Psycho-Social Stress and the Construction of a Flood-Control Dam in Santa Catarina, Brazil

by DENNIS WERNER

Dennis Werner teaches in the Graduate Program in Social Science at the Federal University of Sta. Catarina, and resides at Rua Giel. Bittencourt, 47 (apto 04), Florianopolis, Santa Catarina 88.000, Brazil.

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Before constructing large engineering works, planners take into account the costs of the materials, labor, and land necessary for the project. But perhaps because they are difficult to measure, human costs—such as anxiety over an uncertain future, the need to battle for just indemnities, or lost friendships upon forced resettlements—are often left out of the financial analyses. But even so, these costs must be paid—usually by society as a whole, or by the local populations most affected by the projects.

Earlier research in other parts of the world suggests the importance of human factors in the construction of dams. In a series of studies, Scudder and colleagues (Scudder 1973, 1975a, 1975b, 1976; Scudder and Colson 1982) discuss some of the stressful features of dam construction. First, people may suffer physically after a forced resettlement when confronted with inadequate water supplies, housing, gardens for food production, or health services. Even without resettlement, the influx of workers during the construction phase of a project may overtax the existing services in an area. In addition, the reservoir itself may cause diseases such as schistosomiasis, river blindness, or trypanosomiasis (see especially Goodland 1973; Dasmann et al. 1973 for examples).

Scudder also emphasizes the psychological problems that result from uncertainty over the future, both from the need to form new friendships after a forced resettlement and from the need to adjust to a new physical environment. In their studies of various ethnic groups in Canada (including Indians) Berry and his colleagues (Berry and Annis 1974; Berry et al. n.d., and personal communication) argue that this stress may be especially serious among certain ethnic minorities, especially those with greater disparity between their own cultural backgrounds and the culture of the dominant society.

Finally, dam construction may cause social and cultural problems. The influx of workers into an area may increase vandalism, crime, fighting or alcoholism. The need for negotiation with large businesses or government agencies may create a leadership crisis. The relative impotence of local leaders can make people believe either that their leaders are incompetent or that they are being co-opted by the outside powers (Scudder 1973). Relocation may involve loss of old social ties and cultural patterns. Old skills may no longer be useful in the new environments and economic opportunities may be hard to come by (Scudder and Colson 1982). Also, inequalities may increase in that some individuals, in clinging to old patterns no longer useful, lose out to those who take advantage of sudden new opportunities (Partridge et al. 1982).

This study analyzes some of these "hidden" human costs resulting from the construction of a flood-control dam on the upper Itajai River of Santa Catarina state, Brazil. Besides quantifying some of the different forms of stress in order to make cross-cultural comparisons, the study also attempts to distinguish those specific aspects of the project that resulted in greater problems for farmers and Indians in the area.

The Upper Itajai Dam

In 1974 Brazilian President Geisel approved a large flood-control project involving the construction of 18 dams in Brazil. Among these was the dam to be constructed in Ibirama county, Santa Catarina, Brazil, on the upper Itajai River. This dam would control the floods that periodically plagued the 850,000 people in the Itajai valley and the industrial city of Blumenau, Santa Catarina (*O Estado*, 24-4-75). In 1976 the National Department of Sanitation Works (DNOS) began the long process of indemnifying the land to

be used by the construction company and the 1,600 hectares to be flooded. The majority of lands were in the hands of small farmers (non-Indians) who planted tobacco for sale, as well as corn, rice, beans and other foods for home consumption. In all, the DNOS would indemnify 177 farm owners. The dam would also invade approximately 800 hectares (about 5%) of an Indian reserve, "Posto Indigena Ibirama," home of Xokleng, Kaingang and Guarani Indians. As the area to be flooded included the most fertile lands in the reserve, most of the Indian gardens and homes were located there. .

