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IMPROVING ECONOMIC VALUATION STUDIES BY USING QUALITATIVE
METHODS: LESSONS FROM THE MANGROVE WETLANDS
OF YUCATÁN, MEXICO

By

Michael Dana Kaplowitz

A DISSERTATION

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The data collected in the focus groups and individual interviews was systematically analyzed by coding transcripts following a grounded theory approach. Successive iterations of open, axial, and selective coding efforts resulted in a database of the transcripts, their codes, thematic variables, and response categories. The frequencies of the variables and response categories as well as their cross-tabulations were then examined.

The results of the analytical analysis of the qualitative data supports the supposition that separate focus groups with members from distinct communities that rely upon a common environmental and natural resource produce substantially similar sets of information. However, the data does not support the supposition that information learned in individual qualitative interviews is substantially similar to information learned in focus group interviews. Likewise, the data does not support the supposition that individual interviews conducted in similar communities produce substantially similar sets of information. The findings suggest that focus groups be used to learn about general issues, concerns, and vocabulary of resource beneficiaries and that individual interviews be used to validate focus group findings and learn in depth about sensitive, controversial, and divergent resource issues.

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To my family and friends for teaching me.

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LIST OF TERMS

<i>bordo</i>	dike or sea water retaining system built by DUMAC
<i>ciénaga</i>	marsh
CINVESTAV or CINVESTAV- IPN	Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, Unidad Mérida [Center for Investigation and Advanced Studies of the National Polytechnic Institute, Mérida Campus]
CANR	MSU College of Agriculture and Natural Resources
CV or CVM	Contingent Valuation Method
DUMAC	Ducks Unlimited of Mexico, America, and Canada
EPOMEX	Programa de Ecología, Pesquerías y Oceanografía del Golfo de Mexico [Ecology, Fisheries, and Oceanographic Program of the Gulf of Mexico]
<i>estero</i>	estuary
<i>humedales</i>	wetlands
IAF	Inter-American Foundation
ICRAF	International Centre for Research in Agroforestry
INEGI	Instituto Nacional de Estadística, Geografía, e Informática [National Institute of Statistics, Geography, and Information]
ISP	MSU Office of International Studies and Programs
<i>manglar</i>	mangrove
<i>mojarra</i>	a type of fish
MSU	Michigan State University
<i>nortes</i>	seasonal bad weather usually November to March
NGO	non-governmentally organization
NOAA	National Oceanographic and Atmospheric Administration
OAS	Organization of American States

LIST OF TERMS—*Continued*

PEMEX	Mexico's petroleum industry
Pronatura	Mexican environmental non-governmental agency
<i>puerto de abrigo</i>	sheltered harbor
<i>rastreros</i>	trawlers
RD	MSU Department of Resource Development
<i>ría</i>	estuary
<i>rio</i>	river
SEMARNAP	Secretaría del Medio Ambiente, Recursos Naturales, y Pesca [Secretariat of the Environment, Natural Resources, and Fish]
<i>sondeo</i>	informal popular discussion
UN	United Nations
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WTA	willingness-to-accept payment
WTP	willingness-to-pay

CHAPTER 1

INTRODUCTION

This study examines advantages and disadvantages of using focus group and individual qualitative interviews for designing an economic valuation survey in a developing country. Complex environmental and natural resources, such as the Yucatán's mangrove wetlands, represent substantial sources of cultural, intergenerational, environmental, and economic wealth (Aylward and Barbier 1992). The failure to properly account for the total value of environmental and natural resources results in socially undesirable overexploitation and degradation of complex ecosystems such as mangrove wetlands (Clark 1996). Nonmarket valuation methods, including contingent valuation, provide means for accounting for the economic value of environmental and natural resources.

Contingent valuation studies increasingly are being used to reveal economic values associated with environmental and natural resources and to improve decision making in developing countries (Hoehn and Krieger 1994; Carson et al., *Bibliography*, 1994; Munasinghe 1993). However, the contingent valuation method [CV or CVM] depends upon the use of well-designed and well-implemented survey questionnaires for generating reliable and valid economic estimates (Mitchell and Carson 1989; NOAA 1993). Economists as well as other researchers tend to rely upon sociologists and other social scientists for developing and improving the generally accepted methods of survey design

and implementation. Increasingly, sociologists and other survey research practitioners use qualitative research methods for designing and testing survey-based research (Morgan 1993; Zeller 1993; Laurie and Sullivan 1991). This research project focuses on assessing comparative strengths and weakness of two qualitative methods—focus group and individual depth interviews—for designing an economic valuation study of a complex ecosystem in a developing country.

RESEARCH SITE

YUCATÁN, MEXICO

Mexico's Yucatán peninsula supports abundant biological diversity and a predominantly Maya population (See Figure 1). Areas throughout the peninsula have been designated as archeological and ecological parks, including several Special Biosphere Reserves (Pronatura 1991, 1992, 1993). The United Nations Educational, Scientific, and Cultural Organization [UNESCO] designates Special Biosphere Reserves to protect natural areas and to accommodate local inhabitants (Clark 1996). Two such reserves—Celestún and Rio Lagartos—have been established in the State of Yucatán in an attempt to preserve the characteristic transition zone between land and sea, and to protect endangered and diverse species.

However, most of the peninsula's coastal resources and inhabitants are not part of a systematic state, federal, or non-governmental environmental protection or resource management scheme. This is not unusual, for probably less than 1% of the world's mangrove resources have official protection status (Hamilton, Clark, and Owen Miller 1989). Like elsewhere, the Yucatán's coastal environmental and natural resources are

increasingly relied upon and exploited by local populations for subsistence, by business interests for commercial activity, by various groups for garbage dumps, and by developers for building sites.

YUCALPETÉN ESTUARY

Chelém Lagoon [*Laguna de Chelém*] is one of many names for the coastal mangrove ecosystem that Mexican geological maps label as the Yucalpetén Estuary [*Estero Yucalpetén*] (See Figure 2). The Yucalpetén Estuary ecosystem extends westerly from the port city of Progreso in Yucatán, Mexico. Three year-round communities are located along the approximately 15 kilometer stretch of coastline that borders Chelém Lagoon—Chuburná, Chelém, and Progreso. Chelém and Chuburná are small fishing communities with about 400 and 200 households respectively, while Progreso is a medium-sized port city with approximately 5000 households (INEGI 1992).

Fishing dominates the local economies. Progreso's economic base rests on commercial fishing, fish processing, and other activities centered on the Gulf of Mexico and the city's deep water wharf (Paré and Fraga 1994). Chelém and Chuburná are on the coastal fringe, on one side there is the Gulf of Mexico and on the other side is the lagoon or wetland. Traditionally, these communities have relied upon a combination of activities for their subsistence and economic gain. These communities have been able to survive long periods (November to March) of seasonal bad weather [*nortes*] by developing a multiple use and activity strategy of combining fishing in the sea and lagoons, small scale salt extraction, agriculture, and tourism activities (Paré and Fraga 1994).

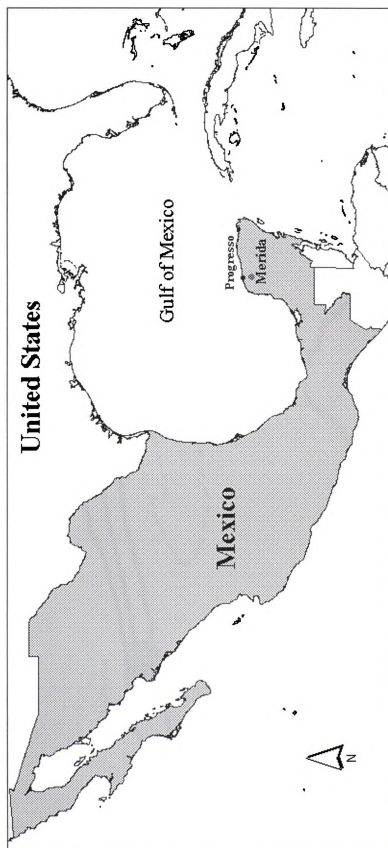
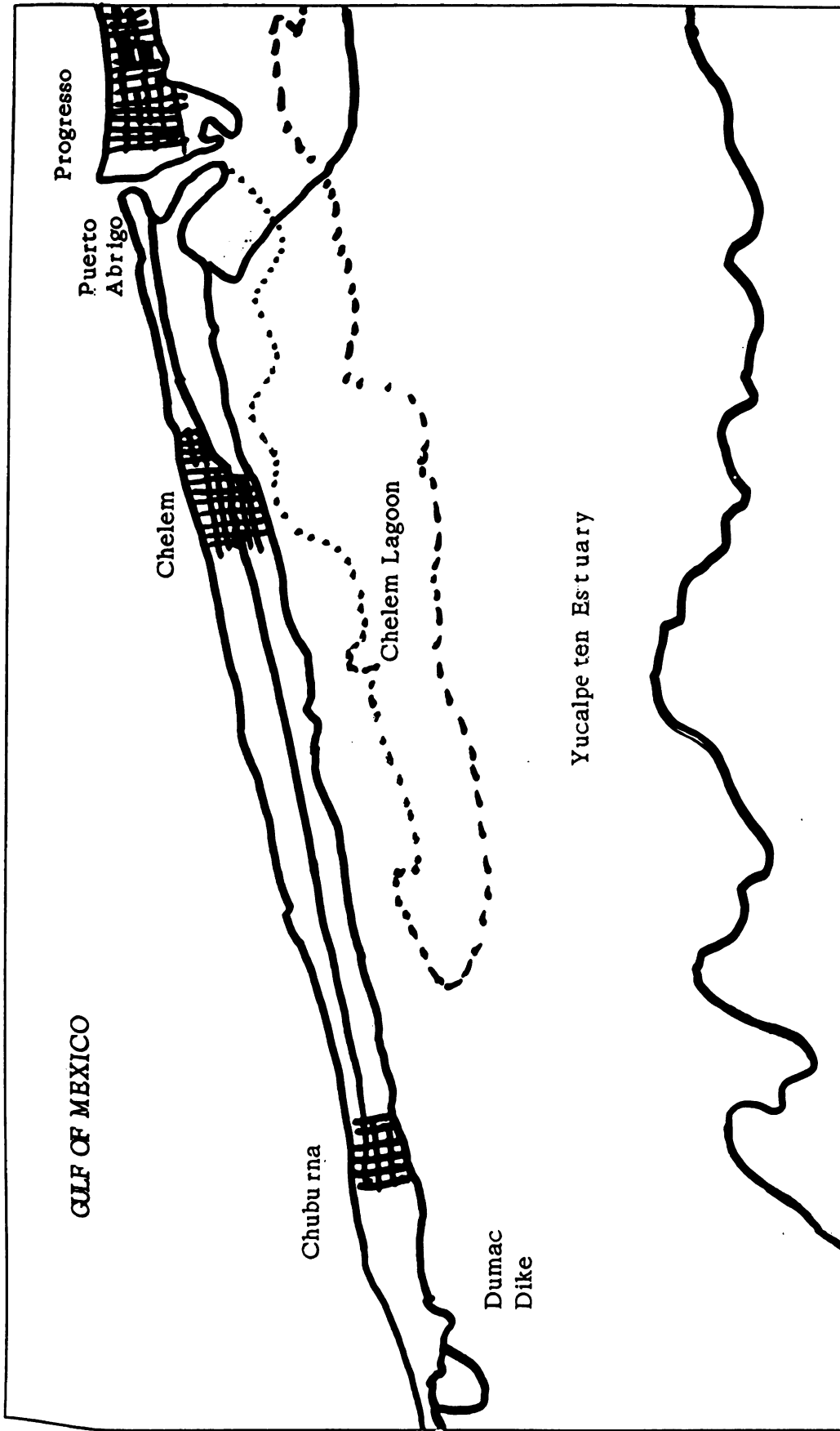


Figure 1. Yucatán Peninsula



Source: INEGI 1992

Figure 2. Chelém Lagoon

This study focuses on the year-round mangrove wetland resource beneficiaries of Chelém and Chuburná. These communities share similar socioeconomic compositions and they both have close relationships with the use and enjoyment of the coastal mangrove ecosystem. Both these villages have a history of relying on nature resources for their livelihood. They have also adapted to successive changes in their natural resource base over time.

