FACTORS INFLUENCING THE SUSTAINABILITY OF INTEGRATED COASTAL MANAGEMENT PROJECTS IN THE PHILIPPINES

Richard B. Pollnac, Monika T. Thiele, Rose-Liza Villahermosa Eisma, Wednesday Gay Gaudan, Esperanza Tabara, Nicel Jane Dinoy, and Rodolfo Avellana, Jr.

ABSTRACT

The paper examines the sustainability of integrated coastal management (ICM) activities associated with several ICM projects in the Philippines. Sustainability implies continuance of activity beyond project termination date; hence, the focus of this study is on those that ended more than 5 years ago. In the large projects examined in the research, activities were carried out in numerous municipalities and villages (barangays), and there were varying levels of sustained activities in the different project sites. This paper examines data from 42 villages in the Visayas, Batangas, and Lingayan Gulf areas of the Philippines and quantitatively elucidates socioeconomic and project activity factors related to these differences in ICM sustainability. The results indicate that social science theory and findings already in the literature can be used to account for some of the differential levels of success. As the research clearly indicates, practices related to sustainability are not always applied in actual project implementation. And even where they are, we still find mixed results suggesting that we must refine our research methods even further to determine other factors influencing ICM project sustainability.

Introduction

Although some would like to divorce the concept of "success" from "sustainable", it should be clear that successful project activities are an essential prerequisite of sustainable coastal management, especially if the activity is somehow linked to sustainable resource use. For purposes of our research, a sustainable integrated coastal resource process has been defined as:

> *a process that supports sustainable resource use beyond the termination of an ICM project. It is adaptive and multi-sectoral as appropriate and is supported by a stable source of financial and technical resources.*

If we define "process" as a particular way of doing things, we can conceptualize project activities, e.g., establishing a marine protected area (MPA), developing a management plan, etc. as a process. The relative success of these activities, then, would be part of the process that influences the sustainability of ICM.

There have been many ICM and community based coastal resource management projects in the Philippines (Courtney and White, 2000; Pomeroy and Carlos, 1997). As they have manifested various levels of success when they were implemented, their sustainability has varied widely. Some are nothing but a memory; others are still visible in terms of ongoing activities. What is interesting, and possibly valuable in terms of learning lessons about factors influencing processes that support sustained resource use, is that within the same project there are varying levels of sustained activities in different project sites. Hence, it seems obvious that if we want to learn what factors influence ICM sustainability, we would do a comparative analysis of project sites that vary in terms of sustained activities.

The purpose of this paper is to examine the sustainability of ICM activities associated with several ICM projects in the Philippines. Since the question concerns sustainability, we set a selection criteria for projects sampled in this evaluation to those where project inputs have ended for at least 5 years. In most of the large projects activities were carried out in numerous municipalities and *barangays*, and in most there were varying levels of sustained activities in the different project sites (Pollnac, et al., 2001; Pomeroy, et al., 1997; Ferrer, et al., 1996). This paper will attempt to quantitatively elucidate factors related to these differences in sustainability.

Background

Numerous case studies (see Crawford, et al., 2000, which was based on a series of focus group meetings and Pomeroy 1994 for a summary) and a few quantitative, comparative studies (e.g., Pollnac, et al., 2001; World Bank 1999; Pomeroy, et al., 1997) have been conducted evaluating factors or variables influencing the success of coastal management project activities. A careful review of this literature has suggested several types of factors that appear to influence sustainability of ICM as related to success of project activities; hence, we focus on predictors of success in the review. The first are contextual: demographic and socioeconomic aspects of the project communities. Several aspects of the physical environment and demography have been suggested as factors influencing success of CRM projects. Crawford, et al. (2000) suggest geographic size of the village. The direction of the relationship is not clear in their report, but it seems possible that villages with larger geographic areas might be more difficult to govern if the population is dispersed. Alternately, one might assume that larger villages would have more alternative (terrestrial) resources; hence allowing the development of more alternative livelihoods to take the place of resources regulated by CRM activities. Several researchers (Crawford, 2000; Novaczek and Harkes, 1998; McGoodwin, 1994) have suggested that population size as well as changes in population size and density influence CRM project success, especially community-based CRM (CBCRM) projects, while Pollnac, et al. (2001) found population size to be a major predictor of MPA success. Small populations seem easier to organize and rapid increases in population can lead to disorganization and conflict. Distance of the village from the municipal center might influence the ability of the municipal government to provide support—government support considered important by Crawford, et al. (2000). Finally, a perceived crisis with respect to coastal resources is alleged to positively influence development of community participation in management (Pinkerton, 1989a,b).

Aspects of the social environment have also been found to influence the success of CRM projects. Socioeconomic and cultural homogeneity have been identified as factors contributing to the success of CBCRM and CB-MPA projects (Pollnac, 2000; Crawford, et al., 2000; White, et al., 1994; Doulman, 1993; Jentoft, 1989; Pinkerton, 1989b). This is probably due to the fact that it is easier to achieve consensus with respect to project activities where the population is more homogeneous. Degree of dependence on coastal resources also seems to be related to acceptance of CRM activities (Crawford, et al., 2000; Pollnac, 1994). Level of community development (Crawford, et al., 2000), degree of integration into political and economic system (Crawford, et al., 2000; Doulman, 1993), and a "healthy" community (Jentoft, et al., 1998) are all said to be related to success of CRM projects.

Communities with a tradition of cooperation and collective action have also been identified as those most likely to effectively respond to CRM projects (Crawford, et al., 2000; Pomeroy, et al., 1997; Jentoft, 1989). Some have linked degree of democracy or authoritarianism to CRM, especially CBCRM project success (Crawford, et al., 2000). It seems obvious that community based projects would be more successful in less authoritarian communities, but it should be noted that Novaczek and Harkes (1998) found that successful local level management systems (*sasi*) in the Moluccas (Indonesia) were likely to be associated with the authoritarian power of a strong local leader. Success of CRM projects has also been linked to stability of local governments (Crawford, et al. 2000). Finally, supportive local leadership is said to contribute to the success of CRM projects (Crawford, et al., 2000; White, et al., 1994). Further, visits to the village by government officials appear to instill community pride in a project.

Crawford, et al. (2000) identified a large number of aspects of project activities that allegedly influence success of CRM projects. Interaction or networking with other CRM projects has been cited as a factor enhancing chances of success. Some have suggested that the existence of other coastal resource management

projects in the community can also facilitate success. Many rural communities have multiple problems, and more can be addressed in multiple projects. It is important to note that establishment of regulations that limit resource exploitation removes some of the resource from harvesting by the community (e.g., as with an MPA). It has been argued that the controlled resource should be replaced by alternative or supplemental income generating activities; hence, these activities have been related to CRM project success (Pollnac, et al., 2001). It is widely accepted that training is a necessary component to any type of development or conservation project (White, et al., 1994). Finally, inputs (financial or material) are essential to project success. Many of the factors alleged to influence CRM success in Crawford, et al., (2000) involve some aspect of local participation in the project. Local level participation in project development and implementation has long been recognized as a factor promoting desired changes (Cernea, 1991; Chambers, 1983; Morss, et al., 1976; Rogers, 1969) and CRM projects are no exception to this rule (Pomeroy, et al. 1997; Pomeroy 1994; White, et al., 1994). With respect to continuity of project activities, the number of ongoing training sessions during and after implementation seems to be important.

In sum, a large number of variables have been implicated in the success or failure of CRM project activities. It seems that if we want to determine factors influencing sustainability of ICM projects it will be necessary to evaluate these factors across a range of project locations to determine which are associated with different levels of success of project components which may impact sustainability.