While other Brazilian construction companies carried out social impact studies before beginning dam construction, the Itajai project began without such prior research. As Aspelin (1982) pointed out, social impact studies are undertaken primarily to meet the requirements of foreign funding agencies such as the World Bank or U.S.A.I.D. As the Itajai project was constructed solely with Brazilian funding, no such studies were required. Instead, the farmers and Indians were simply informed of the construction plans and told to move, but not without a great deal of resentment at the failure of government agencies to consult with them (Aspelin and Santos 1981).

With a completion date scheduled for 1978, the dam's construction began in 1976, but as of 1983 had yet to be concluded. A cofferdam built to divert water away from the construction site burst in 1978, flooding the Itajai valley. New floods in 1980 were caused by the bursting of two cofferdams and by the clogging of water behind the dam. One girl died. The mayor of Ibirama received telephone calls and tape recordings threatening his life, and irate citizens promised to place dynamite in the construction works to prevent the project's continuation (*O Estado*, 24-12-80).

DNOS indemnified most of the farmers' and Indians' flood losses without problems. But a few people (especially Indians) were "ashamed" to list all that had been destroyed. Others were absent at the time indemnities were paid, and unable to specify their losses. Everyone lost irreplaceable items. On my visit to her house one Indian woman excused herself for not having things to show me. Before the flood she had interesting Indian artifacts, diaries, out-of-print books and other items with high emotional value to show her guests. There were also the archives of Eduardo Hoerhan, the Indianist who contacted the Xokleng, and who kept meticulous, detailed monthly records of the Indians for 50 years. All had been lost in the floods.

The indemnities for the farmers' land continued. Although the project had been announced in 1973, as late as 1979 40% of the farmers still had not received indemnification (Aspelin and Santos 1981). When people complained about unjust prices DNOS renegotiated, but, according to some informants, if the third offer was rejected, officials threatened to go to court to force abandonment of lands. Only one farmer sued the government agency. Other farmers declared themselves satisfied with the settlements, but several complained that the agency left them with insufficient land to farm, and so were forced to find someone else to buy up what was left—generally someone who also lost part of his land. Some people complained that the new road detouring around the reservoir would require them to spend much more time and money on transportation, risking the health of those who might need to be taken to a hospital. At the time of field research in March 1983 the Indians had yet to receive indemnities for the lands they would lose. Later in the year, in an attempt to force negotiations over their land, they were driven to illegally take over construction equipment being used to build a road through their reserve.

It is easy to imagine the stress these people felt during this long period—fear of new floods, the need to fight with a large bureaucracy for indemnities, and insecurity about a future in a different place. One woman from Barra Dollmann, the township where the dam is being constructed, complained that her father died when forced to move. With the money he received for his lost land he retired to a different locale, and, according to his daughter, became depressed and nervous. Shortly afterwards he died. The daughter is convinced the death was due to the forced resettlement. (This is a common complaint in forced relocations—see, for example, Perlman 1982 on relocations for Brazilian slum clearance programs.) People also complained about the vandalism that destroyed their church; they argued that before the arrival of the construction workers this sort of thing did not happen.

How serious are the human problems caused by the construction of the Ibirama dam? How does the stress of the local people compare with stress elsewhere? And what exactly is most responsible for this stress? To help answer these questions, in July 1982 an assistant and I interviewed a random sample (using a table of random numbers) of 65 adults (18 years or over) in Barra Dollmann, the township where the dam is being built. Also, in February and March 1983 I interviewed 41 randomly selected Xokleng and Kaingang adults of the lower part of the Ibirama Indian Post and 5 Guarani Indians in the same reserve. (The reserve includes two quite distant settlements of Xokleng and Kaingang as well as two separate villages of Guarani.)

In the interviews we asked many questions about losses due to the dam, indemnities paid, health, and stress, as well as "standard" questions like age and sex. Most of the questions were fairly straightforward, but the question of stress was more complicated and warrants special discussion.