At one time, Chelém was a fishing village that looked to the Gulf of Mexico as its primary source of living while the people of Chuburná focused on a thriving salt extraction business that relied upon the creation of man-made saltwater ponds in the wetland. This changed after the Mexican government dredged out a safe harbor in Chelém Lagoon in the early 1970s. The harbor was designed to protect and promote commercial fishing fleets, it did however result in the loss of the wetland as a salt extraction site. In reaction to these changes, Chuburná, like Chelém, increasingly turned to and relied upon fishing in the Gulf weather permitting. Hurricane Gilbert in 1988 opened a break in the coastal fringe near Chuburná that allowed seawater, marine life, fish fry, and larvae to circulate throughout the lagoon. The result was a thriving estuary ecosystem and resource base that both villages increasingly turned to for their livelihood and subsistence. The construction of a Ducks Unlimited of Mexico, America, and Canada [DUMAC] dike project to preserve duck habitat in the mid-1990s has once again changed the regions natural resource conditions. The DUMAC project has cut off the circulatory flow of seawater in the lagoon and has diminished the vitality of the lagoon as a fishing resource. The villagers of both Chelém and Chuburná now face the dual difficulties of increasing fishing pressure in their coastal fishery and a diminution of the viability of the lagoon fishery.

The villagers in Chelém and Chuburná have limited economic alternatives. They may take time consuming and unreliable public transportation to factory jobs many kilometers away. However, these jobs are not always available, they often are not steady, and they only pay the minimum wage of 15 pesos per day (about \$2). Furthermore, employees must pay for their own transportation and meals. In this coastal area, there is some seasonal tourism. The villagers in Chelém and Chuburná can and do supplement their livelihoods by working in restaurants and servicing tourists' homes during the one to two months of the vacation season (July and August). However, the two villages, by and large, still rely upon their natural resources for their subsistence. Chelém Lagoon has been an important part of the economic, cultural, and social fabric of these two villages. Community members annually participate in religious processions by boat around the lagoon. Villagers admire the flamingoes and endangered turtles that inhabit the mangrove wetland. And, they increasingly rely upon the lagoon's bounty to feed their families.

By using two qualitative research methods with these two populations, differences and similarities in the two groups' resource values and perceptions were discernible. Furthermore, by focusing on these two distinct populations and their shared resources some of the qualitative methods' relative strengths and weaknesses for use with economic valuation studies were identified.

BACKGROUND & LITERATURE REVIEW

This section briefly introduces readers to some relevant terms as well as theoretical foundations for the dissertation. Chapter 2 is a more thorough review of the literature and theory that provides the background, framework, and rationale for this dissertation.

MANGROVE ECOSYSTEMS

The term *mangrove* refers to a number of tree species capable of living in saltwater or salty soils. Mangroves and their ecosystems are found in intertidal areas of sheltered coastlines called *lagoons* and *estuaries*. Ecologically, mangrove wetlands maintain high levels of biological productivity; export nutrients to outside waters; and provide habitat for valuable plant and animal species (Clark 1996). Mangrove ecosystems are also important to the subsistence livelihood of tropical coastal communities (Hamilton, Dixon and Owen Miller 1989). Mangrove ecosystems provide an array of important services—prevention of storm damage, flood and water control, support of fisheries, waste absorption, recreation, and transport. Furthermore, they can also be directly exploited for goods such as fish, agriculture, wildlife, wood, and fresh water (Aylward and Barbier 1992).

Chelém Lagoon

Chelém Lagoon once was a healthy, thriving mangrove ecosystem. In recent times, the Chelém Lagoon area has experienced a number of changes. Some changes are the result of human activities like a government project to open a sheltered harbor [*puerto de abrigo*] and a Duck's Unlimited construction project of a dike [*bordo*]. Other changes are the result of Hurricane Gilbert (September 1988) and increased fishing pressure (Dr. Eduardo Batllori San Pedro, conversation with author, Mérida, Mex., 11 July 1996).

Socioeconomic pressures in Mexico have also resulted in increasing numbers of people migrating to Progreso in search of work and a way to feed their families (Paré and Fraga 1994). The inhabitants of the Chelém Lagoon area have experienced the fallout of the downfall of Mexico's henequen industry, governmental efforts to promote coastal

migration and commercial fishing, and various infrastructure projects. Most of the families that have moved from the interior of the country to the Yucatecan coast have settled in Progreso. Those families that have moved to the villages of Chelém and Chuburná appear to have been welcomed. There seems to be an understanding and acceptance in the communities that these people are simply seeking means to feed their families. At the same time, middle and upper class people from Mérida and elsewhere are buying, building, and renting beachfront houses along the Progreso area coastline for use during July and August. Unfortunately, Chelém's mangrove ecosystem does not seem capable of accommodating and sustaining the increasing demands on it (Eúan 1997; Batllori 1996; Municipality President Raul Lada, personal conversation, Progreso, Mex., July 1996).

Yucatán Mangrove Research

Researchers in Mexico have begun to study the dynamics of the Yucatán's coastal resources and communities (e.g., Eúan 1997; Yáñez-Arancibia 1994). Some researchers assert that the ongoing deterioration of the Yucatán's coastal mangrove resources are a result of: market failures for the ecosystem's assets and services; the failure to properly value the costs and benefits associated with mangrove resource goods and services; the open access nature of the resource; and the high costs of information and enforcement (Seijo et al. 1994).

A project to systematically evaluate the peninsula's coastal communities and resources by Mexico's environmental protection agency—Secretaría del Medio Ambiente, Recursos Naturales, y Pesca [SEMARNAP]—is supposed to:

assess the total economic value of resources associated to the communities, considering that nature [*sic*] value is divided into three categories: use value, existence value, and ecological service value....[and use the] contingent valuation method to determine "willingness to pay" from fishermen and other people from the community. (Hernandez-Flores 1995, 5)

Mexican researchers increasingly recognize the need to properly estimate and account for the economic values of the Yucatán's coastal resources. Furthermore, they recognize the important role that contingent valuation may play in helping to derive accurate estimates of the value that mangrove wetlands represent.

ECONOMIC VALUATION

Mangroves and natural resources, like human-made goods and services, have economic value because of their impact on people's well-being. Economic values are a measure of the tradeoff between what an individual may enjoy by foregoing a good or service and what an individual obtains in securing the desired good or service. These economic values can enter the community decision-making process to the extent that policymakers are able to document or measure such human welfare contributions.

Economic valuation methods provide one framework to help answer questions about how much mangrove wetlands should be conserved or which ecosystems should be protected. While some people may choose to fill-in wetlands and build homes, others may choose to preserve wetlands as wilderness areas. Such choices reflect a balancing of the perceived usefulness of the biological resource and the perceived benefits from alternative uses of the resource including its perceived cultural significance, or some idea of its "right" to exist (Perrings 1995).

Altruistic interests, moral concerns, and philosophical beliefs may and do enter into individuals' decision making and therefore are part of economic valuation. By studying actual and constructed market behavior, economic valuation of environmental and natural resources makes explicit and quantifiable otherwise implicit and hard to measure values.

Economic Value of Mangroves

Mangrove wetlands represent complex sources of societal value. Mangrove resource beneficiaries may derive direct consumptive benefits from fishing and wood collection; they may derive nonconsumptive benefits from birdwatching and tourism; they may benefit indirectly from the flow of ecological services from mangroves such as fishery support; and they may derive nonuse benefits from the continued existence and biodiversity of the mangrove resource (Hamilton, Dixon, and Owen Miller 1989). Natural resources such as mangrove wetlands represent a significant portion of Mexico's and other developing countries' cultural, intergenerational, environmental, and economic wealth (Munasinghe 1993). Additionally, the Yucatán's mangrove wetlands, like those worldwide, tend to be open access, common property resources that do not lend themselves to straightforward traditional regulatory, management, and market-based analysis (Clark 1996).

While some of the value of mangrove ecosystems may be measured in terms of marketed products, the "free" or nonmarket goods and services provided by mangrove ecosystems are more difficult to measure. As a result, governmental and other decision-making processes which do not account for all of the values associated with mangrove resources significantly understate mangrove resources' total value (Clark 1996; Hamilton and Snedaker 1984). The complexity of mangrove resources and the absence of well-

defined and readily available markets for mangrove resource benefits necessitate the use of nonmarket valuation methods for approximating their economic value. Some form of nonmarket economic valuation is required to help make consistent choices between mangrove wetland conservation, preservation, and development decisions (Barbier 1994).

Total Economic Value

Mangrove wetlands provide individuals and groups with a range of benefits and services. Some of these benefits include: (1) extractive benefits of natural resources such as fishing and hunting, (2) indirect benefits like fishery support, and (3) non-extractive benefits such as birdwatching, hiking, and tourism. Accurate valuation of mangrove ecosystems depends on adequately accounting for all the sources of social benefits of and flowing from the resource—total economic value. Total economic value is made up of use and nonuse values.

Use Value

Use values are defined as the values of goods and services that directly enter an economy. That does not mean that the use values associated with a resource must necessarily be market uses. It does mean, however, that some in situ activity takes place that benefits individuals. Examples of some natural resource use values include: camping, hunting, mining of resources, fishing, farming, as well as things such as breathing clean air. While some of these activities may have markets, others do not, *use values* identify the benefits from services associated with actual physical proximity to the resource.