Methods

SAMPLE Project sites associated with three major ICM projects were examined as a part of this research: the Central Visayas Regional Project (CVRP), a municipal level, watershed scale project in the Visayas, which was implemented in 1984 and ran until 1992; the ASEAN-US Coastal Resources Management

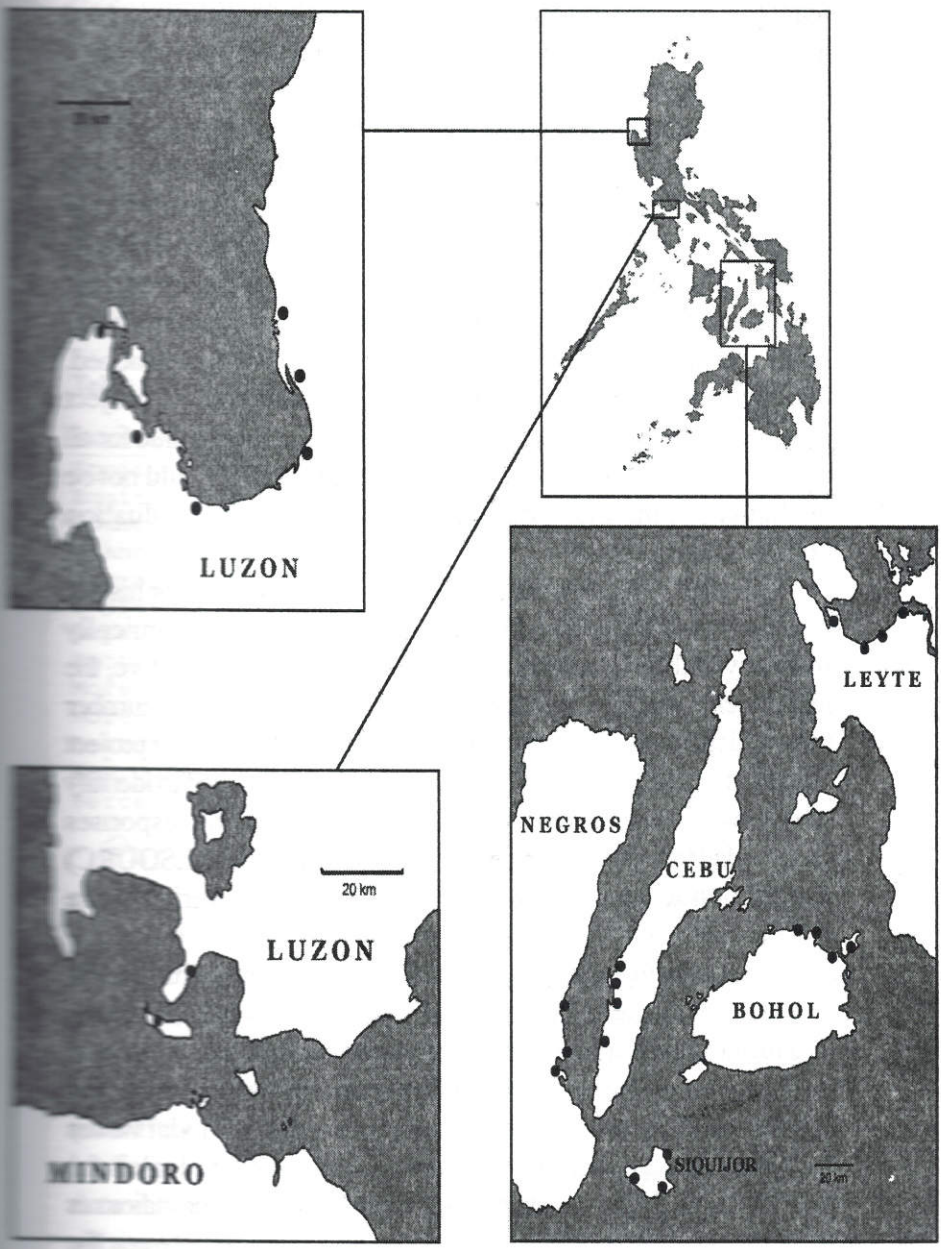
Project (ASEAN-US CRMP, 1986-1992), a gulf wide management planning initiative, and the Fishery Sector Project (FSP, 1989-1996) a bay planning initiative implemented in numerous bays and gulfs in the Philippines. For CVRP data were collected in 3 villages in Siquior, 4 in Negros Oriental, 5 in Cebu, and 11 in Bohol. Six FSP project villages were assessed in Carigara Bay, Leyte. Seven ASEAN-US CRMP project villages were assessed in Lingayan Gulf in the Provinces of Pangasinan and La Union. Finally, six villages associated with a variety of other ICM projects, many funded by NGOs, were assessed in Batangas and Bais Bay, Negros Oriental. Data were collected in a total of 42 project villages, which are located in the 26 municipalities indicated by black dots on the map in Figure 1 (next page).

Data were obtained with the use of a survey questionnaire. In each village, a village official (usually the *barangay* captain) was interviewed to obtain basic information about the village as well as topics related to project activities and impacts. Project participants, individuals involved in project activities, were also interviewed. The number of participants depended on the range of activities carried out. A total of 148 participants were interviewed across the 42 villages resulting in an average of approximately 4 (3.5) per village. Finally, resource users were interviewed. An attempt was made to interview representatives of users of the various types of resources impacted by project activities. Across the 42 villages, 236 resource users were interviewed, resulting in an average of about 6 (5.6) per village.

Measures: Dependent Variables

The dependent variables are project outputs or activities which are indicators of processes that support sustainable resource use beyond the termination of an ICM project. One measure of project sustainability is a summary measure constructed from the research team's evaluations.

Figure 1. locations of project municipalities.



Following completion of data collection at each site, the team (all were involved in the data collection process) assembled and ranked each site in relation to the others on a scale of from 1 to 5 on topics considered as indicators of project sustainability. The topics ranked were compliance with MPA rules, compliance with mangrove conservation rules, beach cleanliness, and overall project impact. The ranking was based on research team observations, as well as comments made by resource users (e.g., fishers), project participants, officials (e.g., the *barangay* captain, secretary, etc.), and other community members concerning the topic. The topics were discussed until a consensus was reached. The summary measure of the team's evaluation of project sustainability was constructed by calculating the mean value for all topics evaluated (e.g., if a MPA was not present, it could not be evaluated). This measure is referred to as Team Evaluation (TEAMEVAL).

In each village a village official (*barangay* captain or his/her representative) was asked if the village benefited economically from any of the project activities. If the response was positive, the respondent was requested to name the activities. The total number of beneficial activities mentioned is used as an indicator of project sustainability (ZTOTACT). The officials were also asked to identify the types of benefits received from the activity. The responses were coded into the categories of resource benefits (BRESOURC) and economic benefits (BINCOM). Both of these variables are dichotomies.

In each village, project participants were requested to evaluate on a scale of from 1 to 4 (1=none, 2=very little, 3=some, 4=a lot) project impacts in terms of each of the indicators listed in Table 1. Modal (the most frequently occurring) values for each of these evaluations were determined for each village. Modal values for the village are used since the village, not the individual, is the sampling unit. While it is interesting to examine each of the indicators one at a time, it is possible that there are relationships between the indicators that can be used to understand changes in more general

factors in the project communities. As a means of discovering these more general factors, principal component analysis with varimax rotation was used to elucidate patterns of relationships between evaluations of the 12 indicators. The screen test was used to determine the number of components, resulting in 2 components, which account for a total of 69 percent of the variance in the data set. The results of this analysis are in Table 1. Most of the items loading highest on the first component are related to access and equity. On the second component most of items loading highest are related to quality of life.