Measuring Stress

The concept of stress has a long history. As Lumsden (1975) points out, many writers give different meanings to the word. Some understand "stress" to be the stimulus that causes problems, others see it as the psychological response to problems, and still others refer to the interaction between stimulus and response. There is some evidence for empirical if not conceptual interrelationships between these different ideas of stress. For example, in a series of well-known studies, various researchers (Lazarus et al. 1966; Rahe 1969; Harmon et al. 1970; Holmes and Masuda 1972; Cochrane and Robertson 1973; Dohrenwend 1973; and Lauer 1973) showed that certain factors considered psychologically stressful—such as sudden changes in life, the loss of a spouse, a change in residence or the loss of a job—seem to encourage certain physical illnesses such as rheumatism or angina pectoris (Aakster 1974). In a controlled experiment Weiss (1972) showed that anxiety over *possible* electrical shocks accounted for stomach ulcers in rats better than did the actual physical

TABLE 1. PSYCHOSOMATIC STRESS

.45[c]	1. Do you have pains in the heart or chest? (yes)[d]
.32[b]	2. Do you usually belch a lot after eating? (yes)
.51[c]	3. Do you constantly suffer from bad constipation? (yes)
.50[c]	4. Do your muscles and joints constantly feel stiff? (yes)
.28[a]	5. Is your skin very sensitive or tender? (yes)
.43[c]	6. Do you suffer badly from frequent severe headaches? (yes)
.51[c]	7. Do you often have spells of severe dizziness? (yes)
.52[c]	8. Do you usually get up tired and exhausted in the morning? (yes)
.66[c]	9. Do you wear yourself out worrying about your health? (yes)
.35[b]	10. Do you usually have great difficulty in falling asleep or staying asleep? (yes)
.37[b]	11. Do strange people or places make you afraid? (yes)
.33[b]	12. Do you wish you always had someone at your side to advise you? (yes)
.40[b]	13. Do you usually feel unhappy and depressed? (yes)
.41[c]	14. Do you often wish you were dead and away from it all? (yes)
.38[b]	15. Does worrying continually get you down? (yes)
.31[a]	16. Are you extremely shy or sensitive? (yes)
.38[b]	17. Does it make you angry to have anyone tell you what to do? (yes)
.55[c]	18. Do people often annoy or irritate you? (yes)
.44[c]	19. Do you often shake or tremble? (yes)
.53[c]	20. Do you often break out in a cold sweat? (yes)

[a] $p < .05$; [b] $p < .01$; [c] $p < .001$; [d] response in parentheses indicates more stress.

TABLE 2. SOCIAL STRESS

.63[c]	1. In the past month did you fight with a neighbor? (yes)[d]
.65[c]	2. Do the important people in this area work well for you? (no)
.39[c]	3. Do the people here help a lot when someone has problems? (no)
.42[c]	4. Do people here treat each other well? (no)
.35[b]	5. Would you like to have other leaders here? (yes)
.37[b]	6. Is crime a serious problem here? (yes)
.36[b]	7. Would you prefer to live in another place in Brazil? (yes)
.31[a]	8. Is there cooperation among the people in this area? (no)
.48[c]	9. Do you know of a neighbor who fought in the past month? (yes)
.40[c]	10. Do the people here treat each other worse than in years past? (yes)
.62[c]	11. Are there people here you don't want to see? (yes)
.31[a]	12. Do people usually follow the laws in this area? (no)
.35[b]	13. Do you know anyone who did something against the law? (yes)

[a] $p < .05$; [b] $p < .01$; [c] $p < .001$; [d] response in parentheses indicates more stress.

stress of the shocks. There is also evidence that psychological stress may exacerbate social problems such as alcoholism, fighting and crime (Berry, cited in Richardson 1975).

As Lumsden (1975) noted, what is important in research is not so much the terminology, but rather the usefulness of a definition (at least at the operational level) for testing theories and making comparisons. It is with this research spirit that I adopted the "psychosomatic stress" scale used by Berry and colleagues (Berry 1976, Berry and Annis 1974, Berry et al. n.d.) in their research among various ethnic groups in Canada and elsewhere. Berry and Annis (1974:384) note that their measure of "psychosomatic stress" could be referred to by others as a measure of "mental health," "personal adjustment," or "personal discomfort." Based on 20 items drawn by Cawte from the larger Cornell Medical Index, this scale had been tested for reliability in various places, and could serve as a comparative base for the present research.