Nonuse Values

John Krutilla (1967) in *Conservation Reconsidered* helped to create a taxonomy for addressing those values associated with environmental and natural resources. Krutilla

pointed out the different types of value that environmental and natural resources might have for people independent of actual use. These values include the value of knowing the resource simply existed (existence value), the value that some people attribute to some potential use of the resource (option value), and the value that some people have knowing that future generations of individuals will have the resource (bequest value). Following Krutilla, resource economists have further refined and defined these types of values, in general, calling them passive use or *nonuse values*.

The nonuse value of natural resources can be defined as the difference between a resource's total economic value and the resource's present use value. Therefore, the universe of values derived from natural resources (total economic value) may be divided into two classes, use values and nonuse values.

NONMARKET METHODS

Traditionally, benefit-cost analyses have been used to determine the viability and acceptability of proposed projects and policy changes. As pointed out above, market price methods theoretically and practically are unable to address the determination of nonuse values and total values of ecological resources. Resource management and damage assessment decisions that fail to account for nonuse value necessarily undervalue the affected environmental and natural resource and promote their destruction. Nonmarket valuation methods enable nonuse values to be incorporated into decision making.

Valuation Methods

The methods employed by economists to reveal the economic value of environmental goods and services in general can be grouped into two categories based upon the data the

methods use—See Table 1. One category of methods derive economic values based on actual market behavior of individuals and the other category of methods derive economic values based on present behavior of individuals as manifest through their selection among alternatives or contingencies. The policy objectives driving the economic valuation study as well as the availability of data help determine the most appropriate methodology for the economic valuation of the selected environmental and natural resources.

Table 1. Economic Valuation Methods

	Actual Market Behavior	Contingent Market Behavior
Explicit Values	Market Prices	Statements of willingness to pay
Implicit Values	Production function Land and wage hedonics Travel cost analysis	Ranking behavior Referenda Payment card

Nonmarket valuation methods help reveal economic values for natural resources by observing individuals' behavior and by directly questioning them. Hedonic methods derive economic values for environmental and natural resources by discerning price differentials (in well functioning markets) associated with environmental goods (bads). Travel cost and contingent market methods use direct questioning techniques (surveys) to collect information that reveals how much individuals pay or would be willing to pay for an environmental good or service.

Comparison of Methods

Actual market behavior based valuation methods use data from already completed transactions that do not necessarily indicate or predict individuals' present or future values

of environmental and natural resources. In fact, it is safe to say that individuals' actual behavior and underlying values will change for all sorts of reasons in the future. For example, a historically little used park or resource site may become much more desirable, prized, and used in the future as alternative resource sites are lost or damaged.

Actual market behavior valuation methods rely to a great extent on models that, in theory, connect past behavior with individuals' preferences for environmental attributes. Researchers decide: (1) how to specify and design economic valuation models, (2) what data to use, (3) how to analyze the data, and (4) how to interpret the results. With actual market behavior methods, resource beneficiaries are far removed (both temporally and spatially) from the process of "valuing" the proposed environmental change.

Contingent market valuation methods focus on respondents' present valuation of current and future changes in environmental and natural resource quality and quantity. Respondents are presented with information about alternative policy programs, given expert opinions (including costs), and then are asked to indicate their preferences, if any. That is, individual stakeholders determine how to weigh the information presented and how they will be affected by the proposed policy change(s) in formulating their responses.

Decision makers, when relying on actual market behavior valuation methods, place substantial reliance upon the analysts' assumptions, techniques, and interpretation of the relationships between individuals' past behavior and value of the proposed policy. In contrast, decision makers relying on contingent market valuation methods rely upon individual respondents to make good choices based upon the information they have. The contingent market methods require decision makers to rely upon researchers to carefully design instruments and methods that are unbiased and capable of producing valid

estimates. However, contingent valuation methods, unlike actual behavior methods, *directly* involve stakeholders in the process of evaluating the benefits (costs) of proposed *environmental* and natural resource policy changes.

Explicit and Implicit Values

As Table 1 points out, methods for measuring the value of environmental assets can also be categorized based on the type of value estimates they generate. Explicit valuation measures reveal economic values directly by observing market prices paid or by asking respondents how much they are willing to pay for the good or service in question. Implicit valuation measures use individuals' behavior to draw inferences about, "reveal" economic values of a particular environmental benefit. Underlying both explicit and implicit valuation methods are behavioral assumptions (optimizing behavior) that enable economists to use the observations and data collected to compute measures of the economic value. Actual market methods are limited, theoretically and methodologically, to measuring certain use values of the resources. Contingent valuation methods are the only methods available for inquiries into the nonuse value and total economic value of environmental and natural resources.

CONTINGENT VALUATION

The contingent valuation method [CV or CVM] elicits economic values, estimates of willingness-to-pay [WTP] or willingness-to-accept compensation [WTA], for environmental amenities and natural resources using carefully designed and administered surveys (See Mitchell and Carson 1989). A strength of CV is that respondents do not have to conceptualize value in terms of money for CV to generate reliable economic

estimates of value. CV does not require direct linkages to be made with market transactions, however its theoretical foundation is the same foundation underlying all economic valuation methods—the analysis of individuals' choices in light of knowledge and information about such choices. An additional strength of contingent valuation is its ability to accommodate a range of policy impacts, address nonuse values, and generate results comparable to other techniques.

There are various approaches to undertaking a CV study. Each is designed to place respondents in a position to make trade-offs between their desire for particular quantities of the environmental and natural resource and their individual budget constraints. One CV approach to valuing an environmental and natural resource benefit or change in benefits (proposed policy X) is to directly ask respondents, "How much are you willing to pay for proposed policy X?" (these are the statements of *willingness to pay*). Likewise, CV studies can ask respondents to: "Rank the following proposed policies in the order that reflects 'most to least valuable to you'" (these are *ranking behavior* exercises). Alternatively, CV respondents may be asked, "Would you vote in favor of a plan to implement policy X if it would mean a tax increase of \$?" (these are *referenda*). Still other CV studies ask respondents to select an amount they would be willing to pay (say, in higher taxes) from choices specified on a *payment card* fashioned for the study.

Regardless of the format of a CV questionnaire, it must be able to provide respondents with: (1) information about the good/service being valued, (2) information about the consequences of alternative policies, (3) information about their individual costs, and (4) a means for eliciting their choice (Mitchell and Carson 1989; NOAA 1993). That is why, proper design and implementation of CV studies are crucial.

Importance of CV Study Design

Research has shown that CV study design is critical for generating reliable and valid economic estimates of value (NOAA 1993). However, "there is no standard approach to the design of a contingent valuation survey" (Portney 1994). Like other types of survey research, CV studies must adhere to generally accepted survey research methodology and procedures. However, CV research also needs to meet additional requirements to generate useful economic data. Mitchell and Carson, in their classic work on *CV Using Surveys to Value Public Goods*, caution that:

[T]he [CV] survey must simultaneously meet the methodological imperatives of survey research and the requirements of economic theory. To meet the methodological imperatives requires that the scenario be understandable and meaningful to respondents and free of incentives which might bias the results. To meet the requirements of economic theory a survey must obtain the correct benefit measures for the good in the context of an appropriate hypothetical market setting. (1989, 17)

CV questionnaires share several well-defined elements. They contain: (1) a scenario or description of the (hypothetical or real) policy or program; (2) a mechanism for eliciting value or choice from the respondent; and (3) questions that elicit information on the socioeconomic characteristics of the respondents. The socioeconomic data obtained during the interview process coupled with econometric analysis helps researchers understand, evaluate, and validate the survey results (See Portney 1994; Mitchell and Carson 1989).

By necessity, no two CV studies can be the same. A great deal of preparation, planning, fieldwork, and development effort is needed to construct a CV instrument and implementation plan that meets CV's dual methodological requirements.

CV in Developing Countries

CV has been increasingly used in developing countries (Carson et al., *Bibliography*, 1994). While economists and others acknowledge the potential contribution of using CV for valuing natural resources and environmental protection in developed countries, doubt has been expressed regarding the design of effective CV studies in developing countries (Aylward and Barbier 1992; Barbier 1994; Munasinghe 1993). Hoehn and Krieger (1994) have demonstrated that CV can be used to reveal reliable and valid estimates of the economic value of environmental and natural resources in a developing country. Likewise, the World Bank, USAID, and others have increasingly used CV in Africa, Latin America, and Asia (e.g., Briscoe et al. 1990; Whittington et al. 1993).

However, a review of many of the developing country CV applications reveals little evidence that the particular CV respondent populations: (1) understood the resources, (2) accepted the plausibility of the policies, and (3) made economically relevant choices when answering. That is, the instrument and design component of CV research is hardly mentioned. In virtually all of the reported CV economic studies conducted in developing countries there is a lack of emphasis on the difficulty of, importance of, and strategies taken to address proper CV instrument and study design (e.g., Whittington et al. 1993).

CV in Yucatán

Mexican researchers increasingly realize the importance of nonmarket valuation methods and their relevance to the study of Yucatecan coastal resources. Seijo et al. (1995) tries to incorporate a CV study questionnaire on the economic value of ecological services into

their study of Campeche's mangrove ecosystem. This attempt highlights the recognition of the importance of including nonuse values in decision making and demonstrates the difficulty of designing and implementing CV studies in a developing country. A review of the CV instrument, methods, and procedures used by Seijo et al. reveals the nascent state-of-the-art of CV research in the Yucatán (Miguel Angel Cabrera, personal conversations, Mérida, Mex., January 1996). The only pretesting and design consideration reported regarding the Seijo study was the use of a United States questionnaire as a model and a pilot test of the final instrument that looked for clearly erroneous responses.

Hernandez-Flores in establishing the framework for a study of the socioeconomics of Yucatecan coastal communities, specifically recognizes the importance of determining the "total economic value of resources associated to [*sic*] the communities" (1995, 5). Hernandez-Flores (1995) calls for the use of CV to help determine the existence and ecological service (i.e., nonuse) values of lagoon and coastal resources. Hernandez-Flores also points out that the use of CV in Mexico is novel but very necessary. Hernandez-Flores believes that much work remains in developing methods for designing and implementing CV studies that can produce reliable and valid economic estimates of environmental values in Mexico (Alvaro Hernandez-Flores, personal conversation, Mérida, Mex., Jan. 1996).