Table 1. Principal component analysis of perceived project impacts

INDICATOR	ACCESS EQUITY	QUALITY OF LIFE
Equity in income from resource	0.847	0.155
Equity in access to resource	0.833	0.120
Community control over resource	0.819	0.181
Quantity of fish	0.794	0.261
Improved access to resource	0.786	0.386
Improved income	0.648	0.588
Improved housing	0.184	0.920
Better health care	0.257	0.880
More education for children	0.414	0.859
More mangroves	-0.410	0.574
Better water quality	0.428	0.556
New occupations	0.208	0.521
Percent Total Variance	36.798	32.514

Component scores representing the position of each village on each component were created for each village. The component scores are the sum of the component coefficients times the sample standardized variables. These coefficients are proportional to the component loadings. Hence, items with high positive loadings contribute more strongly to a positive component score than those with low or negative loadings. Nevertheless, all items contribute (or subtract) from the score; hence, items with moderately high loadings on more than one component (e.g., improved income in the analysis presented here) will contribute at a moderate level, although differently, to the component scores associated with the

both components. This type of component score provides the best representation of the data. In this paper, for these data we will refer to these scores as Access/Equity (ACCEQI) and Quality of Life (QUALIFE) indicators.

Since project participants have the greatest knowledge concerning project activities in the villages, they were requested to indicate all activities undertaken and then indicate whether or not the activity is still being carried out (sustained). The percent of sustained activities is used as another indicator of ICM sustainability (SUSTAIND).

Resource users have the most consistent contact with the resource; hence, they are in a better position to comment on its quality and quantity. Resource users were requested to evaluate changes in fish abundance[1] and coral reef conditions since project implementation on a scale of from 1 to 5 (1=gotten much worse, 2=a little worse, 3=not changed, 4=improved a little, 5=improved a lot). Median values for user respondents in a village are assigned as the value for the village and are identified as time-two resource (T2RESMED) and time-two coral (T2CORAL) respectively.

Table 2. Principal component analysis of sustainability indicators

INDICATOR	COMPLIANCE & ACCESS	SUSTAINED ACTIVITY	RESOURCE & GOVERNANCE
COMPL2U	0.798	-0.066	0.142
T2CORAL	0.726	0.120	0.203
COMPL1U	0.692	0.052	0.265
ACCEQI	0.619	0.103	-0.207
LEGALFTO	0.588	-0.122	0.592
SUSTAIND	-0.051	0.868	0.002
QUALIF	-0.294	0.775	-0.203
TEAMEVAL	0.192	0.690	0.213
ZTOTACT	0.323	0.555	0.322
GRPSUCCU	0.471	0.553	0.187
LEGALWTO	0.190	-0.091	0.745
KNOWRULE	-0.333	0.268	0.717
BINCOM	0.106	0.037	0.522
T2RESMED	0.152	0.191	0.472
Pct. Tot. Var.	21.466	18.632	16.525

Another indicator of sustainability is the continuity of groups or associations (e.g., fisher or farmer cooperatives, etc.) formed as a part of project activities. These groups are usually responsible

for carrying out project activities after project inputs cease; hence, their importance in ICM sustainability. This is a dichotomous variable indicating group success (GRPSUCCU).

A major component of ICM sustainability involves knowledge of and compliance with the rules and regulations that form a part of coastal management. Several indicators are used to evaluate this aspect of sustainability. First, project participants were requested to evaluate on a scale of from 1 to 3 (1=no awareness, 2=some awareness, 3=full awareness) the extent to which community members are aware of ICM rules. The modal value reported in each village is used as the indicator of knowledge of ICM rules (KNOWRULE). Resource users were asked which rules they know, and for each rule (ordinance) they were requested to evaluate compliance on a scale of from 1 to 4 (1=no compliance, 2=most violate, 3=most comply, 4=all comply). The median value for the first two rules mentioned is used as the indicator (COMPL1U and COMPL2U, respectively). All respondents (village official, participants, and resource users) were asked about the presence of blast (dynamite), cyanide, and other illegal fishing methods. If any respondent in each group gave a positive response to one of these categories of illegal fishing, it was coded as present at the village (a dichotomy, 1=present, 0=absent). These values were summed within each category resulting in a score for illegal fishing that ranges between 0 and 3 for each respondent category within each village. The scores for the respondent categories were then summed for each village resulting in a total score for illegal fishing that varies between 0 and 9. To facilitate analysis, the score was converted to a score for legal fishing by changing the sign of the value, resulting in a score varying between –9 and 0, with the lower value (-9) indicating the least amount of legal fishing (LEGALFTO).

An important point concerning illegal fishing is who is involved. It seems obvious that if the illegal fishing is conducted by project villagers, it reflects more negatively on the sustainability of

the project than if it is conducted by outsiders. Hence, respondents were requested to indicate who (in terms of residence) is conducting the illegal fishing. If any respondent in each group indicated community member involvement in one of these categories of illegal fishing, it was coded as present at the village (a dichotomy, 1=present, 0=absent). These values were summed within each category resulting in a score for illegal fishing by community members with a range between 0 and 3 for each respondent category within each village. The scores for the respondent categories were then summed for each village resulting in a total score for illegal fishing by community members that varies between 0 and 9. To facilitate analysis, the score was converted to a score for legal fishing by community members by changing the sign of the value, resulting in a score varying between –9 and 0, with the lower value (-9) indicating the least amount of legal fishing (LEGALWTO).

Table 3. Principal component analysis of village development indicators.

INDICATOR	BASIC DEVELOP.	EXTERNAL LINKS	ADVANCED DEVELOP.
Dentist	0.742	0.088	-0.115
Hard top road	0.673	0.273	-0.183
Electricity present	0.633	-0.088	0.033
Gas station	0.566	0.125	0.197
Doctor	0.528	-0.176	0.416
Restaurant	-0.194	0.752	0.019
Primary school	0.038	-0.732	0.235
Telephone	0.187	0.616	0.305
Newspaper available	0.074	0.572	0.032
General store	0.207	0.012	0.770
Secondary school	-0.068	0.066	0.550
Internet cafe	-0.072	0.048	0.506
Drugstore	-0.110	-0.038	0.500
Septic system present	0.481	0.027	-0.260
Public bus service	0.334	0.230	-0.207
Hotel	0.278	0.312	0.077
Pct. Total Variance	16.042	13.147	12.049

Thus far we have described a relatively large number of indicators of ICM project sustainability. In several cases the measures were summary measures composed of the responses

to several questions. Nevertheless, this large number can result in an overwhelming number of statistics upon analysis; hence, we will once again use principal component analysis to see if interrelationships between the separate measures justifies reducing them to a smaller number of summary scales. The technique used is the same as described above, and it resulted in the analysis presented in Table 2. Variable identifiers are those used in the description above.

The items loading highest on component one are for the most part related to compliance, access and equity; on component two, quality of life, number of activities perceived as beneficial, percent of project activities maintained, and the team evaluation; finally, on the third component, governance (knowledge of rules and compliance with rules governing major categories of illegal fishing), resource abundance, and income. These composite variables are referred to as Compliance & Access (COMPACC), Sustained Activity (SUSTACT), and Governance & Resource respectively (RESGOV).[2] As for the principal component analysis presented above, factor scores on each component were calculated for each village.

Measures: Independent Variables

The independent variables are the factors expected to influence ICM sustainability as they were discussed above in the background section. Most of these variables are rather straightforward in terms of their measurement, and they will be discussed only briefly here.

Demographic and geographic variables were collected from either the village official or obtained from secondary, published statistics. These include population size for different time periods (used to calculate changes in population) and village area (also used for calculating population density. Distance from municipal center was obtained from maps or the village official. Relative abundance of fish resources (as indicated by fish catch) was determined by asking resource users (fishers) to rank the catch

on a scale of from 1 to 5 (1=very poor, 2=poor, 3=average, 4=good, 5=very good). Median value for all user respondents in the village is used as the village indicator.

Several indicators are used to indicate levels of socioeconomic and cultural homogeneity. First, the village official was asked if immigration had an influence on village population. Presence of immigrants can be used as an indicator of heterogeneity. Number of religions and percent Catholic can also be used as indicators of cultural homogeneity. Finally, occupational homogeneity can be estimated by the distribution of occupations. Here we simply use percent fishers for the indicator.

