance, **spirit** is quite far from **money**, because **spirit** is below the grid to the right front and **money** is above the grid to the left center. These plots indicate that people in the DSWR typically do not see the concepts **money** and **spirit** to be particularly closely related—in marked distinction to **garden** and **water** (both central and below the grid) or **man** and **woman** (both left front horizontally and below the grid).

The concepts **spirit** and **fire** are displayed as rather peripheral (Figure 5-1). Our reason for including **spirit** in the list of concepts was not because it

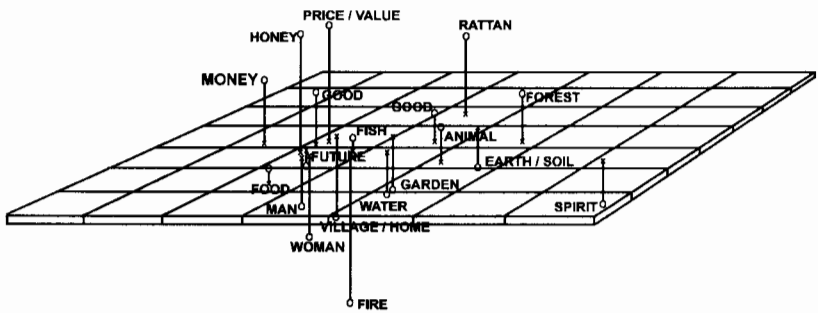

Figure 5-1. *Cognitive Map in Data Set for the DSWR*

came to our minds as a locally appropriate concept in this cognitive domain but because we wanted to examine the DSWR situation (a comparatively sustainable one) in light of the considerable literature on the close spiritual connection between forest peoples and their environment (see the collections by Banuri and Marglin 1993; Kemf 1993). Others suggest that women are particularly environmentally sensitive (Diamond and Orenstein 1990; Gomes and Kanner 1995; Roszak 1995). These data do not support such contentions for this West Kalimantan context. Among these peoples, **spirit** is the most distant from the other concepts and particularly distant from **woman** (see Figures 5-2 and 5-3).

We add that the terms used for spirit in West Kalimantan are not sufficient to represent all the connotations that go with the English term *spirituality.* Additionally, the Iban concept of *spirit* includes both a positive and a negative element; among the Melayu, *spirits* seem invariably bad. In fact, a wealth of qualitative data suggests a significant spiritual link, in the western sense, between Bornean peoples and their environment.[5]

Fire, also distant from other concepts, was likewise not a concept that emerged from our knowledge of people's views of the people–forest link in Kalimantan. However, fire is perceived as a significant threat to the DSWR's unique ecosystem. We wanted to know how people perceived fire in relation