QUALITATIVE SURVEY DESIGN

Some CV literature addresses questions pertaining to the efficacy of CV survey design. There are studies on: the use of different question formats, the problem of embedding effects, and, in one case, the time respondents have to answer (e.g., Brown et al. 1996;

Carson and Mitchell 1993; Whittington et al. 1992). While traditional economists for the most part depend upon data originally collected using survey questionnaires, only a handful of economists have actually focused on survey design and implementation issues. Resource economists directly use survey research methods but generally rely upon sociologists, cognitive psychologists, and other social scientists to advance the generally accepted state-of-the-art of survey research (e.g., Hutchinson, Chilton, and Davis 1995; Schkade and Payne 1994; Schwarz 1997).

Qualitative Methods

One area that survey researchers have been increasingly focusing attention on is the use of qualitative research methods for improving the design and implementation of survey questionnaires. Qualitative research means different things to different people. For some researchers, the distinction between quantitative and qualitative research is a function of the methods used for data collection (e.g., in-depth interviews, focus groups, and participant observation). For others like Strauss and Corbin (1990), qualitative research is any research that produces findings not arrived at by means of statistical procedures or other means of quantification.

However, a satisfactory definition and understanding of qualitative research rests on both the manner in which information is acquired and the nature of the information so acquired. As Bryman points out:

A number of synonymous terms have emerged as alternative labels for the qualitative approach...but they all fundamentally refer to the same thing: an approach to the study of the social world which seeks to describe and analyze the culture and behavior of humans and their groups from the point of those being studied. (1988, 46)

Strauss and Corbin (1990) concur that the strength of qualitative research is that it **uncovers** and helps researchers understand what lies behind phenomenon about which **little** is known and it provides novel and fresh slants on things about which a bit is already **known**.

Qualitative research and methods differ from quantitative approaches because of **their** fundamentally different foci and objectives. Maxwell stresses that qualitative and **quantitative** research are not two different ways of doing the same thing.

Instead, they have different strengths and logics and are often best used to **address** different questions and purposes. The strengths of qualitative research **derive** primarily from its inductive approach, its focus on specific situations or **people**, and its emphasis on words rather than numbers. (1996, 17)

The **focus** of qualitative research is on understanding and learning the deeper reasons **behind** situations, how people feel, and why they act or fail to act. Bryman (1988) **emphasizes** the importance of understanding the real strength of the qualitative research, its **perspective**.

The most fundamental characteristic of qualitative research is its express commitment to viewing events, action, norms, values, etc. from the perspective of the people who are being studied....The strategy of taking the subject's perspective is often expressed in terms of seeing through the eyes of the people you are studying. (Bryman 1988, 61)

Therefore, qualitative research methods allow outsiders to acquire knowledge, vocabulary, and insights from the perspective of the subjects. Qualitative researchers can learn how people understand, use, perceive, rely upon, and describe their environmental and natural resources using qualitative research methods.

Survey Design

Qualitative research studies are especially well suited for use in designing and implementing survey research projects. In fact, exploratory qualitative studies by survey and experimental researchers have been extremely helpful in the design of their questionnaires and the identification of variables for experimental investigation (Maxwell 1996). Fowler (1995) points out the increased attention being given to the evaluation of survey questionnaire design from the cognitive and interactional perspectives. Fowler believes that focus groups and other "testing should be done to find out if people can understand the questions, if they can perform the tasks the questions require, and if interviewers can and will read questions as worded" (1995, 104).

Converse and Presser also stress the importance of understanding and accommodating the cognitive and psychological demands of survey questionnaires on respondents. They lament that "most of us are too likely to neglect [the] preliminary phase of exploration" before drafting survey instruments (1986, 50). Converse and Presser suggest that the crafting of a questionnaire involves intellectual preparation of all sorts. They believe that exploratory inquiry involving 'in-depth' interviews and 'focused discussion groups' with members of the target populations can be particularly valuable when the subjects are likely to have special perceptions, problems, and idioms that may be relatively foreign to investigators.

Focus Group Discussions

Focus groups are carefully planned discussions designed to learn about subjects' perceptions on a defined area of interest in a permissive, nonthreatening environment. They are conducted by a skilled moderator and involve as few as 4 to as many as 12 informants.

The discussion is comfortable and often enjoyable for participants as they share their ideas and perceptions. The sessions are usually tape-recorded to allow for more in-depth analyses (Morgan 1996). Krueger points out that, "Focus group interviews typically have six characteristics or features....(1) people, (2) assembled in a series of groups, (3) possess certain characteristics, and (4) provide data (5) of a qualitative nature (6) in a focused discussion" (1994, 16).

Individual Qualitative Interviews

An individual qualitative interview is a "guided conversation whose goal is to elicit from the interviewee (usually referred to as the 'informant') rich, detailed materials that can be used in qualitative analysis" (Lofland and Lofland 1995). There are several names for this sort of interview: unstructured interviews, qualitative interviews, depth interviews, and in-depth interviews. Qualitative interviews attempt to discover the informant's experience, perceptions, and perspectives of a particular topic or situation. Weiss (1994) points out that the strength of qualitative interviews is that they draw on individuals' familiarity and comfort with one-on-one conversations concerning issues, ideas, and problems. While the style may appear conversational, the interviewer directs the respondents to the topics that matter to the study. Weiss (1994) believes that qualitative interviews are appropriate for: (1) developing *detailed descriptions* about an event or development; (2) integrating *multiple perspectives* on an organization, development, or event; (3) *describing process* of human enterprise; (4) developing *holistic descriptions* of complex entities; (5) learning *how events are interpreted*; (6) grasping an *understanding from the inside*; and (7) *identifying variables and hypotheses* for quantitative research.

Potential Use

Increasingly, social scientists from various fields use qualitative research methods in conjunction with designing positivistic quantitative methods. The candidate's research used two different qualitative research methods to learn how members of two communities "see the world." Two communities along a 12-kilometer stretch of coastal mangrove wetlands were studied using focus groups and individual qualitative interviews. Hopefully, the systematic use of qualitative research can help teach researchers how local resource beneficiaries describe, perceive, and use their environmental and natural resources and how to better design and implement economic valuation studies of environmental and natural resources in developing countries.

HYPOTHESES

Contingent valuation of the economic value of environmental and natural resources depends on well-designed and well-implemented survey instruments. CV survey respondents must understand the good or service being investigated, accept the plausibility of proffered policy change, and consider economic constraints when answering the valuation questions. This study set about to collect evidence for the proposition that focus group and individual interviews reveal similar types of information pertinent to the proper design and implementation of a contingent valuation study. It was hypothesized that focus group interviews concerning environmental and natural resources reveal information of substantially similar in scope and character to the information revealed using individual qualitative interviews on the same subject. Furthermore, it was hypothesized that using

these two methods may provide a means for assessing the strength and accuracy of the two methods used.

METHOD AND ANALYSIS

The data collection portion of this research took place in phases (See Table 2). In addition to preliminary fieldwork follow-up research, and data analysis, there were two periods of focus group interviews and one period of individual interviews. Data were collected using field notes, investigator debriefing, and audiotape recordings. All focus group and individual interviews were tape-recorded and subsequently transcribed. The transcriptions were then coded. The coded data were used for cross-case and cross-method analyses that looked at frequency and cross-tabulation tables of selected codes.

POPULATION AND SAMPLE

The villages of Chelém and Chuburná have approximately 400 and 200 households respectively. Census data from 1990 indicates that populations for these communities are approximately 2180 and 1244 with there being slightly fewer women than men (INEGI 1992). Few families have telephones, and other information, such as land title, car registrations, and fishing licenses, is neither available nor appropriate for the subject populations. Likewise residents' homes are not clearly numbered in a way that would permit a systematic random selection process. Making matters more difficult, there are no accurate street maps of this area. In short, there are no readily available and reliable lists from which to draw random samples of the two populations.

Table 2. Research Overview

Stage	Name	Components	Comments
1	Initial Scoping	- Key Person and Expert Interviews - Site Visits - Collaboration Building	- Reviewed various potential research sites - Formed research partnerships - Met with local beneficiaries - Met with governmental & non-governmental agencies - Drafted research plan
2	Focus Groups I	- Further Scoping - Visited research site & began informal interviews - Finalized research plan - Designed, organized & attended focus groups - Began to analyze focus group data	- Learned about ecological, socioeconomic characteristics of site. - Coordinated research program with Mexican collaborators - Collected information on mangroves, population, laws, & policies. - Developed focus group script and key questions - Identified & segmented focus groups by gender, geographic location, & socioeconomic level. - Attended, conducted, & oversaw focus group sessions.
3	Focus Groups II	- Design focus groups II - Organize and attend focus groups II	Additional focus groups from fishing villages.
4	Individual Interviews	- Design & organize individual interviews - Conduct key-person interviews - Train research assistants/interviewers	- Develop script for individual interviews - Conduct and observe individual interviews - Debrief interviewers
5	Data Analysis	- Transcribe audio cassettes of interviews - Develop a system of codes for qualitative data - Code transcripts - Re-evaluate coding scheme - Re-code data - Analyze codes using computer program	

As a result, it was decided to use a purposeful sampling strategy. In order to control for differences in gender and community experiences, it was decided to recruit participants for focus groups that would be same-sexed and from the same community. Initially, efforts were made to also further control for socioeconomic status but this proved too difficult. Most villagers and their homes displayed no obvious indicators of differentiable socioeconomic status.

Research assistants canvassed randomly selected sections of the target communities at staggered times to recruit participants. Participants were told that a university-sponsored project was seeking their opinions and input on the area and its natural resources. They were also told that their participation was voluntary and that there would be complete confidentiality. Because of different cultural norms and expectations, inducements were not offered to focus group participants as is done elsewhere (e.g., the United States).

Overall 12 focus groups and 19 individual interviews were conducted in Chelém and Chuburná. Table 3 shows a breakdown of the interviews by type, locale, and gender. Altogether, 97 people were interviewed individually or in groups. Each focus group was comprised of between 4 and 7 respondents of the same gender. Because of the qualitative nature of the study and the inability to collect a random sample of participants together with their socioeconomic data, no attempt is made to generalize findings to different populations based upon the substance of the interviews.

Table 3. Focus Groups and Interviews

	Chelém		Chuburná	
	Men	Women	Men	Women
Focus Group Interviews	4 groups	3 groups	3 groups	2 groups
Individual Interviews	8 interviews	2 interviews	7 interviews	2 interviews
Total	12 transcripts	5 transcripts	10 transcripts	4 transcripts

PROCEDURES

As described above, the research program consisted of a series of field research components and the systematic analysis of the qualitative data obtained from focus group and individual interviews. An attempt was made to purposefully recruit participants who represented a cross-section of members from the communities to facilitate learning about the various attitudes, perceptions, and concerns regarding the mangrove ecosystem.