Degree of dependence on coastal resources is estimated by the relative importance of fishing to the village economy. The village official was requested to rank all occupations to obtain this indicator. Degree of tourism is also an indicator of the importance of coastal resources since most tourists in the region are coastal oriented. Degree of tourism was ranked on a scale ranging from 1 to 5 by the research team[3] based on interviews and observation of facilities. Tourism was also measured as a dichotomy—present or absent.

Level of community development was assessed using several techniques. First, the research team ranked the standard of living of community inhabitants based on observations and interviews. Additionally, information concerning the presence or absence (and in some cases the percentage or number) of various community development indicators was collected by observation and interviews with village officials. A subset of these variables was analyzed using principal component analysis as described above. The results of this analysis and the variables used can be found in Table 3. Percent of households with electricity and sealed septic systems are used as separate indicators. They were also dichotomized at the sample means for use in the principal component analysis.

The analysis resulted in three components. The first includes basic items related to community development such as healthcare and sanitation, electricity, and transportation integration. The

second includes items associated with tourists and other links to the larger society (newspaper and telephone). The third includes items indicative of a higher level of development than component one, such as retail services and a secondary school. The existence of "internet" on this component is puzzling. The three components are referred to as Basic Development, External Links, and Advanced Development respectively.

Degree of integration into the political system is measured by the number of visits provincial level officials make to the village per year. Degree of integration into the economic system is indicated by questions concerning the marketing of village products. The village official was asked where local products are sold: in the village, the municipality, the province, the nation, or internationally. Each response was coded as a dichotomy and the responses were summed resulting in a measure that ranges from 1 to 5.

As a measure of community health we used an evaluation of child weights. We contend that a community's well being will be rapidly reflected in the nutritional status of its children. This measure is probably closely related to another indicator of quality of life—infant mortality rate. According to Newland (1981:5) "no cold statistic expresses more eloquently the differences between a society of sufficiency and a society of deprivation than the infant mortality rate." The "rapid response" nature and ready availability of classified pre-school child weights at the local level led us to select it as our measure. The evaluation of child weights is based on pre-school weights of children classified as slightly underweight, moderately underweight, and severely underweight. The community health center is responsible for weighing all pre-school children and making these classifications. They record the number overweight, normal, and slightly, moderately, and severely underweight. The measures used in this research are total percent underweight and total percent moderately and severely underweight.

Several indicators are used for determining whether the

village has a tradition of cooperation and collective action. First, the number of official groups and associations was obtained from village officials. They were also asked if there was a *bayanihan* (self-help association) in existence before project implementation. Since conflict reduces the level of cooperation, the village officials were also requested to rank the community on a scale of from 1 to 5 for this indicator (1=no conflict and 5=a great deal of conflict. Finally, the research team ranked the village on a scale of from 1 to 5 concerning the degree of tension ascertained through interview responses and observations made in the community.

The indicator for community participation in community affairs was annual number of official village meetings and the attendance rate (percent of villagers) at these meetings. This information was obtained from village officials. Number of *barangay* captains since 1980 is used as an indicator of stability of local government.

Turning to variables associated with project activities, the *barangay* captain's involvement in project activities and the mayor's running on an environmental platform are used to indicate support of the project by local leadership. This information was obtained from village officials. Involvement of members of the tourist industry in ICM activities was also ascertained from interviews with project participants. Project participants were also requested to indicate who was involved in making decisions influencing project activity: project related village associations, community members, project officials, village government, and supra-village government (e.g., municipal, provincial, etc.). Each of these groups is treated as a dichotomy. The values for each group are also summed to provide a figure indicating the total number of groups involved in project decision-making. This scale ranged from 1 to 5. Project participants also indicated whether or not community members were involved in project monitoring and whether the monitoring resulted in changes in project activities.

The types of training programs carried out by the project were determined. The total number of initial training sessions and

ongoing training sessions are the indicators used in this report. Stability of project staff was ascertained by asking project participants if there were changes in staff during the project. This was coded as a simple yes/no dichotomy. Project participants also provided information concerning whether they were networking with people from other ICM projects outside their village. The relative adequacy of supporting funds and material was ranked by project participants on a scale of from 1 to 3 (1=not adequate, 2=somewhat adequate, 3=adequate). The modal value for all participants is used as the village indicator. Finally, resource users were requested to name all rules they know that apply to ICM. They were also requested to evaluate the rule in terms of degree of restriction. The level of perceived restrictiveness of the first (therefore, most salient) regulation mentioned is the indicator used in the analysis.

Analysis

Bivariate analyses. The first step in the analysis consisted of calculating the zero-order correlations between the independent (predictor) variables and the sustainability indicators. The results of these analyses can be found in Tables 4a through 6c. Comments are restricted to variables statistically significantly correlated with the sustainability indicators ($p < 0.05$).

Demographic, Geographic, and Socioeconomic Variables. Turning first to the demographic, geographic, and socioeconomic variables (Tables 4a through 4c), we find that the larger the population, and the higher the component scores on the basic and advanced development component scores, the lower the score on the team evaluation (TEAMEVAL) indicator. There are no statistically significant correlations associated with total number of beneficial activities (ZTOTACT) and benefits to the resource (BRESOURC). Population density is positively correlated with BINCOM, indicating that the greater the density, the more project activities the *barangay* captain associated with income benefits for the community. Number of religions (an indicator of social

heterogeneity), percent of houses with closed septic systems, and the change in population density since 1990 are all negatively correlated with the Access/Equity component score (ACCEQI). This indicates that as the values on the predictors increase, the Access/Equity component score decreases. Only one variable is statistically significantly correlated with the Quality of Life component score (QUALIFE), presence of tourism, which has a negative coefficient. This indicates that sites with tourism score lower on that indicator.

There are no statistically significant correlations with the percent of project activities sustained (SUSTAIND). Turning to the post-project status of the resource indicators (T2RESMED and T2CORAL), we find that distance from the municipality is positively correlated with perceptions of a positive change in fish abundance (T2RESMED) and negatively correlated with the basic development component score. This indicates that in this data set, villages farther from the municipal center, with lower levels of basic development are more likely to perceive positive changes in fish abundance. Positive changes in the status of the coral are associated with higher levels of tourism, a lower number of religions in the community (an indicator of social homogeneity) and lower scores on the basic development component scale. There are no statistically significant correlations with success of project-sponsored group or association (GRPSUCCU).

Turning to the composite measures of sustainability, the Compliance and Access component score (COMPACC) is lower where there is a larger number of religions (cultural heterogeneity), and a smaller change in population density since 1990. It is higher where the level of tourism and standard of livings are higher. Finally, the Sustained Activities score (SUSTACT) is lower and the Resource and Governance score (RESGOV) is higher where tourism is present.

Table 4a. Zero-order correlations between ICM sustainability indicators and socioeconomic and demographic variables.