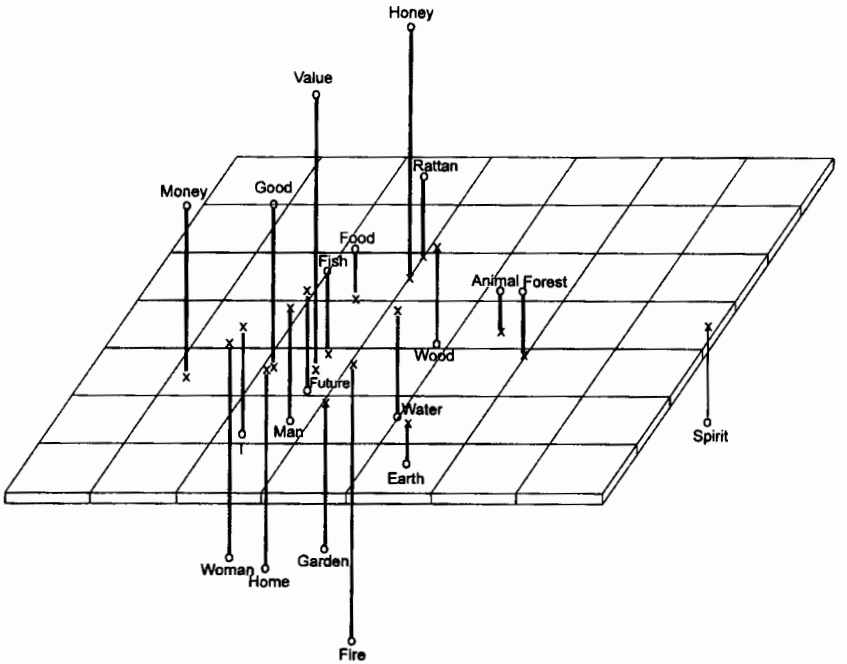

Figure 5-2. *Cognitive Map of Women in Data Set for the DSWR*

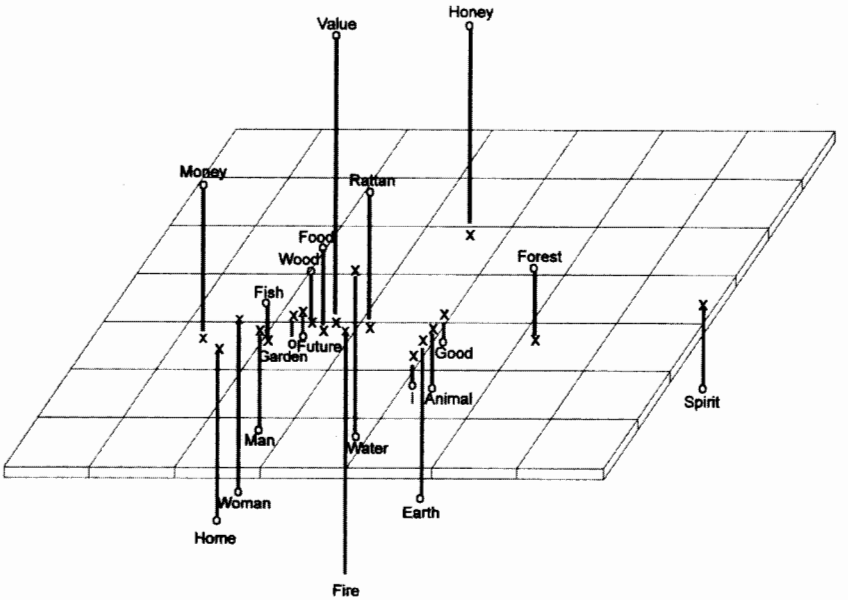

Figure 5-3. *Cognitive Map of Men in Data Set for the DSWR*

to the other concepts we were examining. The 1997–98 El Niño also spurred added interest in the implications of fire in Borneo.

Rattan and **honey** were selected as relevant for both ethnic groups. For the Iban, these products are only two of a vast repertoire of regularly gathered NTFPs; for the Melayu, they are the two most important. In the Melayu context, these products also have been the focus of the local Conservation Project activities to increase production and local incomes (Figure 5-4). The Kelayang Iban have also long been involved in rattan collection and sale to timber companies and, more recently, processing of handicrafts for sale to the Conservation Project (Figure 5-5). Note the smaller distance between **honey** and **money** among the Melayu, for whom honey collection can constitute a major income source at certain times of the year.

Another interesting feature of these cognitive maps is the fairly uniform closeness with which **man** and **woman** are perceived. They are slightly closer among the Iban than among the Melayu, which again fits with our expectations. Men and women seem to be perceived as much closer than they typically are in American studies of this kind (Newton 1977; Newton and others 1984). The comparative lack of gender stereotyping in some Bornean groups has been documented in other studies (see Dove 1981; Davison and Sutlive 1991; Drake 1991; Mashman 1991, for gender studies among Iban groups).[6] Our data seem to support these previous conclusions.