Table 1 shows the items of this scale. Questions are of various types. Some deal with physical problems that result from worries—such as difficulty in going to sleep or headaches. Others deal with purely psychological problems such as fear of strangers or wishing oneself dead. Even so, research in other parts of the world shows that the scale forms a coherent whole. Those who respond "yes" to one question generally respond "yes" to the others. The item-to-rest correlations for the Barra Dollmann sample (interviewed eight months before the Indian sample) showed the scale was also internally reliable in the present study.

Besides the more psychological stress measured in Berry's scale, I also wanted some way to measure Scudder's (1975b) concept of "social stress." By "social stress" Scudder was referring to problems such as fighting with neighbors, lack of confidence in local leadership, and crime. In a later publication, Scudder and Colson (1982) expanded this concept to talk of "sociocultural stress," in which they included questions of economic hardship and the loss of a group's cultural inventory.

In this study I am primarily interested in "social stress" as defined in Scudder's earlier works. Unlike economic hardships which economic planners are more apt to recognize in their projects, social stress is a more elusive human cost that has been little investigated. Also, unlike loss in cultural repertoire which may or may not be desirable, social stress is clearly an unfavorable phenomenon and should be kept to a minimum in major engineering projects.

To measure social stress I constructed a scale from 20 original questions about such problems as drinking, distrust of neighbors, fear of thievery or other crime, and lack of confidence in leadership. For some questions a "yes" answer indicated more stress, while for others a "no" answer was more stressful. To test for internal reliability I checked whether the people who gave stressful responses on any given question were also more likely to give stressful responses on the other questions. That is, I checked the correlation of each question with the sum of the remaining questions. This analysis of "item-to-rest" correlations showed that seven of the original questions were unreliable, principally because there was little variation in responses to the question or because the question was poorly understood. Table 2 shows the 13 remaining questions together with their "item-to-rest" correlations. The sum of stressful responses to these 13 questions served as an indicator for social stress. With measures for these different forms of stress, I could examine the factors that most led to increased stress among the study's farmers and Indians.

How much stress is there among the farmers and Indians in the area of the flood-control project? Of the 20 items in the psychosomatic stress scale, the farmers responded "yes" (more stress) to a mean of 9.13 questions. The Indians responded "yes" to a mean of 8.12 questions. The difference between the two groups is not statistically significant. But it is important to place these means in perspective with the means of other groups. John Berry studied stress using this scale in 12 different ethnic groups (Berry 1976; Berry and Annis 1974), including nine Canadian Indian groups, Vietnamese refugees in Canada, and Canadian English farm and mining villages. The means for psychosomatic stress varied from 1.79 for the Canadian farmers to 7.03 for the Cree Indians. Thus, the means of the Ibirama farmers and Indians are higher than for any other studied group. Except for the case of the Cree (who also suffered the intrusion of a dam into their territory), the differences between the Ibirama groups and those studied by Berry are all statistically significant. These results leave little doubt about the high degree of stress among the Ibirama farmers and Indians.

As for "social stress," the Barra Dollmann farmers gave stressful responses in a mean of 2.65 of the 13 questions, while the Indians responded with more stress in a mean of 4.83 questions. This difference between the two groups is highly significant ($F = 13.3$, $p < .001$). The Indians suffer much more social stress.

What are the reasons for the high degree of psychosomatic stress among the farmers and Indians and for the high social stress among the Indians? To what extent can the stress be attributed to the Ibirama dam? Although this study does not include a totally unaffected community, there were many Barra Dollmann farmers and reservation Indians who lived and worked above the flood line and would not lose their own lands. Thus, it is possible to make comparisons to distinguish the effects of the dam from other possible stressors.