	TEAMEVAL	ZTOTACT	BRESOURC	BINCOM	ACCEQI	QUALIFE
Village population 2000	-0.305*	-0.094	0.079	0.101	-0.103	-0.018
Village area	0.031	-0.126	0.059	-0.257	0.022	0.055
Immigration present	-0.034	0.076	0.050	-0.100	-0.135	0.080
Distance to municipal center	0.099	0.233	0.054	0.106	-0.017	-0.078
Number of religions	-0.163	-0.305	-0.074	-0.074	-0.509**	0.062
Percent Catholic	-0.066	-0.142	-0.181	-0.152	0.101	-0.046
Percent fishers	-0.005	0.134	0.080	0.309	-0.031	0.190
Rank importance of fishing	-0.075	-0.237	-0.044	-0.288	0.064	-0.120
Tourism present	-0.031	-0.193	-0.081	0.145	-0.185	-0.358*
Houses with electricity (%)	-0.071	0.062	0.064	0.027	-0.117	0.060
Houses with septic system (%)	0.158	0.301	-0.134	0.130	-0.349*	0.027
Total market destinations	-0.113	-0.275	-0.080	-0.162	-0.090	0.006
Level of tourism	0.080	0.126	0.088	0.144	0.145	-0.209
Standard of living	0.085	0.279	0.190	0.150	0.212	-0.061
Village population density	0.009	0.265	-0.110	0.323*	0.102	-0.110
Change in population density	-0.154	0.151	-0.077	0.112	0.066	0.132
Children mod/sev underweight %	-0.060	-0.109	-0.068	0.087	-0.170	-0.157
Children underweight (%)	-0.095	0.148	-0.237	0.165	0.045	0.021
Basic development scale	-0.349*	-0.011	0.027	0.043	-0.248	-0.052
External links scale	-0.076	-0.015	-0.064	-0.046	-0.072	0.022
Advanced development scale	-0.462**	-0.265	-0.117	-0.004	-0.211	0.023
Pre-project status of fishery	-0.296	-0.155	0.244	-0.248	0.156	0.119
Population change 1980-2000 %	0.192	0.074	0.197	-0.092	-0.034	0.127
Population change 1990-2000 %	0.165	0.045	0.047	-0.046	-0.341*	0.209

*=p<0.05 **=p<0.01 N=42

Table 4b. Zero-order correlations betweenICM sustainability indicators and socioeconomic and demographic variables.

	SUSTAIND	T2RESMED	T2CORAL	GRPSUCCU	KNOWRULE	COMPLIU
Village population 2000	-0.216	-0.042	0.031	-0.239	0.043	0.406**
Village area	0.058	0.068	0.110	-0.126	-0.037	0.151
Immigration present	-0.028	-0.050	0.059	0.009	-0.196	0.207
Distance to municipal center	0.242	0.462**	0.292	0.071	0.214	0.092
Number of religions	-0.183	-0.121	-0.354*	-0.092	0.092	-0.058
Percent Catholic	0.131	0.285	0.014	-0.172	0.068	-0.183
Percent fishers	0.139	0.239	-0.026	0.067	0.322*	0.162
Rank importance of fishing	-0.246	-0.160	-0.022	-0.224	-0.276	-0.289
Tourism present	-0.151	0.100	0.268	0.045	-0.078	0.084
Houses with electricity (%)	-0.059	-0.210	0.038	-0.003	-0.266	0.095
Houses with septic system (%)	-0.013	-0.130	-0.028	0.070	-0.197	-0.074
Total market destinations	-0.104	0.064	0.015	-0.020	-0.091	-0.117
Level of tourism	0.050	0.104	0.376*	0.231	-0.247	0.311*
Standard of living	0.078	-0.019	0.192	0.155	-0.221	0.239
Village population density	0.102	0.097	0.078	0.108	0.139	-0.057
Change in population density	0.149	0.120	-0.141	0.031	0.170	-0.000
Children mod/sev underweight %	-0.245	-0.057	0.061	-0.087	-0.124	0.021
Children underweight (%)	0.088	0.084	0.001	-0.137	-0.055	-0.086
Basic development scale	-0.195	-0.328*	-0.313*	-0.139	-0.303	-0.004
External links scale	-0.162	-0.194	-0.012	-0.282	-0.255	-0.101
Advanced development scale	-0.291	-0.038	-0.091	-0.293	-0.165	-0.052
Pre-project status of fishery	-0.077	-0.187	-0.297	-0.282	0.036	-0.151
Population change 1980-2000 %	0.103	0.292	0.210	0.211	0.280	0.327*
Population change 1990-2000 %	0.271	0.174	-0.083	-0.002	0.343*	-0.026

*p=0.05 **p=0.01 N=42

Table 4c. Zero-order correlations between ICM sustainability indicators and socioeconomic and demographic variables.

	COMPL2U	LEGALFTOT	LEGALMTOT	COMPACC	SUSTACT	RESGOV
Village population 2000	0.150	0.012	-0.083	0.112	-0.262	0.020
Village area	-0.025	-0.110	-0.246	0.074	0.007	-0.271
Immigration present	0.147	-0.105	-0.140	0.153	0.186	-0.125
Distance to municipal center	-0.088	0.087	0.126	-0.021	0.179	0.309
Number of religions	-0.164	-0.235	-0.243	-0.396*	-0.122	-0.032
Percent Catholic	-0.084	0.075	0.185	-0.152	-0.039	0.122
Percent fishers	0.174	0.009	-0.146	-0.036	0.148	0.165
Rank importance of fishing	-0.352*	-0.161	0.045	-0.118	-0.174	-0.139
Tourism present	0.267	0.368*	0.448**	0.078	-0.403*	0.359*
Houses with electricity (%)	0.169	0.098	0.293	0.089	-0.103	-0.046
Houses with septic system (%)	-0.307	-0.127	0.159	-0.170	0.241	0.171
Total market destinations	-0.174	-0.350*	-0.179	-0.177	-0.005	-0.248
Level of tourism	0.477**	0.344*	0.274	0.440**	-0.221	0.097
Standard of living	0.147	0.322*	0.289	0.350*	-0.025	0.007
Village population density	-0.121	0.191	0.082	0.014	0.099	0.266
Change in population density	-0.086	-0.060	-0.108	-0.110	0.140	0.056
Children mod/sev underweight %	-0.081	-0.187	-0.129	0.037	-0.229	-0.133
Children underweight (%)	-0.069	-0.048	-0.048	-0.041	-0.015	-0.044
Basic development scale	-0.085	0.132	0.169	-0.108	-0.136	0.104
External links scale	-0.018	0.024	-0.067	-0.023	-0.205	-0.031
Advanced development scale	-0.042	-0.145	-0.309*	-0.078	-0.218	-0.146
Pre-project status of fishery	-0.279	-0.379*	-0.248	-0.113	0.026	-0.290
Population change 1980-2000 %	0.201	0.231	0.095	0.154	0.152	0.210
Population change 1990-2000 %	-0.033	-0.114	-0.049	-0.368*	0.145	0.123

*=p<0.05 **=p<0.01 N=42

Table 5a. Zero-order correlations between political stability, social cohesion, and ICM sustainability indicators.

	TEAMEVAL	ZTOTACT	BRESOURC	BINCOM·	ACCEQI	QUALIFE
Barangay capt. turnover	-0.071	-0.161	-0.089	0.267	0.032	0.179
Annual village meetings (fq.)	0.071	0.033	0.211	-0.122	0.022	0.107
Village meeting attendance %	0.103	-0.188	-0.331*	-0.046	-0.203	0.016
Visits by province officials	0.211	0.124	-0.120	0.228	0.206	-0.163
Village level of conflict	-0.031	0.101	-0.181	0.200	-0.205	-0.041
Village level of tension	0.120	0.018	-0.033	0.075	0.119	-0.249
Other CRM projects in village	0.018	0.127	0.014	0.156	0.003	0.137
Total number of associations	-0.074	-0.104	0.091	-0.060	-0.166	0.111
Pre-project bayanihan	0.119	-0.127	0.100	-0.200	-0.149	0.029

*=p<0.05 **=p<0.01 N=42

Table 5b. Zero-order correlations between political stability, social cohesion, and ICM sustainability indicators.