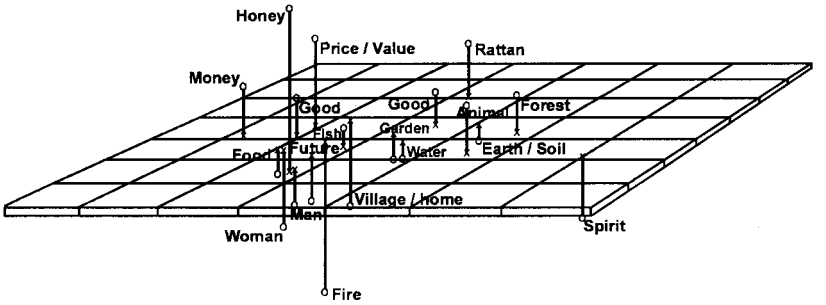

Figure 5-4. *Cognitive Map of Iban in Data Set for the DSWR*

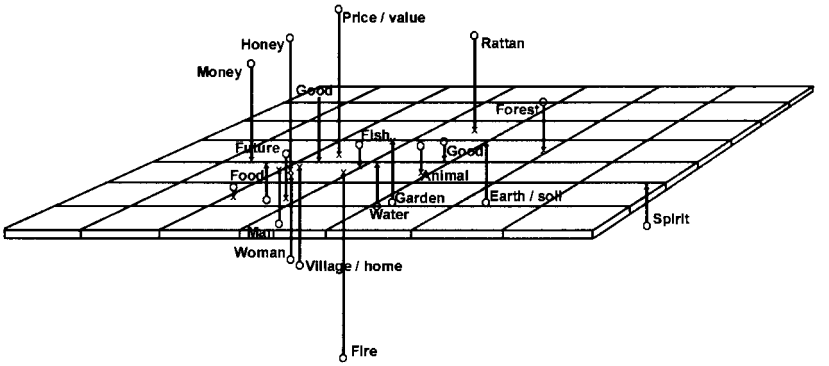

Figure 5-5. *Cognitive Map of Melayu in Data Set for the DSWR*

In including **price/value**, we were trying to get at the idea of *value* as something abstract and related to values (in a noneconomic sense), but the local terms (*rega* in Melayu and *berega'* in Iban) always implied both. This usage is consistent with previous analyses of other Bornean groups (see also Colfer and others 1997a). Only the Iban analysis (Figure 5-4) shows this concept to be relatively integrated with the other concepts. This result may reflect the Iban's higher sociocultural or philosophical valuation of the natural environment than the Melayu, which would be consistent with our impressions as well. The Iban and other Dayak, though scorned at the national level as "backward," exhibit a marked self-confidence and commitment to their own way of life which does not characterize the Melayu. Although cash is much more important in Melayu daily life, it may be that these Iban—like some Kenyah Dayak—consider money to be of less value than locally produced goods (because money quickly disappears, but rice, for instance, can be stored and more easily kept for emergency needs).

Whereas the plots provide the best holistic view of these data, the most accurate reflections of people's estimates of distance are the actual means. Tables 5-1 and 5-2 show the distances men and women perceive various concepts to be from one of our central concepts, **forest**. In the eyes of the average DSWR woman, the cognitive distance between **forest** and **fish** is 3.5, whereas the average DSWR man's perception is that **forest** and **fish** are 3.81 units apart (farther). These means are accurate to about ±5% for the total sample, ±6–8% for the gender segments, and ±10–15% within each village. Obviously, a great number of tables and figures could be created, depending on which concepts were of interest for any particular research problem. Table 5-1 shows results from the total data set (which we call "DSWR"), reflecting the distances estimated by all the respondents in all four communities. Table 5-2 deals with each of the four villages individually.

For the DSWR as a whole, the concepts perceived as closest to **forest** are **earth/soil**, **wood** (predictably), and **animal**. **Rattan**, **water**, and **honey** are also fairly close. Women express the greatest distances between **forest** and **fire**, **food**, and **price/value**, and men also consider these concepts to be comparatively distant from **forest**. The distance of **price/value** from **forest** is

Table 5-1. *DSWR Men's and Women's Perceptions of the Distance between Forest and Other Study Concepts*

Concept	*All female*	*All male*
Fish	3.50	3.81
Wood	1.75	2.17
Rattan	2.42	2.58
Honey	2.96	3.24
Garden	4.12	3.06
Price/value	6.09	5.36
Good	4.22	3.94
Future	4.45	4.69
Spirit	4.05	4.54
Animal	2.29	2.44
Food	6.48	5.10
Earth/soil	1.65	1.72
Water	2.78	3.10
I	4.67	4.71
Man	4.96	4.76
Woman	5.85	5.21
Village/home	5.95	5.24
Fire	6.96	5.36

Table 5-2. *Men's and Women's Perceptions of the Distance between Forest and Other Study Concepts*

	Nanga Kedebu'		*Danau Seluang*		*Kelayang*		*Wong Garai*	
Concept	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*
Fish	3.73	3.04	3.72	3.71	4.08	4.06	3.93	3.64
Wood	2.00	1.32	1.67	1.73	1.73	1.84	2.64	2.32
Rattan	1.77	2.35	2.06	2.27	2.03	3.13	3.68	2.86
Honey	1.88	2.35	3.39	3.12	3.89	3.47	4.39	3.32
Garden	2.23	2.81	4.06	5.36	1.76	1.69	3.18	2.81
Price/value	5.19	5.33	6.39	6.82	5.97	5.59	4.86	5.36
Good	3.96	3.11	3.28	4.48	4.95	3.59	4.37	5.00
Future	5.42	3.89	3.39	4.45	5.35	4.19	4.86	5.14
Spirit	3.85	3.26	4.61	4.29	3.19	3.28	5.15	4.45
Animal	1.62	1.48	2.33	2.15	1.57	1.91	3.30	3.59
Food	5.50	6.33	6.50	7.18	4.32	4.34	3.78	5.05
Earth/soil	1.38	1.07	1.39	1.64	1.30	1.22	2.25	2.36
Water	2.96	2.48	2.83	2.59	3.41	2.91	3.39	3.59
I	4.42	4.04	4.89	5.22	3.86	2.81	4.86	4.18
Man	4.81	4.07	4.28	5.04	4.65	3.66	5.04	5.86
Woman	5.19	5.44	5.22	5.73	4.65	3.97	5.21	6.64
Village/home	5.65	5.48	4.67	5.92	4.84	4.34	5.21	6.59
Fire	4.04	6.15	6.94	6.98	3.81	3.53	5.54	7.00

interesting in light of international timber prices and reflects a genuine difference between the views of locals and the views of outsiders. Both men and women consider **forest** to be closer to **man** than to **woman**, but the difference is not great.[7]