Table 3 shows the correlations of different variables with psychosomatic and social stress. The simple fact of having lost something because of the dam predicts stress neither among the Indians nor among the farmers. Perhaps this result is predictable since many people claimed satisfaction with the indemnities they received; a few even remarked that they did very well. For example, one man used his indemnization to buy a retirement home for his parents and to set up a very successful butcher shop.

It seems the question of *uncertainty* is more important. The Indians and farmers who know they will lose land but have not yet been indemnified show slightly more psychosomatic stress than the others (although these differences do not reach statistical significance). The problem of indemnities is more serious for the Indians since none of the lands they will lose has been indemnified. In the case of the farmers, only the land to be taken by a new roadway around the dam still needs to be indemnified. This probably explains the higher correlation between "awaiting indemnification" and "psychosomatic stress" among the Indians.

A few other correlations in Table 3 also deserve comment. In general, men show less psychosomatic stress than do women. This sex difference may be common in many ordinary situations, but it is also possible that the greater stress for

TABLE 3. PSYCHOSOMATIC AND SOCIAL STRESS

	Psychosomatic stress		Social stress	
	Barra Dollmann (N = 65)	P.I. Ibirama (N = 46)	Barra Dollmann (N = 64)	P.I. Ibirama (N = 46)
Man?	−.31[a]	−.27	−.04	−.03
Old?	.15	.15	−.25[a]	−.07
Suffered losses?	.003	.14	.02	−.20
Will suffer losses?	.16	.21	.16	−.003
Awaiting indemnification?	.16	.26	.16	.04
Dissatisfied with indemnification?	—	.06	—	−.23
Married?	−.05	.09	−.21	.09
Became ill?	.10	.38[b]	.18	.23
"Pure Indian"?	—	−.24	—	−.11
Dissatisfied with leadership?	—	.13	—	.49[b]
Psychosomatic stress	—	—	.33[b]	.37[b]

[a] $p < .05$; [b] $p < .01$.

women may in part be due to their greater difficulty in relating to public agencies. Most women are accustomed to domestic and agricultural work, and have little contact with outside authorities. The dam meant that many had to become more involved with these outsiders. Various authors have commented that women generally experience greater stress during transitions of this type (see Scudder 1973, 1975a for examples), although there are cases where women may suffer less stress (see Spring 1982 for an example).

In Barra Dollmann older people show less social stress than do younger. This seems contrary to the findings of many researchers who claim greater general stress for the elderly in situations of forced social change (Scudder 1973; Spring 1982). The finding deserves more investigation. Perhaps the older people in the Barra Dollmann sample felt more at ease with their neighbors and friends simply because they knew them better after so many years of living together. The sample did not include older people who moved out of the area and who might well exhibit much greater social stress.

Table 3 also shows correlations between psychosomatic and social stress. This confirms the general arguments about how the two may influence each other. For example, Berry (as quoted in Richardson 1975) points out that stressed individuals are more likely to engage in fights, commit crimes, or become alcoholic.

Finally, Table 3 also shows a correlation between "leadership dissatisfaction" and social stress. (The leadership insatisfaction variable is based on questions I asked the Indians about who *in fact* were their leaders and who the Indians *would like* their leaders to be. People who changed many names from one question to the other were coded as less satisfied.) This association was expected since questions about leadership formed part of the social stress scale. I report the

TABLE 4. INDIGENOUS LEADERS

	Leaders in fact % of votes	Leaders desired % of votes	Intercorrelations									
			B	C	D	E	F	G	H	I	J	K
A	(70)	(52)	.03	−.05	.13	.33	−.07	.15	−.03	−.16	.23	.23
B	(52)	(39)		.59	.44	.25	−.48	.43	−.41	−.40	.33	.19
C	(39)	(33)			.24	.15	−.35	.28	−.28	−.31	.29	.15
D	(30)	(22)				.69	−.37	.29	−.33	−.26	.07	.53
E	(30)	(22)					−.37	.29	−.33	−.25	.08	.53
F	(24)	(24)						−.31	.75	.69	−.20	−.20
G	(24)	(24)							−.28	−.22	.13	.46
H	(20)	(20)								.79	.17	.17
I	(13)	(15)									−.14	.14
J	(11)	(13)										.10
K	(11)	(9)										

correlation here because leadership problems seem particularly acute among the Indians and merit special attention. Scudder's (1973) argument about how outside agencies create local leadership crises may be particularly important here.