	SUSTAIND	T2RESMED	T2CORAL	GRPSUCCU	KNOWRULE	COMPL1U
Barangay capt. turnover	-0.031	-0.239	-0.212	-0.210	-0.156	-0.165
Annual village meetings (fq.)	0.019	0.284	-0.044	0.061	0.190	-0.037
Village meeting attendance %	-0.258	0.117	0.003	-0.131	0.282	-0.301
Visits by province officials	-0.110	0.096	0.092	0.147	0.121	0.084
Village level of conflict	-0.051	0.015	-0.123	-0.065	0.179	0.121
Village level of tension	-0.275	-0.109	0.184	0.047	-0.225	0.068
Other CRM projects in village	0.111	-0.034	0.127	0.275	-0.263	0.180
Total number of associations	-0.197	-0.474**	-0.180	-0.250	-0.046	-0.159
Pre-project bayanihan	-0.252	-0.189	-0.200	-0.178	0.250	-0.272

*=p<0.05 **=p<0.01 N=42

Table 5c. Zero-order correlations between political stability, social cohesion, and ICM sustainability indicators.

	COMPL2U	LEGALFTO	LEGALWTO	COMPACC	SUSTACT	RESGOV
Barangay capt. turnover	-0.329*	-0.173	-0.089	-0.254	0.025	-0.124
Annual village meetings (fq.)	-0.097	-0.331*	-0.385*	-0.130	0.161	-0.127
Village meeting attendance %	-0.345*	-0.179	-0.202	-0.253	0.059	0.102
Visits by province officials	0.178	0.286	0.291	0.153	-0.114	0.300
Village level of conflict	0.042	0.008	0.007	-0.133	-0.100	0.212
Village level of tension	0.245	0.216	0.027	0.319	-0.210	0.032
Other CRM projects in village	0.102	0.069	0.125	0.173	0.253	0.131
Total number of associations	0.027	-0.174	-0.201	-0.056	-0.138	-0.227
Pre-project bayanihan	-0.272	-0.225	-0.180	-0.255	-0.104	-0.118

*=p<0.05 **=p<0.01 N=42

Political Stability and Social Cohesion. Turning to sociocultural variables related to political stability and social cohesion (Tables 5a through 5c), we find that degree of compliance with second rule mentioned (COMPL2U) decreases as the turnover in *barangay* captains increases. The degree of legal fishing by both community members and outsiders (LEGALFTOT and LEGALWTOT, respectively) decreases (illegal fishing increases) as the number of formal *barangay* meetings increases. The degree of compliance with the first two regulations mentioned by resource users (COMPL1U and COMPL2U) decreases as percent community attendance at formal *barangay* meetings increases. Visits by provincial officials is positively related to the Resource and Governance component score (RESGOV), while the degree of tension is positively related to the Compliance and Access component score (COMPACC). Finally, the total number of associations and other cooperative groups in the village is negatively related to perceptions of post project increases in fish abundance (T2RESMED).

Project related variables. Zero-order correlations between project related variables and sustainability indicators are found in Tables 6a through 6c. As expected on the basis of previous research (Pollnac, et al., 2001) a relatively large number of project related variables are statistically significantly correlated with the sustainability indicators. This will make the discussion of the relationships relatively tedious, but all the relationships are important and should be considered.

First, tourist business involvement in ICM activities is negatively related to the Quality of Life and Sustained Activities component scores (QUALIFE and SUSTACT, respectively) and positively related to compliance with the first rule mentioned and the compliance and access composite measure of sustainability (COMPL1U and COMPACC, respectively).

Table 6a. Zero-order correlations between ICM sustainability indicators and project activities.

	TEAMEVAL	ZTOTACT	BRESOURC	BINCOM	ACCEQI	QUALIFE
Tourist industry involvement	-0.061	0.029	0.109	-0.012	0.063	-0.377*
Barangay capt. involvement	0.342*	0.430**	0.307*	0.194	0.246	-0.031
Mayor involved in ICM project	0.164	-0.018	-0.176	0.079	0.012	-0.062
CVRP	0.181	0.007	-0.139	-0.139	-0.177	0.014
CRMP	0.014	0.266	0.294	0.209	0.313*	-0.182
FSP	-0.064	-0.128	0.050	0.050	0.481**	-0.150
LCCAMC	-0.154	-0.128	-0.250	0.050	-0.541**	-0.037
Number of project participants	-0.036	0.046	-0.017	0.259	0.218	0.325*
Association makes decisions	-0.031	-0.139	0.197	-0.251	0.013	0.059
Community makes decisions	-0.222	-0.028	0.140	-0.033	0.330*	0.235
Project staff makes decisions	0.215	0.188	0.271	-0.014	0.320*	0.029
Village gvt. Makes decisions	0.048	-0.236	0.014	-0.129	0.062	-0.322*
Supra-village gvt. makes dec.	0.087	0.268	0.117	0.253	0.083	0.078
Total number decision makers	0.066	0.020	0.392*	-0.114	0.372*	0.017
Monitoring leads to change	0.253	0.570**	0.050	0.283	0.539**	0.123
Community does monitoring	-0.120	-0.075	0.171	0.059	0.166	0.073
Number of project trainings	0.338*	0.127	0.193	-0.075	0.284	0.040
Number of ongoing trainings	0.096	0.153	0.068	0.160	0.506**	-0.002
Project staff turnover	0.062	-0.060	0.032	0.032	0.037	0.233
Networking with other ICM proj	0.192	0.164	0.183	-0.050	0.182	-0.073
Adequate inputs	0.284	0.370*	0.382*	0.081	0.364*	0.325*
Restrictiveness of ICM rules	0.079	0.278	-0.046	0.265	0.125	-0.089

*=p<0.05 **=p<0.01 N=42

Table 6b. Zero-order correlations between ICM sustainability indicators and project activities.

	SUSTAIND	T2RESMED	T2CORAL	GRPSUCCU	KNOWRULE	COMPL1U
Tourist industry involvement	-0.117	-0.019	0.280	-0.009	-0.130	0.348*
Barangay capt. involvement	0.341*	-0.032	0.245	0.375*	-0.003	0.408**
Mayor involved in ICM project	-0.033	-0.057	0.033	-0.197	0.032	-0.173
CVRP	-0.175	0.389*	0.258	0.048	0.197	0.109
CRMP	0.007	0.018	0.305*	0.284	-0.132	0.590**
FSP	-0.060	-0.318*	-0.153	-0.265	-0.061	-0.316*
LCCAMC	-0.067	-0.348*	-0.317*	0.035	-0.128	-0.120
Number of project participants	0.414**	0.039	0.007	0.032	0.325*	0.097
Association makes decisions	-0.035	-0.524**	-0.198	-0.119	-0.311*	-0.183
Community makes decisions	0.043	-0.193	-0.187	-0.280	-0.142	-0.249
Project staff makes decisions	0.058	0.430**	0.497**	0.108	0.212	0.130
Village gvt. Makes decisions	-0.088	-0.062	0.105	0.189	-0.020	-0.006
Supra-village gvt. makes dec.	0.195	-0.209	0.020	0.023	-0.106	0.157
Total number decision makers	0.084	-0.343*	0.110	-0.038	-0.211	-0.076
Monitoring leads to change	0.475**	0.073	0.260	0.334*	-0.096	0.360*
Community does monitoring	-0.109	-0.493**	-0.353*	-0.070	-0.108	-0.197
Number of project trainings	0.066	-0.183	0.180	-0.022	0.113	-0.084
Number of ongoing trainings	0.150	-0.033	0.212	-0.109	-0.108	-0.056
Project staff turnover	-0.036	-0.215	-0.068	0.092	-0.130	-0.162
Networking with other ICM proj	0.104	0.043	0.179	0.212	-0.171	-0.105
Adequate inputs	0.266	0.307*	0.445**	0.469**	0.055	0.292
Restrictiveness of ICM rules	-0.052	-0.067	0.055	0.161	-0.255	0.029

*=p<0.05 **=p<0.01 N=42

Table 6c. Zero-order correlations between ICM sustainability indicators and project activities.