Good, **future**, and **forest** are concepts that we felt bore special significance for sustainability (see below). The distance between **forest** and these concepts falls in an intermediate range for both men and women. Men consider the **forest** to be closer to **good** than women do, and slightly less closely connected with **future**. These data do not suggest that these people have a particularly close or positive feeling about the forest, despite their extreme dependence on it, considerable knowledge about it, and continual interaction with it.[8] From our general experience, we know that forests also contain many perceived dangers (dangerous or poisonous animals, potential for injury from falls, fast regrowth into places needed for uses such as housing and agriculture, malevolent spirits, and so forth).

The concept **money** provides another lens for interpreting perceptions (Tables 5-3 and 5-4). It is clear that the peoples of the DSWR consider **money** to be more tightly integrated than **forest** into this conceptual domain (Table 5-3).[9] Women consider **money** to be closer to **people** (**I**, **man**,

Table 5-3. ***DSWR Men's and Women's Perceptions of the Distance between Money and Other Study Concepts***

Concept	*All female*	*All male*
Fish	3.17	3.21
Wood	4.74	3.93
Rattan	4.51	3.56
Honey	3.69	3.36
Garden	3.43	4
Price/value	2.85	3.24
Good	3.62	3.18
Future	4.01	3.52
Spirit	9.32	8.2
Animal	5.58	6.01
Food	3.41	4.13
Earth/soil	5.28	4.77
Water	5.07	4.4
I	2.22	3.29
Man	2.75	2.89
Woman	2.25	2.64
Village/home	3.46	2.99
Fire	7.23	6.03

Table 5-4. *Men's and Women's Perceptions of the Distance between* **Money** *and Other Study Concepts*

	Nanga Kedebu'		Danau Seluang		Kelayang		Wong Garai	
Concept	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*
Fish	1.92	1.79	2.28	3.82	2.43	1.88	4.96	3.41
Wood	3.48	4.14	2.78	4.73	3.89	2.91	5.07	5.50
Rattan	2.65	3.65	3.06	4.65	3.11	2.88	4.74	5.18
Honey	1.81	2.23	2.39	3.53	3.68	2.64	5.43	5.77
Garden	2.79	2.54	1.94	3.33	4.11	4.21	6.36	4.73
Price/value	2.28	2.67	1.44	2.42	3.59	2.45	5.33	4.09
Good	2.64	2.07	1.67	4.10	2.76	2.12	4.64	4.41
Future	3.19	3.76	1.67	3.50	3.59	4.33	5.07	5.50
Spirit	8.75	10.12	9.11	9.74	7.81	8.30	7.14	7.41
Animal	6.85	4.36	4.00	5.55	5.78	5.03	6.54	7.05
Food	3.77	2.41	2.50	3.55	2.62	1.81	5.50	4.32
Earth/soil	4.85	4.85	2.83	5.27	3.24	3.09	6.00	5.82
Water	3.77	3.62	3.83	5.20	3.84	3.59	5.36	6.50
I	2.65	2.35	2.11	1.54	2.76	1.66	4.64	3.68
Man	2.23	2.77	1.94	2.35	3.30	1.78	4.11	3.64
Woman	2.04	1.85	1.89	2.06	2.49	2.10	3.68	3.18
Village/home	2.85	2.85	3.06	3.67	2.43	1.55	3.07	3.73
Fire	5.77	7.27	6.67	7.27	5.54	4.68	5.86	7.09

woman) than men do. The only concept from which **money** is truly distant is **spirit**, and to a lesser extent, **fire**.

Careful inspection of Tables 5-1 to 5-4 can yield an abundant harvest of insights into the worldviews found in these four villages, but we cannot make such a thorough analysis here.

Ethnic Differences in Conceptual Distances

The two main ethnic groups in the DSWR surroundings, the Melayu and the Iban, have lived in the area for a long time (Harwell 1997, 2000a; Wadley 1999b). Although both groups rely heavily on natural resources for their subsistence, they tend to use very different habitats. The Iban of Wong Garai reflect a habitat use that is closer to the "ideal type" for the Iban than do the peoples of Kelayang (who live closer to fish resources, have more Melayu neighbors, and for whom fishing is more important). Similarly, the Melayu of Danau Seluang have more interaction with Iban than do those of Nanga Kedebu'. Previous experience with cognitive mapping in Sumatra (Colfer and others 1989),[10] as well as our qualitative evaluation of differences in values and lifestyles, suggested that ethnic differences might be quite significant.