Focus Groups

The focus group interviews ranged in size from 4 to 7 participants and were conducted by a Mexican professional focus group moderator. The doctoral candidate assisted with conducting the group interviews. The focus groups were held in participants' homes, local eating establishments, and a centrally located home that was rented for use by the researchers. All participants were told of the voluntary nature of their participation as well as the strict confidentiality of their participation and their responses. Tape recording did not begin until participants consented to the audio recording of the interviews. Furthermore, participants did not receive compensation for their participation.

While interview scripts were developed and continuously modified, the actual interviews and question orders did not follow a strict pattern. Every attempt was made to inquire, in several ways, about the participants' uses, perceptions, opinions, and experiences vis-à-vis Chelém Lagoon and its environs. Likewise, attempts were made to include all participants and their opinions in the discussions. The focus group interviews lasted on average about one hour with the shortest lasting only 40 minutes and the longest almost 2 hours. The community setting presented interesting challenges and the researchers needed to adapt as circumstance required. At the conclusion of each focus group, participants were thanked and given the name, address, and telephone number of a nearby Mexican collaborator should they need or desire to contact the researchers in the future.

Individual Interviews

Nineteen individual qualitative interviews were conducted with community members from Chelém and Chuburná. The individual qualitative interviews, while initially conceived of as a means for validating the finding and conclusions drawn from the focus groups, evolved into part of an effort to compare and contrast the strengths and weaknesses of two qualitative research methods in a developing country setting.

Respondents were recruited by canvassing randomly selected sections of the communities. Interview participants were told that the study was sponsored by a university, that their participation was voluntary, and that their identity and responses would be kept confidential. Respondents were then asked if their interviews could be tape-recorded.

The interviews were generally 30 minutes long and not highly structured. Like the focus group interviews, a script with several key research questions and topics was used. However, the free flowing nature of qualitative interviewing required interviewers to introduce discussion topics as they were able to. The individual interviews were structured to encourage informants to freely volunteer information. Interviewers were instructed to avoid asking for responses to closed-ended or leading questions. At the end of the interview, respondents were thanked for their participation and instructed how to contact the researchers if they had additional questions or comments.

It should be noted that none of the respondents were in both focus group and individual interviews. This was done to control for information and other bias. While, it would be quite interesting to compare the differences and similarities of information revealed by respondents in individual qualitative interviews after they have participated in focus groups, this was beyond the scope of the dissertation research.

DATA ANALYSIS

Although data and information from many sources and of many types were collected during the many stages of the research program, the focus group and individual qualitative interviews are the sources of the primary data analyzed in this dissertation. The audiotapes of the interviews were labeled, copied, and transcribed. The transcripts were then made into computer files for use with computer-based qualitative research programs.

The initial step in qualitative analysis is reading the interview transcripts. Then the analyst has several options. Maxwell put them into three groups: “ memos, categorizing strategies (such as coding and thematic analysis), and contextualizing strategies (such as

narrative analysis, individual case studies, and ethnographic microanalysis)"(1996, 78).

Each of these groups have relative strengths and weaknesses. Categorization helps to understand the particular individuals and their situations. However, Maxwell makes the point that questions about similarities and differences across settings or individuals need some contextualizing of the categorizing strategy

Coding

The main categorizing strategy in qualitative research is coding. However, the goal of qualitative research is not to produce simple counts of things, but to “fracture” the data and rearrange it into categories that facilitate the comparison of data within and between categories (Maxwell 1996; Strauss and Corbin 1990). The first step in the coding process was to draw on existing literature on the possible sources of mangrove wetland values and the elements necessary for designing a CV study. This initial grounding in the literature is one manner to initiate what Strauss and Corbin (1990) refer to as grounded theory analysis of qualitative data.

With this background, the transcripts were loaded first into HyperRESEARCH and subsequently into QSR NUD·IST for the coding process. While these programs ultimately failed to allow sufficiently sophisticated quantitative analysis of the codes, they each provided a wonderful opportunity to read, label, and formally code text for further analysis.

Several transcripts were open coded using HyperRESEARCH. That is, virtually every word or phrase was coded. After the unsatisfactory attempts to statistically analyze the codes, the transcripts were loaded into and axial coded with QSR NUD·IST. Axial

coding uses themes and categories to group the qualitative data. Although QSR NUD·IST seemed more capable for statistical analysis of codes, it proved too frustrating and limited for the type of analysis desired. Although these programs were ultimately unsuccessful in computing cross-tabulations and frequency tables, they both helped develop the selective codes ultimately used with the data. The transcripts were eventually re-coded by hand. These codes were recorded in a Microsoft® Excel file that was subsequently loaded into SPSS for the required data analysis.

Cross-Case Analysis

Together with the contextualizing of narrative analysis, the categorizing activity of coding the transcripts allows for cross-case analysis. That is, groups of respondents and their data can be examined for similarities and differences. The data, by rearranging it into categories can be used to understand the individuals and situations.

In this study, data were eventually grouped according to interview type (focus group or individual interview), gender (male or female), and location (Chelém or Chuburná). Then particularly interesting and theoretically relevant observations about the “findings” of the focus groups and interviews were used to identify the selective codes for analysis. The data set was layered according to the three groups to be looked at and cross-tabulations and frequency analysis performed. In this manner, a cross-case and cross-method analysis of the qualitative data learned using both focus groups and individual qualitative interviews was undertaken.

ASSUMPTIONS AND LIMITATIONS

As with any study, this dissertation has limits and shortcomings. Some of these defects are a function of the assumptions, both explicit and implicit, of the researcher. Other deficiencies stem from the methods used and their application. Qualitative research is not an exact science, nor is it intended to be. It is however a means for learning how people see their world. It is assumed that by developing tools that help researchers acquire a better sense of how respondents apprehend, comprehend, and use their natural resources, that those researchers will be able to design and implement better questionnaires.

Note, the caveats inherent in qualitative research should be repeated. Unlike quantitative studies from which scholars may be able to generalize to distinct populations based on statistics, qualitative research is usually limited to making claims about the people studied. While qualitative studies are usually used to study a single setting or a small number of sites, using theoretical or purposive rather than probability sampling, this does not mean that qualitative studies are never generalizable beyond the settings or informants studied (Maxwell 1996). Often, qualitative studies have *face generalizability*—no obvious reason *not* to believe the results apply more generally. Likewise, generalizability of qualitative studies may be based on the development of a theory that can be extended to other cases. According to Maxwell “these characteristics can provide credibility to generalizations from qualitative studies, but none permit the kinds of precise extrapolation of results to defined populations that probability sampling allows” (1996, 97-98).

The difficulties of conducting household-level research investigation in rural Yucatán, Mexico was a limitation of this study. The absence of telephones, reliable

transportation, and other infrastructure taken for granted in most developed country settings did impact the study. The difficulty in recruiting for the focus groups and individual interviews in the villages of Chelém and Chuburná resulted in the researcher's decision to forego collecting socio-economic data from each participant. As a result, it was assumed that the focus group and individual interview participants were more or less representative of community members and their resource knowledge and concerns.

Because of the difficulty of locating well-trained focus group moderators and qualitative interviewers, it was decided to use the male focus group moderator with all of the groups and to use participants of one gender in each focus group. Likewise, out of necessity, the qualitative interviewers used were both female. It was assumed that the gender of the moderator and the interviewers would not significantly impact the information volunteered by respondents. While this assumption may be unreasonable for sensitive matters of a personal nature, it was believed to be reasonable in light of the public nature of resource use and knowledge information.

Economic valuation studies of developing country environmental and natural resources will be needed in places of similar and no doubt more challenging environs. It is hoped that the results of this study demonstrate that relatively short-term qualitative and other environmental and natural resource research can be successfully undertaken in developing countries. Furthermore, it is hoped that the results demonstrate that focus groups and individual interviews can help researchers improve their economic valuation studies.

CHAPTER 2

LITERATURE REVIEW

This chapter presents the theoretical foundations for the dissertation. A review of the literature provides the background, framework, and rationale for an examination into the efficacy of using qualitative research methods for designing a nonmarket economic valuation study of complex environmental and natural resources in a developing country.

INTERNATIONAL DEVELOPMENT

During the immediate post-war era, international development assistance had the stated purpose of serving the interests of “recipient” states. Benefits that accrued to the “donor” states were stated to be indirect, secondary, or incidental—such as “peace in the world” and “better trade relationships” (G. Axinn 1988). The basic idea behind international economic development efforts was to share industrialized country “know how” with less developed nations. As George Axinn (1988) points out, there are three assumptions implicit in this approach to international development assistance: (1) the United States and other donor countries are “developed” and the rest of the world is “less or under developed;” (2) the U.S. (and other industrialized nations) “know-how” and capital can transform “underdeveloped” nations through the transfer of outside technology; and (3)

that technically qualified people from industrialized states can apply technologies assumed to be scale, gender, and politically neutral in the developing countries.

By the 1960s, the first assumption underlying “technical assistance” came under attack. The experiences of scholars and practitioners at some U.S. and other universities taught them that they and their technology were “culture bound.” Instead of helping others use science to discover technological solutions to their problems, the practitioners found themselves attempting to directly transfer alien “First World” technologies into “Third World” situations. By the 1970s, the second and third assumptions lost credibility with scholars of the development process although some practitioners (especially government agencies and multilateral donors) continue their allegiance to technology transfer. Disappointing results increased scholars’ and enlightened practitioners’ desire to first learn about and understand the reality of developing countries and then use that understanding to intervene (G. Axinn 1988).

The increased awareness of the flaws in addressing socioeconomic problems in developing countries with “First World” remedies gave rise to a literature dealing with concepts of: dependency; center-periphery relationships; rural rich versus rural poor; and the division between “negative academics” and “positive practitioners” (G. Axinn 1988; Prebisch 1962; Cardoso and Faletto 1979; Chambers 1983). By the 1980s, it became clear to some that all three previous assumptions about development via technical assistance were unwarranted. A shift towards a new paradigm for successful international economic development began.

BOTTOM-UP APPROACH

Norman Uphoff (1987) points out that, “the challenge to students and practitioners of development is not simply to broaden their sights” but that “prevailing linear modes of thinking about development actually need to be altered” (665). This challenge to find a new paradigm for development led scholars start at the beginning—define development. Recognizing that purely economic development for some segments of societies did not necessarily make everybody better-off, development practitioners and scholars developed the notion that development was politically and diplomatically controlled (G. Axinn 1988; Cardoso and Faletto 1979; Elsenhans 1991; Prebisch 1962).

Some like Paulo Friere (1970) warned about the approach being taken by outsiders. Friere pointed out the need for outsiders to be concerned with communicating with, learning from, and teaching the heterogeneous populations of developing countries. Others, notably Robert Chambers (1983), lead the way for development practitioners and scholars to begin to evaluate and understand the realities of development and redefine issues of appropriate intervention. Recognizing that development is more than merely change, parties effecting and affected by development efforts need to be identified and included in the process. For defining development as change for the better requires the identification of who is better-off and at what and whose expense (G. Axinn 1988).