	COMPL2U	LEGALFTOT	LEGALWTOT	COMPACC	SUSTACT	RESGOV
Tourist industry involvement	0.289	0.340*	0.265	0.347*	-0.377*	0.132
Barangay capt. involvement	0.269	0.422**	0.396**	0.378*	0.210	0.258
Mayor involved in ICM project	-0.304*	-0.056	-0.124	-0.140	-0.076	-0.008
CVRP	0.070	-0.192	-0.260	0.091	0.080	0.062
CRMP	0.712**	0.365*	0.269	0.685**	-0.141	0.048
FSP	-0.133	0.045	-0.020	0.002	-0.187	-0.211
LCCAMC	-0.354*	-0.045	0.180	-0.372*	-0.007	0.156
Number of proj. participants	0.182	0.110	-0.048	-0.072	0.515**	-0.021
Association makes decisions	-0.080	-0.147	-0.081	-0.022	0.019	-0.377*
Community makes decisions	-0.206	-0.116	-0.003	-0.073	-0.001	-0.235
Project staff makes decisions	0.369*	0.102	-0.125	0.361*	0.066	0.024
Village gvt. makes decisions	-0.016	0.211	0.315*	0.134	-0.039	0.202
Supra-village gvt. makes dec.	0.188	0.146	-0.143	0.143	0.090	-0.150
Total number decision makers	0.132	0.093	-0.033	0.274	0.069	-0.274
Monitoring leads to change	0.453**	0.465**	0.242	0.515**	0.286	-0.017
Community does monitoring	-0.107	-0.172	0.002	-0.049	0.025	-0.178
Number of project trainings	0.125	0.096	0.115	0.175	0.087	-0.015
Number of ongoing trainings	0.081	-0.045	0.079	0.163	-0.039	-0.216
Project staff turnover	-0.073	-0.219	-0.004	-0.027	0.046	-0.216
Networking with ICM proj	0.025	-0.092	-0.118	0.127	0.048	-0.310
Adequate inputs	0.317*	0.073	-0.180	0.457**	0.427**	-0.142
Restrictiveness of ICM rules	0.205	0.145	0.030	0.288	-0.057	-0.099

*=p<0.05 **=p<0.01 N=42

Involvement of the *barangay* captain seems to have a positive effect on a large number of sustainability measures, including the team evaluation, the total number of successful activities, as well as activities having resource benefits, the percentage of project activities sustained, the success of the project related group, level of compliance with the first ordinance mentioned, amount of legal fishing activity, and the compliance and access composite measure of sustainability. It is interesting that involvement of the mayor has no positive impact and negatively impacts one of the compliance measures (COMPL2U).

Turning to specific projects, CVRP has a positive impact on post-project perceptions of fish abundance, while CRMP project activities are positively related to the access/equity component score, post-project perceptions of the status of the coral, level of compliance with ICM ordinances, degree of legal fishing, and the compliance and access composite measure of sustainability. CRMP is a project that was a follow-up to CVRP at many CVRP project sites except on Bohol and was involved in the Bais Bay and Batangas sites. FSP is positively related to the access/equity component score, and negatively related to post project perceptions of increases in fish abundance. ASEAN-US ICM Project is negatively related to the access/equity component score, post project perceptions of increases in fish abundance and the status of the coral, compliance with the second ordinance mentioned, and the compliance and access composite measure of sustainability.

Number of project participants has only positive effects. This variable is positively correlated with the quality of life component score, percent of sustained project activities, knowledge of ICM rules, and the sustained activities composite measure of sustainability.

Project decision making by the project related association seems to have negative impacts on several of the sustainability indicators. It is negatively correlated with post project perceptions of increases in fish abundance, knowledge of ICM rules, and the

resource and governance composite measure of sustainability. In contrast, decisions concerning project activities made by the community have a positive impact on the access/equity component score. Decisions made by project staff are also positively related to the access/equity component score, as well as post project perceptions of increases in fish abundance and the status of the coral, level of compliance with the second ordinance mentioned, and the compliance and access composite measure of sustainability. Decisions made by the village government are negatively related to the quality of life component score and positively related to the level of legal fishing by villagers. There are no statistically significant correlations with decisions made by government authorities above the village level. Finally, the total number of levels involved in project related decisions is positively related to the access/equity component score and negatively related to post project perceptions of increases in fish abundance.

The existence of project monitoring programs, which influence changes in project activities, is positively related to the total number of beneficial activities, the access/equity component score, the percent of sustained activities, success of the project-related association, the level of compliance with ICM rules, the amount of legal fishing by villagers and outsiders in village waters, and the compliance and access composite measure of sustainability. It is interesting that involvement of community members in the monitoring process seems to have negative impacts on post project perceptions of increases in fish abundance and the status of the coral.

Total number of training sessions is positively related to the research team's overall evaluation of the project, and the number of ongoing training sessions is positively related to the access/equity component score. Adequacy of funding and other project inputs positively impacts the total number of activities, activities benefiting the resource, the access/equity and quality of life component scores, post project perceptions of increases in fish abundance and status of the coral, success of project-related

association, level of compliance with ICM rules, and the compliance and access and sustained activity composite measures of sustainability. Finally, staff turnover, networking with other ICM projects, and level of restrictiveness of ICM rules seem to have no statistically significant effect on any of the sustainability indicators.

Table 7. Multiple predictors of ICM sustainability indicators.

DEPENDENT VARIABLE: TEAMEVAL
(overall evaluation by research team)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Basic development component score	-0.349	-2.671	0.011
Advanced development component score	-0.462	3.540	0.001

R=0.579 R^2=0.335 Adj. R^2=0.301 F=9.833 p < 0.001 N=42

DEPENDENT VARIABLE: ACCEQI
(Access/equity component score)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Number of religions	-0.256	-2.354	0.025
FSP	0.382	3.382	0.002
ASEAN-US ICM Project	-0.225	-1.944	0.061
Project monitoring influenced changes	0.262	2.377	0.024
Adequate inputs	0.289	2.481	0.019

R=0.826 R^2=0.683 Adj. R^2=0.633 F= 13.765 p < 0.001 N=38

DEPENDENT VARIABLE: QUALIFE
(Quality of life component score)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Tourism business involved in ICM	-0.394	-2.704	0.011
Adequate inputs	0.344	2.366	0.024

R=0.510 R^2=0.260 Adj. R^2=0.218 F=6.162 p = 0.005 N=38

DEPENDENT VARIABLE: T2FICO
(Post-project level of improvementin fish and coral resources)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Distance from municipal center	0.351	2.814	0.008
ICM decisions made by project staff	0.484	3.877	<0.001

R=0.635 R^2=0.404 Adj. R^2=0.373 F=13.208 p < 0.001 N=42

DEPENDENT VARIABLE: COMPACC
(Compliance and access composite sustainability component score)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Number of religions	-0.284	-2.740	0.010
CRMP	0.534	4.946	<0.001
Project monitoring influenced changes	0.235	2.170	0.038
Adequate inputs	0.218	2.074	0.046

$R=0.836$ $R^2=0.699$ Adj. $R^2=0.660$ $F=18.013$ $p < 0.001$ $N=36$

DEPENDENT VARIABLE: SUSTACT
(Sustained activities composite sustainability component score)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Tourism business involved in ICM	-0.310	-2.466	0.019
Number of project participants	0.431	3.426	0.002
Adequate inputs	0.418	3.390	0.002

$R=0.719$ $R^2=0.517$ Adj. $R^2=0.472$ $F=11.424$ $p < 0.001$ $N=36$

DEPENDENT VARIABLE: SUSTACT
(Resource and governance composite sustainability component score)

INDEPENDENT VARIABLE	STANDARDIZED COEFFICIENT	t	p (2-tail)
Tourism present	0.337	2.239	0.032
ICM decisions made by association	-0.356	-2.366	0.024

$R=0.505$ $R^2=0.255$ Adj. $R^2=0.210$ $F=5.657$ $p = 0.008$ $N=36$

Summary of Bivariate Analyses. The bivariate analyses indicated that there are some rather complex relationships between the independent variables and the sustainability indicators. Specific sustainability indicators are variously related to different sets of independent variables. Most of the relationships are in the expected direction, but a few are counter to expectations: e.g., the negative relationship between some sustainability indicators and the decision-making authority of project related associations and community based monitoring. The various bivariate relationships, while rather tedious to examine, can be of use to practitioners in the field. They can suggest specific actions which influence specific components of ICM sustainability. The purpose of this paper, however, is to go beyond the particular and try to make some generalizations about combinations of variables that influence ICM sustainability.