The overall ethnic differences are summarized in Table 5-5, with **forest** and **money** as key concepts. Despite the different lifestyles of the two groups, we noted some remarkable similarities along with some not too surprising differences. For instance, the Iban live on dry land and practice swidden agriculture. Their agricultural endeavors, represented in English by **garden**,[11] are intimately connected with the forest (because the forest is regularly cut to make fields and forest often surrounds fields). As expected, the connection for the Iban between **forest** and **food** is markedly closer.

The Melayu, who live by fishing in and around the **forest**, place **water** slightly closer to **forest** than do the Iban (who recognize the importance of water for fish and for their agricultural endeavors). Although the Melayu use far fewer forest products in general than do the Iban, they concentrate their forest product collection on three items: wood, rattan, and honey. Thus, the Melayu indicate closer connections between **wood** and **forest**, **rattan** and **forest**, and **honey** and **forest** vis-à-vis the Iban.

Not surprisingly, the Melayu consider **money** to be closer to the other concepts in general than do the Iban (Table 5-5). Although both groups use money extensively, the Melayu rely on it for daily life (see also Table 5-4). Iban men, on the other hand, go to Malaysia to earn money, with which they buy consumer goods, whereas Iban daily needs are largely supplied by subsistence activities (agroforestry, agriculture, hunting, fishing, and so forth). Kelayang is located closer to Melayu communities than is Wong Garai. It is not surprising that with increasing geographical distance from the

Table 5-5. *DSWR Men's and Women's Perceptions of the Distance between Forest and Other Study Concepts*

	Iban		*Melayu*	
Concept	***Forest***	***Money***	***Forest***	***Money***
Fish	3.96	3.06	3.86	2.61
Wood	2.08	4.20	1.69	3.88
Rattan	2.60	3.84	2.06	3.55
Honey	3.79	4.19	2.94	2.65
Garden	2.27	4.79	3.63	2.85
Price/value	5.49	3.75	5.72	2.39
Good	4.50	3.38	4.10	2.77
Future	4.87	4.53	4.27	3.44
Spirit	3.89	7.82	4.47	8.87
Animal	2.43	5.97	2.29	4.99
Food	4.35	3.40	6.39	3.16
Earth/soil	1.69	4.31	1.62	4.64
Water	3.30	4.63	2.96	4.23
I	3.89	3.10	4.93	2.19
Man	4.70	3.18	4.95	2.42
Woman	4.97	2.81	5.65	2.17
Village/home	5.14	2.60	5.46	3.21
Fire	4.72	5.66	6.08	6.82

Melayu and other marketing outlets, the cognitive distance between **money** and the other concepts would increase.

Galileo Concepts Directly Related to Sustainability

Because we hypothesized that the concepts **good**, **future**, and **forest** were important to consider in assessing social criteria and indicators for sustainable forest management, we prepared two tables that show the distances from those concepts to others in the data sets (Tables 5-6 and 5-7).

Interestingly, **spirit** is comparatively close to **forest**, suggesting a possible mechanism for protecting the forest by encouraging belief in spirits (but see Wadley and others 1997). Iban views of spirits are decidedly ambivalent, including fear; for the Melayu, spirits are considered to be bad. In Wong Garai, the Iban deal with spirits most safely by exhibiting humility in speech and action. Wanton destruction, boasting of fishing catches, and other egotistical behavior are not done where spirits might see or hear (particularly in

Table 5-6. *DSWR Cognitive Distances among Selected Concepts for Sustainability*

Concept	**Good**	**Future**	**Forest**
Fish	3.41	5.20	3.90
Wood	3.73	4.97	1.86
Rattan	3.38	4.96	2.30
Honey	2.96	4.93	3.32
Garden	3.40	4.80	3.03
Price/value	3.25	4.73	5.62
Spirit	7.63	7.83	4.22
Animal	5.60	5.35	2.35
Food	2.97	3.82	5.49
Earth/soil	3.64	4.03	1.65
Water	3.56	3.86	3.11
I	2.95	3.23	4.47
Man	3.04	3.45	4.84
Woman	3.16	3.83	5.35
Village/home	3.42	4.15	5.32
Fire	5.02	5.30	5.48
Money	3.04	3.92	6.26

the forest). This approach seems to have an obvious relevance for resource use and sustainability (see also Wadley and others in preparation; Colfer and others (1997a) found a similar Kenyah aversion to such boasting in East Kalimantan for the same reasons). The whole question of spirits and spirituality is complex. A full assessment would need far more specification, drawing from the discourse of the people studied, than is available using the Galileo method alone (personal communication from Robert Lee in a review of this chapter, November 4, 1999).