Leadership within the Indian Reserve

The Ge-speaking Indians of Brazil are renown for their factionalism. With a history of numerous fights and killings between political opponents, the Xokleng and Kaingang are no exception (Henry 1941; Urban 1978). Recently, physical fights between leaders of the different factions have become almost routine, and the reserve has experienced at least one murder in the past few years. To what extent can the leadership problems within the Indian reserve today be attributed to this general Ge tendency for political fighting and to what extent can they be attributed to contemporary problems?

According to Urban (1978:69, 323, 350–354), factionalism is at the "heart" of Xokleng social life, and may form the basis for other aspects of life as well, such as kinship and ritual. Today, Urban (1978:354) argues, the Indians have succeeded in turning the "Brazilian national society macrocosm in some measure into an image of their factional microcosm." That is, the Indians have managed to manipulate outsiders (Indian foundation bureaucrats, state and national congressmen, missionaries and anthropologists) to support their own internal disputes. Santos (1973) has recorded numerous examples of Xokleng factional politics that drew in important outsiders in deals over such forest products as heart of palm and fine woods. In this context, the dam seems like just one more reason to exacerbate these factions.

It is important to understand how much the Indians are manipulating outsiders and how much they are being manipulated. According to some Indians, for example, it is FUNAI (the National Indian Foundation) that is dividing the Indians by paying "salaries" to some who, in fact, do nothing to earn the money. These "salaried" Indians form a support group for FUNAI's politics, especially in questions of indemnities or other contracts between outsiders and the Indians. According to some Indians, these "bribes" allow outsiders to buy Indian products (like lumber) for much less than their actual value. The FUNAI practice of paying these fictitious salaries is new in the reserve, having originated shortly after the beginning of the flood-control project.

Who is right about these factions? Are they Indian traditions, or are they, at least in part, created by FUNAI? Are they an admirable characteristic of a culture with a strong egalitarian ideology, or are they destructive in dividing the Indians before outside exploiters? To understand these questions I decided to examine in more detail the nature of the Indian factions. I asked all the Indians interviewed to give me the names of five leaders in the reserve, and of five people whom the Indians would like to be leaders. In Table 4 the 11 most voted leaders are identified by letters of the alphabet, and the percentage of votes each received are shown in the first two columns. For example, 70% of the interviewees said that "A" was a leader, but only 52% said they *wanted* him to be a leader. It is worth noting that leaders "D" and "E" ranked fourth as actual leaders, but fell to sixth place as "wanted" leaders.

The correlation matrix in Table 4 shows that the people who wanted B as a leader generally also voted for C, D, E, G, J and K. But those who voted for B did *not* vote for F, H or I. As can be seen from the table, there are two clear factions in the reserve. In one are B, C, D, E, G, J and K; in the other are F, H and I. Those who voted for leaders of one faction generally did not vote for those of the other. Only leader "A" is somewhat above this factionalism, since almost all accepted him as a leader.