Analysis

Multivariate Analyses. It is rarely only one variable that influences a dependent variable as complex as an ICM sustainability indicator. This is evident in the relatively large number of independent variables that are statistically significantly related to some of the indicators in the above analyses. As a means of determining the combinations of variables that influence ICM sustainability, we will use a form of regression analysis. In this section of the paper we will only analyze a set of the composite indicators described and analyzed above. Confining the analysis to these composite indicators will move the analysis from the particular to the more general. The sustainability indicators we will analyze here are the composite team evaluation (TEAMEVAL), the access/equity and quality of life component scores (ACCEQI and QUALIFE), a resource improvement measure composed of the sum of the evaluation of the change in post-project fish abundance and status of the coral (T2FICO), and the three composite ICM sustainability indicators (COMPACC, SUSTACT, and RESGOV).

The technique used in the analysis is a stepwise (forward) regression analysis. In the application used here, all independent variables manifesting statistically significant zero order correlations with a specific ICM sustainability indicator are intercorrelated with the dependent variable (the specific ICM sustainability indicator). The one with the highest correlation (the one that explains the most variance in the specific ICM sustainability indicator) is entered first into the multiple regression equation. Then the effects of the entered variable are controlled, and the variable with the highest partial correlation with the specific ICM sustainability indicator is entered into the equation. The R^2 (squared multiple correlation coefficient, which is equal to the amount of variance explained in the resource beliefs component score) for the two independent variables and the dependent is then calculated. The next step enters the independent variable that has the highest partial correlation with the specific ICM sustainability indicator controlling for

variables already entered. This stepwise procedure is continued until some pre-set criterion is reached. In this case the criterion was that the variable to be entered has a $p < 0.05$. Partial correlations were carefully examined at each step to insure that multi-collinearity did not have an effect on the analysis. The results of these analyses for the seven composite ICM sustainability indicators are in Table 7. Note that sample size (N) varies in table 7. This is due to the fact that cases with missing values on any of the variables included in the regression are not used in the analysis.

The stepwise regression procedure selected the two development component scores as the best combination of variables for predicting the research team's evaluation of overall project impact. The adjusted R^2 is 0.301 indicating that about 30 percent of the variance in the overall research team's evaluation (TEAMEVAL) can be accounted for by this combination of variables.[4] Note that the standardized coefficients are negative. That indicates that increasing levels of development have a negative impact on the overall research team's evaluation (TEAMEVAL). These results do not mean that the other variables which are statistically significantly correlated ($p<0.05$) with the overall research team's evaluation (as presented in Tables 4a, 5a, and 6a) are not important. When the stepwise procedure entered the basic development component score in the first step and controlled for its effects on the overall research team's evaluation (TEAMEVAL), the correlations between the overall research team's evaluation (TEAMEVAL) and population size, *barangay* captain involvement in project activities, and number of training sessions reduced to a level that they were no longer statistically significant. In part this is due to the fact that the advanced development component score is correlated with both village population ($r=0.39$, $p=0.01$) and *barangay* captain involvement in project activities ($r=-0.42$, $p=0.005$).

Almost two-thirds of the variance in the access/equity component (ACCEQI) is accounted for by 5 independent variables. The negative standardized coefficient associated with

number of religions (a cultural homogeneity/heterogeneity indicator) indicates that cultural heterogeneity has a negative impact on access/equity, as predicted by the model developed in the background section of this paper. Also, the fact that the project was adaptable (project monitoring influenced changes) and adequate inputs (both financial and material) had a positive impact (positive standardized coefficients) fits the model. This pattern of expected results is repeated throughout the analyses presented in Table 7; hence, we will not discuss each regression result separately, but will attempt a synthesis in our concluding remarks.

Synthesis and Conclusions

Significant in the analyses are some unexpected findings, findings that run counter to accepted wisdom, which have been summarized in the background section. It has been argued that level of community development has a positive influence on the success of CRM projects. Some recent comparative studies (e.g., Pollnac, et al. 2001) have found no relationship with overall community development, and the current research suggests that there is a negative relationship. This relationship suggests that more research is necessary to explain the complex interactions between community development and ICM sustainability.

There have also been inconsistent reports concerning the relationship between tourism and the success of CRM projects. Some feel that tourism can provide alternative incomes to replace income lost by some types of resource management. Others argue that tourism can result in conflicts in resource use that can turn villagers against CRM efforts. The analyses presented here indicate that tourism has a positive impact, but involvement of tourist business interests in CRM has a negative impact. This is probably the result of conflicts of interest. In several of the villages in the sample, the tourism industry was intent on expanding reserve areas and posted guards to keep villagers from fishing in existing reserves. This created a great deal of tension in the communities. Clearly, the role of tourism in ICM needs to be carefully examined in future

comparative studies, especially its potential for having negative impacts on local inhabitants, which may in turn harm ICM efforts. In most developing country contexts, successful ICM depends on community support.

Equally interesting are the findings concerning project decision making. Most social science researchers will argue that community empowerment is not only desirable, but is essential to project success. Pollnac, et al. (2001) found that level of peoples' participation in community affairs was strongly related to success of MPAs. But participation in project decision making, as examined in this research, suggests that the issue is more complex than past findings and current ideology would suggest. The regression analyses presented here suggest that while ICM decisions made by project staff are positively associated with an ICM project sustainability indicator (post-project improvement in resources), decision making by a project-related village association has a negative impact. Once again, these findings suggest that we must revisit some of our assumptions with more rigorous research.

Overall, however, our findings, which are based on quantitative data collected in 42 villages, support recommendations and findings readily found in the more qualitative, case study based social science literature. To be sustainable, ICM projects need adequate inputs, adaptive management, and more local participants. Since we know that sociocultural heterogeneity can negatively impact community-based ICM, where we find it, we must put greater effort into community organizing to create more social solidarity to support project activities. Since we already know most of these things (except for the surprising findings noted above), we might ask, "why did we find such a great range of project success across the villages in our sample?" The simple reply, which is supported by our data, is that what we know to be "good practices" are not always used in implementation of ICM projects. And where they are, if we still find mixed results as we have in this report, it means that we must refine our research

methods to determine other, unexpected determinants of ICM project sustainability.

[1] As is common with responses to this question, some respondents probably confounded abundance with catch. Since the fish are underwater and not easily observed (by net and line fishers), they usually equate relative abundance with catch.

[2] For the most part we followed a common practice of naming factors based on the item that loads highest on the factor. We are not really satisfied with this practice, but an examination of the content of the preponderance of items loading highly on each component provides some support for the naming. Some may prefer to simply think of each component as a weighted sum of the included items.

[3] As indicated in the discussion of sustainability indicators, the research team conducted the ranking process at completion of data acquisition at each site. They discussed the indicator and came to a consensus concerning the ranking.

[4] R-squared is traditionally adjusted when there is more than one predictor variable. This is done to account for the fact that as the number of variables approaches the number of cases there is an increased probability that some linear combination of the variables will account for a very large proportion of the variance; thus, inflating the R-squared. The adjustment is used to reduce the R-squared to a more realistic level. The formula: Adj. $R^2 = R^2 - ((p-1)/(n-p)) \times (1 - R^2)$, where p is the number of independent variables.

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