The distances from **price/value** and **money** to **forest** are considerably larger than to **future** and still larger than to **good**. These data could suggest the absence of what westerners consider a conservation ethic; however, in our research, we all have noted features of the people's worldviews that suggest a concern about the land and its future capability to produce.[12] We remain uncertain whether this problem may be with the concept of *conservation ethic* itself or whether we have simply not succeeded in finding a way to measure it satisfactorily. Perhaps the inclusion of the concepts **love** and **fear** could provide a useful distance in trying to place different stakeholder groups on some sort of "conservation ethic continuum."

The small distance between various forest products or NTFPs (**wood**, **rattan**, **honey**, **animal**, **fish**, **garden**) and **forest** is in marked contrast to the

Table 5-7. *Cognitive Distances among Selected Concepts for Sustainability*

	Nanga Kedebu'			*Danau Seluang*			*Kelayang*			*Wong Garai*		
Concept	***Good***	***Future***	***Forest***	***Good***	***Future***	***Forest***	***Good***	***Future***	***Forest***	***Good***	***Future***	***Forest***
Fish	2.95	5.15	3.98	3.83	5.27	3.71	2.77	4.93	4.07	4.52	5.58	3.80
Wood	3.34	4.50	1.66	3.60	4.65	1.71	3.36	5.34	1.79	5.10	5.68	2.50
Rattan	2.48	5.43	1.93	3.88	4.51	2.21	2.93	4.23	2.09	4.80	5.86	3.32
Honey	2.44	5.16	2.74	2.88	3.97	3.19	2.41	4.76	3.70	4.70	6.16	3.92
Garden	2.45	4.17	2.49	4.06	4.68	5.01	2.94	4.80	1.74	4.74	5.98	3.02
Price/value	2.55	4.00	4.90	3.25	5.28	6.71	3.04	4.33	5.79	4.68	5.76	5.08
Spirit	7.37	7.85	4.55	8.48	8.87	4.38	7.67	7.69	3.23	6.80	6.54	4.84
Animal	5.14	5.17	2.36	5.42	4.43	2.20	5.66	6.29	1.73	6.52	5.62	3.43
Food	2.82	2.95	5.86	3.07	2.86	7.00	2.35	5.06	4.36	3.98	4.82	4.35
Earth/soil	3.78	3.34	1.66	3.53	3.07	1.57	3.57	5.09	1.26	3.66	5.00	2.30
Water	3.56	3.80	3.22	3.39	2.61	2.65	3.30	4.77	3.17	4.16	4.42	3.48
I	2.52	3.15	4.76	3.10	2.60	5.13	2.21	3.11	3.41	4.46	4.42	4.56
Man	3.08	3.71	5.05	3.25	2.37	4.84	1.71	3.39	4.20	4.54	4.59	5.40
Woman	3.27	4.17	5.70	3.58	2.88	5.59	1.84	3.37	4.34	4.26	5.22	5.84
Village/home	3.71	4.06	5.34	3.81	3.26	5.59	1.97	4.33	4.66	4.42	5.26	5.82
Fire	5.05	5.59	5.31	6.14	5.12	6.97	3.34	4.80	3.69	5.78	5.76	6.18
Money	2.17	3.79	5.59	3.46	3.03	6.79	2.56	4.03	6.04	4.54	5.27	6.90

distance between those products and **future**. This difference may reflect a feeling that the future does not lie with exploitation of natural resources, that it lies elsewhere or with other economic endeavors—despite the comparative proximity of **good** to these products.

In examining the worldview of each village (Table 5-7), we find a greater distance between **forest** and **food** for the Melayu than for the Iban. The Iban obtain almost all their food from the forest, whereas Melayu food either comes from the lakes and streams or is bought. **Woman** in all communities is perceived as farther from the **forest** than is **man**.[13] **Fire**, one of the concepts of particular interest to the Conservation Project at the DSWR, was fairly distant from **good** and **forest** on all sites. This finding is interesting because of the importance of fire in the Iban system of swidden cultivation and in fish processing among the Melayu. People who considered **fire** close to **woman** or to **good**, for instance, typically mentioned its role in cooking food. Considerably more burned forest surrounded Danau Seluang than Nanga Kedebu' (see Chapter 17). These data (and qualitative interviews as well) do not support the Conservation Project's hypothesis that fires were more common in the Danau Seluang area because of different perceptions about fire. Both communities consider **fire** to be distant from **forest** and **good**—even though the people of Nanga Kedebu' see **fire** and **future** as more distant than do the residents of Danau Seluang (which is near the edge of the reserve, in an area that has been more extensively logged and where losses from fire have been greater).