While the emphasis for many development practitioners became identification of “appropriate technology,” for others it became learning to learn from intended beneficiaries about their societies and needs. Focusing on understanding problems like poverty instead of (mis)applying foreign technology in developing countries resulted in some important, but not surprising, findings. Susan George (1984) bluntly observed that

governments are most often concerned with enriching those who keep them in power.

Likewise, George pointed out how cultural and political biases of outsiders have interfered with development in the developing nations.

Hernando de Soto (1991) addresses his concern for the poor, democracy, and market economies in developing countries. De Soto points out that: “the freemarket is not enough” and that “the poor can be the engines of growth” (xxi). Recognizing that development “must be driven from within...not by outsiders” and that “development involves change in all aspects of any system which is developing,” G. Axinn (1991) urges the adoption of a systems approach to achieve sustainable development.

Bawden (1991), while recognizing the role of technological innovations in the “green revolution,” points out “the increasing sense of unease about degradation of biophysical environments, and dislocations of cultural environments” as a result of outside technological innovation in developing countries (2362). Bawden suggests that it is time to “let go of the old paradigm” and “embrace” systems thinking and practice. As Bawden puts it, “the systems paradigm calls for us to rethink our views of our world (and of the way its interrelated components are patterned) as well as our ways of going about the way we view the world” (2371).

For development efforts to address the pervasive problems of the poor (both urban and rural) and promote sustainable improvements, a change from the top-down approach of technical assistance and policy analysis towards a new paradigm has become a necessity. George (1984) suggested several goals for international organizations and governments to become more effective in their development efforts. Underlying these suggestions is the explicit condition that these agents must receive and use input and

participation from the affected citizens and stakeholders. That is, treat local people as a source of knowledge.

NEW PARADIGM

During the last decade or so, a new paradigm for international development assistance has begun to solidify. If history, Thomas Kuhn (1970), and some current trends are correct, it probably will not be long until a new, new paradigm for international development and assistance takes hold. For now however, elements of the currently evolving paradigm are most relevant. Among these elements is the recognized importance of the participatory (grassroots) approach to development, social change, and research.

Underscoring the importance of participatory approaches to development, Marilyn Hoskins (1991) describes a "revolution" taking place in community forestry as a result of listening and empowering local people. Robert Chambers in his successive works, has been a visionary and champion of the bottom-up approach to development. Beginning with *Rural Development: Putting the Last First* (1983), Chambers has been able to identify the problems associated with outsiders vis-à-vis development efforts. Chambers has repeatedly called for the use of cost-effective appraisal and research methods that are inventive, adaptable, and open to unexpected information. Most importantly, Chambers insists that researchers and development practitioners that involve local people themselves as partners in evaluation and implementation of efforts.

The current thinking among development scholars and practitioners embraces several notions falling under the rubric of participatory development. It is believed that incorporating local beneficiaries in policy formation, planning, implementation, and

evaluation processes, helps assure the sustainability of the project, develop a respect for the beneficiaries, and minimize outsider insensitivity to the circumstances of poor people. The ideas behind the participatory development approach rest upon the foundation laid by, among others, de Soto (1991), Chambers (1983), and Friere (1970). Put simply, local beneficiaries must be included because they know about their systems, their problems, their capacities, and the possible solutions.

Current thinking is that for a project to be successful in the long-run, local participants must be viewed as the clients of development practitioners', the proposed policy's beneficiaries, and the experts. Stakeholders should be actively involved and invested in the framing, design, implementation, and maintenance of development efforts. Local participation also means that outsiders must learn to hear about, listen to, and understand the world (systems) of local people. Outsiders must learn the language, customs, rituals, and values of local populations in order to be effective change agents.

E N V I R O N M E N T A N D D E V E L O P M E N T

There is growing recognition in Latin America, Africa, and Asia that human systems require healthy and viable ecosystems. The compelling human needs of developing countries have focused attention on the importance of sustainable development. The environment must be maintained as a means for balancing "progress," providing sources of income, and preserving species. President Kenneth Kaunda of Zambia observed:

Wildlife sanctuaries, which in some cases have for generations existed side-by-side with human populations, have not been established for prestige reasons or indeed for the sake of affording the wildlife a better protected life than that led by human beings. Rather, it should be understood that wildlife is part and parcel of our cultural heritage and hence we have a duty to protect it. (Llewellyn 1990, 210)

Nepal and Weber (1995) point out the rise in the creation of reserve and other protected areas in the developing world since the 1970s as governments have searched for rational approaches to conservation and sustainable development. The governments of developing countries have realized that conservation strategies must be coordinated to accommodate the exigencies of subsistence economies. United State style national parks (no taking of plants or animals) have not faired well in the developing world.

Since the Biosphere Reserves Action Plan of 1984, some developing countries have attempted to integrate planning and management in order to support the roles of protected areas and directly involve local residents and users (Nepal and Weber 1995). While the strict preservation ethos of "rich" countries may not be appropriate for natural resource protection policy in many developing countries, developing countries have begun to view national parks and natural resources as valuable components in larger regional socioeconomic and ecological systems. This has resulted in a simultaneous concern for protecting natural resources, cultures, and ways of life. Such a concern tends to promote the creation of biosphere reserves, where, in theory, local people are consider important actors in determining a path for sustainability.

MANGROVE ECOSYSTEMS

The term *mangrove* refers to a number of tree species capable of living in saltwater or salty soils. Mangroves and their ecosystems are found in intertidal areas of sheltered coastlines called *lagoons* and *estuaries*. Ecologically, mangrove wetlands maintain high levels of biological productivity; export nutrients to outside waters; and provide habitat for valuable plant and animal species (Clark 1996). Mangrove ecosystems are important to the subsistence livelihood of tropical coastal communities (Hamilton, Dixon and Owen Miller 1989). Natural wetlands, including mangrove forests, provide local and national economies with an array of important services—prevention of storm damage, flood and water control, support of fisheries, waste absorption, recreation, and transport.

Furthermore, mangrove wetlands can be directly exploited for goods such as fish, agriculture, wildlife, wood, and fresh water (Barbier 1994; Aylward and Barbier 1992).

Wetland ecosystems, like the mangroves of Chelém, account for about 6% of the global land area and are among the most threatened of all environmental resources (Turner 1991). The tropical wetland resources of developing countries are undergoing increasing change as a result of improved access to wetland zones and the pressures of population growth and economic development. Overuse including overfishing and overgrazing degrades developing country wetlands. Recent studies across the developing regions of the world have suggested that healthy tropical wetland systems have a crucial role to play in these regions' economic development (Barbier 1994). There is a growing awareness that wetlands in developing countries are more valuable economic resources when retained in their natural or semi-natural state rather than converted or degraded (Turner 1991).

Conversion or degradation of such natural assets therefore often does not represent an efficient use of such limited resources.

Researchers calculate that 80-90% of the commercial fisheries in the Gulf of Mexico are dependent on mangrove ecosystems (Hamilton, Dixon, and Owen Miller 1989). Coastal waters and their fisheries are enriched by the export of decomposable organic material and its decomposition. Mangrove wetlands are the primary source of the raw, organic material that becomes the critical food base for the crustaceans, mollusks, and fish of the coastal waters and fisheries. The coastal zone, its mangrove wetlands and salt marshes, is the site of important physicochemical reactions between saltwater and freshwater flows. Such a zone is an area of the "highest biological productivity" (Turner 1991, 61).

To help decision makers consistently choose between wetland conservation, preservation and development options—or between a decision to halt, modify or continue with an activity that is inflicting damage on a mangrove wetland—requires the application of a reasonable and appropriate economic appraisal method for evaluating the alternative options (Barbier 1994). It seems that the valuation of the noncommercial uses of the wetlands by local populations is critical in determining the economic value of developing country tropical wetlands. The failure to account for all sources of wetland value explains policy decisions that result in the overexploitation or excessive degradation of tropical wetland systems. Barbier (1994) asserts that when properly measuring the total economic value of a wetland's ecological functions, its services and its resources often exceed the gains of converting the area to an alternative use.

CHANGES IN CHELÉM LAGOON

In recent times, the Chelém Lagoon area has been experiencing a number of changes. Some of these changes have been resulted from human activity, while others have been the result of ecological and climactic activity. According to scientists at a leading Mexican research institution in Mérida—the Centro de Investigación y Estudios Avanzados [CINVESTAV]—some of the factors believed responsible for the physical changes to the estuary have been: a governmental project to open a sheltered harbor [*puerto de abrigo*] for commercial fishing vessels in Chelém lagoon; Hurricane Gilbert's (Sept. 1988) creation of new seawater inlets along the estuary's coastal barrier; and the construction of dikes [*bordos*] by Duck's Unlimited of Mexico, America, and Canada [DUMAC], an international non-governmental organization (Eduardo Batllori San Pedro, conversation with author, Mérida, Mex., 11 July 1996).

Beginning in the 1970s, the Yucatecan coast began to receive attention as a way for Mexican economic development. The coastal resources were seen as a way to absorb excess labor from the interior of the state and as a good place for national investment (Paré and Fraga 1994). Paré and Fraga (1994) point out five steps to this strategy: (1) construction of Yucalpetén's safe (sheltered) harbor [*puerto de abrigo*], (2) development seafood industry infrastructure, (3) construction of paved network of roadways, (4) construction of an industrial corridor between Mérida and Progreso, and (5) the development of tourism. These projects have substantially modified the coast's population and ecological dynamics.

Puerto de Abrigo (sheltered harbor)

A dramatic change to the Yucalpetén estuary began to take place when the Mexican government undertook the construction of a new roadway system for the Progreso municipality as well as the construction of a sheltered harbor [*puerto de abrigo*] for commercial fishing vessels in the late 1960s and early 1970s (Paré and Fraga 1994). As a strategically placed port city for the Yucatán peninsula, Progreso was already an active commercial shipping center for Mexico and the Caribbean. These and other factors resulted in the Mexican government's construction of a highway connecting Progreso with Mérida and new sheltered harbor. As a result, it has become the main port city for the peninsula as well as the Caribbean basin. Progreso also serves as a main terminal for the transport of petroleum products used throughout the peninsula. In addition to shipping, commercial fishing and fish processing concerns located in the Progreso area have grown. Furthermore, the Mexican navy currently maintains an active base using the sheltered harbor on Chelém Lagoon.