Is this factionalism more pronounced than normal for Ge groups? By way of comparison I decided to do this same exercise with data from another Ge group researched in 1976 and 1977—the Mekranoti-Kayapo of southern Para state, Brazil (see Werner 1981, 1982). The Mekranoti are also known for their "factionalism" (for example, see Turner 1969). In the Mekranoti case I asked a random sample of 30 adults to give me the names of 10 male leaders and 10 female leaders. To make for a more exact comparison with the Ibirama

TABLE 5. ORIGINS OF FACTIONALISM

Leaders	A's family	"Pure Indian"
A	.14	.13
B	.38	.36
C	.44	.36
D	.59	.24
E	.40	.008
F	−.17	−.64
G	.37	.27
H	−.15	−.52
I	−.13	−.65
J	.34	.25
K	.45	.20
Dissatisfied with leaders?	−.17	.08

Indians I decided to consider only the first five male names given by the Mekranoti. (The Ibirama Indians did not name women.) The correlation matrix that resulted from the Mekranoti data was quite different from the Ibirama matrix. Thirty-one of the 55 Ibirama correlations were equal to or greater than .25, but only 9 of the 55 Mekranoti correlations were equal to or greater than .25. Thus factionalism among the Mekranoti was much weaker. People simply did not divide themselves into clearly distinct factions.

The political schisms of the Ibirama Indians cannot be attributed simply to the general tendency for Ge factionalism, since at least some Ge groups (the Mekranoti) do not exhibit this degree of political rivalry. What, then, are the other factors that might be responsible for the internal divisions of the Ibirama Indians?

Depending on who is talking, the splits in Posto Indigena Ibirama are seen differently. For some Indians, the principal division is between "pure Indians" and "mestizos,"—the latter accused of wanting to get ahead at the expense of the "pure Indians." For others the main split is between the "family" of leader A, which receives salaries from FUNAI, and everyone else.

To examine these ideas I divided the interviewees into "pure Indians" and "mestizos" using the Indians' criteria as collected by one of the Indians. I also divided the interviewees into the members of leader A's family and everyone else. The purpose of this exercise was to see if the people who voted for one or the other leader could best be classified as "pure Indians" or as "members of A's family."

Table 5 shows the results of this study. The correlation between "voting for leader B" and "being a member of A's family" is .38. The correlation between "voting for leader B" and "being a pure Indian" is .36. In this case the two correlations are similar so there is no way to distinguish whether people vote for B because they are "pure Indians" or because they are members of A's family. But for other leaders the differences are clearer. The members of A's family had a strong tendency to vote for leaders D and E, while "pure Indians" did not follow this tendency ("D" and "E" are sons of leader A). This implies that these two leaders enjoy leadership positions primarily because of the influence of their family. On the other hand, leaders F, H, and I were "elected" by "mestizos." Being a member of A's family had little to do with their leadership positions.

As these correlations show, some leaders in the Indian community enjoy their positions because of their family ties. This supports the argument of the faction claiming that FUNAI is co-opting this family, and thereby dividing the community. This co-optation fits well with Scudder's (1975a) argument about how large private or government bureaucracies gain control of areas affected by engineering works, and suggests one source of the high social stress among the Indians. This finding is also in line with arguments that see a feeling of lack of control over one's own affairs as socially stressful. Compared to the Barra Dollmann farmers who are not so easily manipulated by outside bureaucracies, the Indians may experience more social stress because they have less control over their own affairs. Much of this outside control pre-dates the Ibirama flood-control project, but the disputes over indemnization seem particularly acute. In addition, it should be remembered that there are also other problems in the Indian community between "mestizos" and "pure Indians" that are not restricted to the "bribes" paid by FUNAI.

Conclusions

The farmers and Indians affected by the construction of a flood-control dam in Santa Catarina show higher dgrees of stress than do people elsewhere. At least in part this stress seems to be associated with problems brought about by the dam, such as the delay in paying indemnities. The case of the Indians in Ibirama also supports the contention of Scudder about how large bureaucracies that handle construction works can create a crisis in local leadership, and increase general social stress.

If psychological and social stress result from engineering projects, we must ask who should be held responsible for these "hidden costs." Do we have the right to ask local populations to suffer for the benefit of distant cities? And if stress (especially social stress) prevents people from organizing themselves satisfactorily in defense of their rights, then what is the role of outsiders who want to help? And what are the obligations of the agencies responsible for the projects? We need to clarify these questions in order to guarantee that projects, like the construction of dams, really benefit all and not just those who live far from the problems.

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