Conclusions and Recommendations

We believe that this study fairly accurately represents the cognitive view that local peoples have of their environment. The differences in the cognitive maps between men and women and between ethnic groups are consistent with our expectations based on long-term ethnographic research: they reflect how local peoples see their environment and their place within it.

Some methodological questions remain. First, we wonder whether the distances are entirely comparable, even with a standard ten-unit measuring rod (the distance between **black** and **white** specified for all respondents). Higher distances in general were attributed in Wong Garai than in Kelayang, even though they are both Iban communities (Table 5-7). We had a similar experience in East Kalimantan, where we found the people of Long Ampung consistently estimated greater distances than those in Long Segar (Colfer 1982). This issue has implications for the process of developing threshold values for making comparable cross-site assessments.[14]

Second, in our cross-cultural comparisons (see Chapter 6), we found what appears to be a core set of concepts that are valid or important in all the humid tropical forests we examined, with empty "slots" (in the questionnaire)

for special, locally determined concepts. For example, rattan might be important in one location, palm hearts in another—but NTFPs were important in all areas. One of our concerns remains the different meanings of a concept in different locations and among different peoples. Although we translated **garden** as *umai* (Iban) and *tayak* (Melayu), these concepts are not entirely comparable. Whereas the Iban garden is a rice field that is associated with the people's subsistence base, uses large amounts of their time, and involves major spiritual significance, the Melayu garden is a small, part-time endeavor not practiced by all families; it has no spiritual significance that we were able to ascertain. Another locally important difference relates to the importance among the Iban of varying stages of forest regrowth (of which the *kampong* stage is likely to be much closer to **spirit** than the word we selected, *babas*). A core set of concepts, if achievable, would simplify cross-site comparisons considerably (for more discussion of this issue, see Chapter 6).

Third, after this research, we wanted to investigate relevant concepts in various contexts, along a continuum of sustainable forest management from both human and biophysical standpoints. In the DSWR, the forests are and have been fairly sustainably managed. Comparable data from more diverse stakeholders in Cameroon, Brazil, and East Kalimantan are discussed in Chapter 6 (for related studies in the United States and Australia, see Cary 1995 or Richardson and others 1996). We hoped that such comparisons could provide useful information on the implications of the conservation ethic, emotional proximity to the forest, and the forest–culture link for sustainability.

In this chapter, we have presented illustrative analyses that we believe accurately reflect local people's cognitive views. The data demonstrate intermediate—not particularly close—cognitive relationships between **forest** and such important concepts as **I**, **good**, **future**, **spirit**, **man**, and **woman**. As such, they do not provide strong support for any of the issues we identified as potentially pertaining to a conservation ethic. Yet ethnographic research has demonstrated strong, if ambivalent, links between people and the forests there.

We had hoped that this kind of analysis could help us pin down the idea of a conservation ethic more precisely. That has not been the result. The Galileo method is designed to measure cognition. Perhaps future efforts to measure a conservation ethic should focus on emotional content rather than the cognitive aspects measured by the Galileo method.

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Annex 5-1. The Galileo Method as Applied in the DSWR

Traditionally, a Galileo study requires respondents to report their perceptions of the differences (often called *distances*) among a set of concepts considered central to the definition of a selected topic, for example, **forests**. These estimated dissimilarities are averaged across all respondents in any segment and projected onto orthogonal coordinate axes to produce a perceptual map or space. Within this space, distances are predictive of attitudes, beliefs, and behaviors.

In our study, 277 respondents estimated the pairwise dissimilarities among a set of terms including **forest** and 19 other concepts identified in previous analyses as pertinent to the perception of forests in Kalimantan villages. The resulting square mean dissimilarities matrix was then analyzed in several ways, including perceptual maps (multidimensional scaling), charts, graphs, tables, and advanced artificial neural networks. Perceptual maps were made using Galileo software, which produces very precise representations of the dissimilarities in graphic form and allows transformations (rotations and translations) to common orientations for easy comparisons of data over time and across subsamples. Previous research has shown Galileo to be an appropriate tool when

- holistic models of cognitive structure and processes are required,
- precise results are desirable,
- a standard metric needs to be maintained across time or subsamples (as when time-ordered maps are needed, or when maps are to be compared from sample to sample), and
- the concepts to be mapped are known.