The harbor construction involved the dredging out of a naturally occurring seawater inlet to Chelém Lagoon and the installation of commercial fishing and other harbor facilities. The roadway construction involved moving massive amounts of earth to fill-in the wetlands and provide a roadbed. Unfortunately, in neither case was the health and viability of the mangrove ecosystem adequately taken into account. But for two seawater culverts between the harbor and the lagoon, the construction projects made no allowances for necessary seawater inundation, freshwater flooding, drainage, and plant and animal migration needed to maintain a healthy ecosystem. As a result, the mangrove wetlands near Progreso have become stagnant, virtually lifeless, mudflats and the

mangrove trees, plants, and animals of the lagoon were radically changed. The salt extraction operations that provided a lucrative income to the coastal villagers was decimated by the increase volumes of sea water flowing unchecked into the lagoon as a result of the new harbor. However, the populations in the areas were able to adapt by increasingly relying on coastal fishing for conch, lobster, grouper, and octopus.

Hurricane Gilbert

Hurricane Gilbert hit this area in September 1988. In addition to the property damage caused, Gilbert changed the physical characteristics of Chelém Lagoon. All along the Yucatán coast, Gilbert caused new breaks in the coastal fringe. In the Yucalpetén Estuary, Gilbert broke open seawater inlets near Chuburná. The result was the deepening of the lagoon and the creation of circulatory currents of seawater from the Gulf of Mexico. Interestingly, the mangroves adapted to the new atmosphere. Most importantly, these changes resulted in the lagoon becoming very rich in fish and shellfish life. It seems that the currents brought fishfry and shellfish larvae into the lagoon where they were able to grow and establish populations. At the same time as coastal commercial fishing began to increase, the villages of Chelém and Chuburná were able turn to the lagoon for their subsistence and economic needs.

DUMAC Project

The most recent physical change to the lagoon has been a result of a Ducks Unlimited of Mexico, America, and Canada [DUMAC] project. Motivated by a desire to preserve duck nesting and breeding grounds, DUMAC identified the Chuburná seawater inlet (created by Hurricane Gilbert) as threat to the viability of duck habitat. DUMAC told the local

population that they were going to build a dike system that would be regulated to allow for the inflow of fish fry and shellfish larvae but also prevent too much seawater from entering and ruining the duck habitat. With funds from the United States for wetland preservation and from elsewhere, DUMAC built the dikes in the mid-1990s.

Initially the gates that would allow for seawater passage were closed.

Unfortunately, these gates have never been opened despite vocal and organized actions on the part of the local villagers. Some results attributed to the DUMAC project are: the receding of the lagoon has from Chuburná and the sharp drop in the lagoons fishing productivity. Currently, the people of Chuburná, the municipality of Progreso, and researchers from CINVESTAV are all trying to persuade DUMAC to take down the dikes (Eduardo Batllori San Pedro, conversation with author, Mérida, Mex., 11 July 1996).

Other Changes

Furthermore, researchers have begun to note changes associated with human activities along the coast. An increasing number of people are migrating to the coast out of economic necessity. Many of these people have been leaving the defunct henequen plantations seeking to become crew members on commercial fishing boats, to find work in fish processing plants, and to find a means to provide subsistence for their families (Paré and Fraga 1994). Also there has been an increase in commercial trawler fleet [*rastreros*] activity in the near-by waters of the Gulf of Mexico.

These ecological and human changes have directly and indirectly impacted the use, productivity, and health of Chelém's mangrove wetland. Increased off-shore fishing pressure has made it increasingly difficult for the villagers of Chelém and Chuburná to

provide for their families from their traditional use of artisanal fishing (i.e., seasonal, small boat, nearshore fishing). These villages have, when possible, begun to heavily rely upon Chelém Lagoon as a primary source of subsistence activities. Unfortunately, the lagoon does not seem easily capable of accommodating the recent changes and increasing demands. Villagers and researchers alike report the decreasing levels of fish and shellfish populations in Chelém Lagoon (e.g., Eúan 1997; Batllori 1996; Municipality President Raul Lada, personal conversation, Progreso, Mex., July 1996).

Another change in Chelém's coastal land use patterns is the growth of seasonal inhabitants. According to Paré and Fraga (1994) there are increasing numbers of people who migrate to the coast to fish during the lucrative fishing seasons, increasing numbers of people who move to the coast out of a year-round subsistence strategy, and finally an increasing population of seasonal vacationers. Increasingly, middle and upper-class families from the state capital of Mérida and elsewhere are buying, building, and renting homes along the Chelém coastline for use during July and August. These seasonal inhabitants, whether categorized as tourists or not, seem primarily attracted to and interested in homes and activities oriented towards the Gulf of Mexico. That is, they build homes, consume seafood, and throw away their garbage apparently with little knowledge of and regard for Chelém Lagoon, the mangrove ecosystem, and the local year-round communities.

YUCATÁN MANGROVE RESEARCH

Researchers at CINVESTAV as well as other governmental and non-governmental organizations in Mexico have begun to study the dynamics of the Yucatán's coastal

resources and communities (e.g., Eúan 1997; Yáñez-Arancibia 1994; Paré and Fraga 1994). Juan Carlos Seijo (1994), along with others, has been developing a dynamic economic-ecological model for mangrove management. According to Dr. Seijo, some of the possible explanations for the ongoing conversion and deterioration of the Yucatán's coastal mangrove resources are:

The current overexploitation of mangrove ecosystems could be explained by a number of factors including: (1) the lack of market prices for ecological functions and services of mangrove ecosystems, (2) an incomplete cost-benefit analysis of conversion of coastal ecosystems..., (3) in general [*sic*] these are open access resources, and (4) the existence of high information and enforcement costs. (Seijo et al. 1994, 2)

Paré and Fraga, in their work 1994 entitled *La Costa de Yucatán: Desarrollo y Vulnerabilidad Ambiental* [The Coast of Yucatán: Development and Environmental Vulnerability], investigate two lines of research to analyze the social impacts and uses of the Yucatecan coastal resources. They look at the history of the region as well as the nature and structure of the resource use conflicts of the area. Their anthropological approach tries to develop an understanding of the relations and the dynamics of the various stakeholders, policymakers, and others in the area. Paré and Fraga (1994) ultimately offer a reference mark for other researchers studying this area. They leave unanswered the question of how to meet the goal of the computable development of tourism, fishing, urbanization and industrialization of the Yucatán's tropical coast and its complex ecosystems.

In its effort to protect coastal resources and promote sustainable development, Mexico's environmental protection agency—Secretaría del Medio Ambiente, Recursos Naturales, y Pesca [SEMARNAP]—has begun a process to systematically evaluate the

peninsula's coastal communities (Hernandez-Flores 1995). One of the stated goals of SEMARNAP's Socioeconomical and Environmental Diagnostic of 16 Coastal Communities project is to:

assess the total economic value of resources associated to the communities, considering that nature [*sic*] value is divided into three categories: use value, existence value, and ecological service value....We will use [the] contingent valuation method (CV) to determine "willingness to pay" (WTP) from fishermen and other people from the community. (Hernandez-Flores 1995, 5)

ECONOMIC VALUATION

For economists, it is axiomatic that prices of goods and services help allocate scarce resources. Viewed as a signaling and incentive system, prices provide feedback to producers and consumers so they can make adjustments. However, it is rare for all beneficial and adverse impacts concerning natural resources and environmental quality to be efficiently priced and reflected in markets (Randall 1987). Freeman, in his treatise *The Measurement of Environmental and Resource Values*, explains that:

because of externalities and the common property and public characteristics of [natural resources], market forces can be relied on neither to guide them to their most valued uses nor to reveal prices that reflect their true social value. (1993a, 2)

Mangrove wetlands and other environmental and natural resources, like human-made goods and services, have economic value because their impact on people's well-being. Philosophers since the Greeks have been concerned with the nature of economic value. Philosophy even has portfolios of well-defined concepts for considering ethics and values. Concerned with somewhat different phenomena, economics has refined its own,

specific definition of economic value. Modern economists see economic values as the outcome of supply and demand—of what a willing buyer offers to a willing seller in exchange for a good or service (Kaplowitz and Hoehn 1997). Economic values are therefore a tradeoff between what an individual may enjoy by foregoing a good or service and what an individual obtains in securing the desired good or service.

These economic values can enter the community decision-making process to the extent that policymakers are able to document or measure such human welfare contributions. Economics, at its core, does not question the philosophical nature of the contribution. Furthermore, economics does not require that an environmental amenity or a natural resource justify itself by its physical composition or economic origin. What matters is that goods and services contribute to human welfare (Kaplowitz and others 1997). If a biodiverse wetland provides biological support for a commercial fishery, then it enters the domain of economic valuation. On the other hand, if an isolated lake were to become polluted and if no one benefited from the lake, directly or indirectly, before or after the pollution, then economists would say that the lake has no economic value. There may well be some philosophical or moral value to the lake but not economic value. This is akin to the parable about hearing the sound of a tree falling in a woods when nobody is there. Economic analysis depends upon some nexus between people and the particular good or service in order to register some measure of value.

This nexus does not have to be physical or even conscious for economic value to exist or be measured. That is, economics can measure the value to individuals of preserving remote wilderness areas; whales they will never actually see; and biodiverse ecosystems that may be far away. Likewise, peoples' actions (e.g., buying homes, visiting

sites, contributing to organizations) can be used to reveal underlying economic values not readily apparent for certain environmental amenities. Economics can be used to measure the explicit or implicit tradeoffs that people make and therefore can be used to quantify some portion of the value of environmental and natural resources.

Different individuals and societies place different values on biological resources. While some people may choose to fill-in wetlands and build homes, others may choose to preserve wetlands as wilderness areas. Such choices reflect a balancing of the perceived usefulness of the biological resource and the perceived benefits from alternative uses of the resource. The value of mangrove wetlands as well as decisions to convert or preserve them are based upon mangrove wetland usefulness in production or consumption, its perceived cultural significance, or some idea of its “right” to exist (Perrings 1995). The value of mangrove wetlands can be seen through ethical, moral, philosophical, and other conceptual frameworks. However, those frameworks do not, in and of themselves, help answer questions about how much mangrove wetlands should be conserved or which ecosystems should be protected first?

The economic concept of value rests on the notion that individuals are the best judge of their own well-being. An individual’s level of welfare, it is theorized, is a function of the quantity of market goods and flows of nonmarket (i.e., environmental) goods and services (Freeman 1993a). The need for public policy in managing environmental resources and the absence of market information has led resource economists to develop methods to measure economic values of nonmarket goods and services (Randall 1987; Freeman 1993a). By analyzing individuals’ choices between alternative market goods (or monetary amounts) and nonmarket assets, economists derive

estimates of the economic value people place on the nonmarket goods and/or services (Carson et al., *DDT*, 1994).

Economic valuation methods provide an objective framework to evaluate some of the relative benefits and costs associated with alternative management decisions. The use of economic measures of value does not preclude individuals from acting in actual or contingent markets based upon their held values. That is, altruistic interests, moral concerns, and philosophical beliefs may and do enter into individuals' decision making. Economic valuation of environmental and natural resources, through studying actual and constructed market behavior makes explicit and quantifiable otherwise implicit and hard to measure values.