Galileo modeling may be less appropriate (Woelfel and Barnett 1982, 1992; Woelfel and others 1986, 1989; Cary and others 1989) when investigators are uncertain as to which concepts occur in the cognitive model, or when

- light respondent burdens are crucial,
- there is no need to maintain an invariant metric over time and across samples, and
- precise results are not important.

When less is known about the concepts that need to be included—as in preliminary studies—similar results can be obtained from CATPAC, a self-organizing neural network that reads text and uncovers the main underlying concepts. CATPAC makes it possible to work from in-depth interviews rather than quantitative scales and derive similar results (Cary 1995).

Endnotes

1. Muslim Melayu fisherfolk live in the seasonally flooded core of the reserve. Christian and animist Iban live in the surrounding hills; they are swidden cultivators and, to a much lesser degree, forest workers. These two main groups inhabit ecologically very different habitats and have distinct natural resource management systems.

2. Sample sizes are approximate because overall sample size varies slightly from item to item. Complete statistics are available from the authors.

3. Plots were made with TerraVision, an interactive computer graphics program for perceptual mapping.

4. In this case, the probability that the concept will be in its correct position vis-à-vis other concepts on the map is roughly 75%—a high figure, because of the high degree of agreement among respondents at DSWR about the distances among concepts.

5. See also Freeman 1970, Howell 1984, Davison and Sutlive 1991, Roseman 1991, Colfer and others 1997a, and Wadley 1999a. Moreover, these human–environment links extend to assert human responsibilities to each other, including dead ancestors. Many Dayak believe that various forms of injustice or misdeeds must be redressed to avoid adverse effects in both the environment and the human condition, including climatic extremes, harvest failures, illness, and death (Dove and Kammen 1997; Harwell 2000a,b; Katz and others in press).

6. See Colfer 1981, 1982, 1983a, 1985a, 1985b, and 1991 on the Kenyah; Sutlive and Appell 1991 for a thorough coverage of the issue; or Tsing 1993 for an unusual approach.

7. Colfer found similar results among the Kenyah of two locations in East Kalimantan in 1980 (Colfer 1982).

8. In the 1980 study of perceptions of forests in East Kalimantan, **forest** and **good** were considered quite close among both adults and young people in the remote Long Ampung; a little more distant among adults in Long Segar (a resettlement village closer to "civilisation"), and still more distant among Long Segar's young people (Colfer 1982).

9. Table 5-6 allows us to infer the substantial distance between **forest** and **money.** That **forest** and **money** are not directly compared on this table is an artifact of our analysis process. We also conducted an analysis which used these results to predict the outcome of a vote where people had to choose between **money** and **forest. Money** won by a landslide.

10. In the Sumatra study, one ethnic group was indigenous (Minangkabau), the others were transmigrants (Javanese, Sundanese) from very different environments and cultures.

11. "Garden" is not a good translation for **umai,** the Iban word used in the form. However, because the two groups have such different kinds of agriculture, and we

wanted to compare the findings, we have used one English word. **Umai** would be more properly defined as "field."

12. Wadley notes that Wong Garai men make considerable money logging in Sarawak and suggests, based on these data, that the forests at home may be considered more valuable in their existing state than are forests elsewhere.

13. This was also true in the 1980 East Kalimantan study mentioned above (Colfer 1982). From simple interest, we performed an Automatic Message Generator (AMG) analysis on these data, for possible use in extension or awareness programs to encourage people to use the forest more sustainably. Woelfel's communications research experience indicates that concepts lying between **me** and a concept of interest (in our case, **forest**) have the most potential, when used in extension or awareness programs, to bring the concept of interest closer to **me.** This in turn can result in behavioral changes relating to that concept. Using this software, we identified the concepts with the most potential for moving the concept, **forest** closer to **me,** in the community's cognitive map. The two top contenders were three-concept messages, consisting of **fish, honey,** and **woman** and **honey, woman,** and **village/home.** A message that links **forest** to these concepts is likely to result in local people's feeling closer to the forest and behaving more sustainably toward it. Either of these three-concept combinations had the potential to remove all but 5% of the distance remaining between **forest** and **me.**

14. One common practice of Galileo researchers that might alleviate this difficulty is to choose two concepts from within the domain as the criterion pair. Several researchers (for example, Woelfel and Fink 1980) have suggested that this might provide a more accurate model, because the measuring rod does not have to be "transported" such a large psychological distance to be compared with the distances in the domain. A second advantage is that the internal criterion distance can be used to rescale the data after the fact, should differences in scale size appear.

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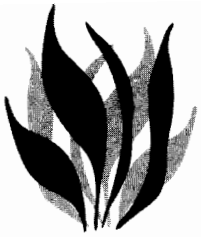

People Managing Forests

The Links between Human Well-Being and Sustainability

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