ECONOMIC VALUE OF MANGROVES

Environmental and natural resources represent potentially valuable goods and services to individuals, communities, and societies. Human action and inaction impacts the viability of many environmental assets and services. As Smith (1993) points out, it is no wonder that the increasing loss of environmental and natural resources makes those remaining resources even more valuable.

[I]ndustrialized societies, as well as developing economies, are transforming regional environments on an unprecedented scale. Environmental resources are increasingly recognized as assets providing services that are no longer readily available. Indeed, demands to measure their values and incorporate them into our decisions is precisely what we would expect as their scarcity increases. (Smith 1993, 1)

Mangrove wetlands represent complex sources of societal value. Mangrove resource beneficiaries derive direct consumptive benefits from fishing and wood collection;

they derive nonconsumptive benefits from birdwatching and tourism; they benefit indirectly from the flow of ecological services from mangroves such as fishery support; and they derive nonuse benefits from the continued existence and biodiversity of the mangrove resource (Hamilton, Dixon, and Owen Miller 1989).

Natural resources such as mangrove wetlands represent a significant portion of Mexico's and other countries' cultural, intergenerational, environmental, and economic wealth (Munasinghe 1993). While some of the value of mangrove ecosystems may be measured in terms of marketed products, the "free" or nonmarket goods and services provided by mangrove ecosystems are more difficult to measure. As a result, governmental and other decision-making processes which seldom take into account all of the values associated with mangrove resources significantly understate of mangrove resource's total value (Clark 1996; Hamilton and Snedaker 1984).

Costanza, Farber, and Maxwell (1989) believe that the economic value of wetland ecosystems is a function of the connections between the ecosystem and people. They assert that, "The point that must be stressed is that the economic value of ecosystems is connected to their physical, chemical, and biological role in the overall system, *whether the public fully recognizes that role or not*" (339). However, in their study of the economic value of wetlands, Costanza, Farber, and Maxwell estimate values for the resource's commercial fishing, recreation, storm protection, and waste treatment benefits. They do not as part of their analysis place values on nonuse values such as the existence and option value of the wetlands.

Hamilton, Dixon, and Owen Miller (1989) point out the limitations of simply measuring the value of market goods that may be derived from mangrove ecosystems:

Unfortunately, the directly marketed goods (or services) produced by a mangrove ecosystem represent only a fraction of the total array of goods and services that yield benefits to individuals and societies. As a result, mangroves are commonly considered as low-value ecosystems. (277)

In other words, the nonmarket and nonuse values of mangrove wetlands may be substantial. Hamilton, Dixon, and Owen-Miller (1989) go on to stress the importance of including the value of mangrove goods and services that market mechanisms usually ignored. Most importantly, many of these goods and services provided by complex ecosystems in developing countries play a major subsistence role in local economies.

Another complicating factor in the economic valuation and regulation of complex environmental and natural resources, such as mangrove ecosystems, in developing countries is the land tenure and property right structure of such resources. The Yucatán's mangrove wetlands, like mangrove ecosystems worldwide, tend to be open access, common property resources. As such, they do not lend themselves to straight-forward traditional regulatory, management, and market-based analysis (Clark 1996).

Researchers believe that the benefits of fishery support, erosion and flood prevention, and recreational value of mangrove wetlands may outweigh the benefits from any other use for these areas (Hamilton, Dixon, and Owen Miller 1989). Fishery and marine products, both within the mangroves and nearby waters, are valuable. The importance of mangroves as supportive of fisheries and as per se fish habitats is becoming well established in some regions of the world, including Mexico and the Caribbean (Yáñez-Arancibia and Day 1988). However, questions still remain as to how to determine the economic value of mangrove wetlands.

The complexity of mangrove resources and the absence of well-defined and readily available markets for mangrove resource benefits necessitate the use of nonmarket valuation methods for approximating the value of mangrove wetlands. Even assuming that market mechanisms could be used to measure some of the consumptive uses of mangrove resources, substantial benefits that flow outside of markets to resources beneficiaries from mangrove ecosystems would fail to be captured at all by markets and market prices. Therefore, some form of nonmarket economic valuation is required to help make consistent choices between mangrove wetland conservation, preservation, and development decisions (Barbier 1994).

TOTAL ECONOMIC VALUE

The total economic value of a natural resource may be described as the sum of the resource's use and nonuse values. Use values (e.g., mining, recreation) are associated with in situ use of a resource. Nonuse values (e.g., existence value, bequest value) are independent of in situ resource use (Freeman 1993a).

Mangrove wetlands provide individuals and groups with a range of services that include: (1) extractive benefits of natural resources such as fishing and hunting, (2) indirect benefits like fishery support, and (3) non-extractive benefits such as birdwatching, hiking, and tourism. While market-based uses lend themselves to traditional economic analysis (including the problems of accounting for externalities), nonmarket use and nonuse values of mangrove ecosystems requires specialized economic valuation methods. The accurate valuation of environmental and natural resources depends on adequately accounting for all the sources of social benefits of and flowing from the resources.

Use Value

In general, use values are defined as the values of goods and services that directly enter an economy. That does not mean that the use values associated with a resource must necessarily be market uses. It does mean, however, that some in situ activity takes place that benefits individuals. Examples of some natural resource use values include: camping, hunting, mining of resources, fishing, farming, as well as things such as breathing clean air. While some of these activities may have markets, others do not. Use values identify the benefits from environmental goods and services associated with actual physical proximity of the resource.

Nonuse Values

John Krutilla (1967) in *Conservation Reconsidered* helped to create a taxonomy for addressing those values associated with environmental and natural resources other than what have been called use values. Krutilla pointed out the different types of value that environmental and natural resources might have for people independent of actual use. Some of these values include the value of knowing the resource simply exists (existence value), the value that some people attribute to some potential use of the resource (option value), and the value that some people have knowing that future generations of individuals will have the resource (bequest value). Following Krutilla, resource economists further refined and defined these types of values, in general, calling them nonuse values.

Notably, the United States federal judiciary recognizes the importance of including nonuse values, calling them passive use values, in the valuation of natural resource damage. In *Ohio v. U.S. Department of the Interior* (880 F.2d 432 (D.C. Cir. 1989)), the

court allowed the use of nonmarket economic valuation methods for determining the size of the damage award. As the court pointed out: “From the bald eagle to the blue whale and snail darter, natural resources have values that are not fully captured by the market system” (462-63). Since then, nonmarket valuation methods have been used to help determine the awards associated with nonuse value damages in a variety of environmental incidents and injuries to ecosystems (e.g., Exxon Valdez oil spill (Carson et al. 1992); DDT and PCB contamination (Carson et al. 1994); and fungicide spill in Little Salmon River, Idaho (Loomis and Anderson 1992)).

Typically, nonuse values are those socioeconomic values not derived from either direct or indirect uses of natural resources. Indirect use values associated with a wetlands might include such processes as groundwater recharge, nutrient retention, flood control, and fishery support. Nonuse wetland values might include existence value, cultural uniqueness, and bequest value. Building upon this, the nonuse value of natural resources can be defined as the difference between a resource’s economic value and the resource’s present use value. Therefore, the universe of values derived from natural resources may be divided into two classes, use values and nonuse values.

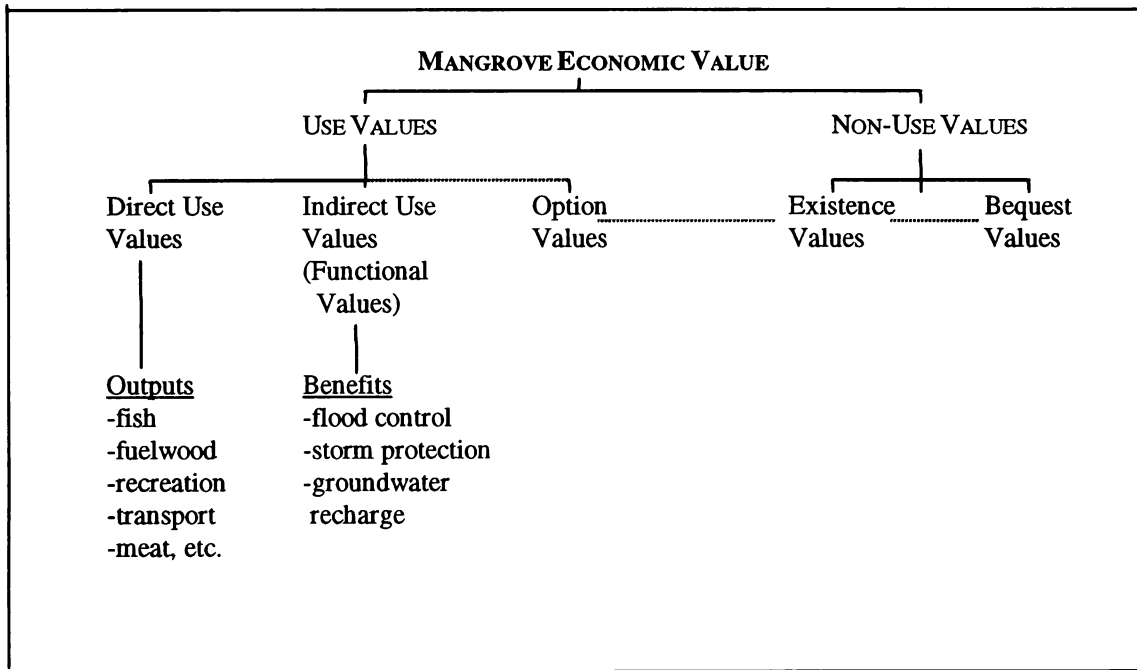
Mangrove Total Value

For the purposes of this dissertation, the total economic value of a mangrove resource may be considered to be the sum of the mangrove wetland’s use and nonuse values. Use values (e.g., fishing, recreation) are associated with on site resource goods and services and nonuse values (e.g., existence value, bequest value) are independent of on-site resource goods and services.

Barbier (1994) develops a general framework of cost-benefit analysis as a methodological approach to assessing tropical wetland values. After establishing a tropical wetland total economic value schema, illustrated in Figure 3, Barbier goes on to discuss the use of a production function approach to valuing some nonmarketed wetland benefits. Following Barbier (1994), the total economic value of mangrove wetlands is composed of the use values (such as fishing, recreation, ecological functions, and perhaps, option values) and nonuse values (such as existence, bequest, and perhaps, option values). Barbier focuses on using a production function valuation method to determine the value of the indirect use values of tropical wetlands. However, as Figure 3 illustrates the contingent valuation method is widely recognized as the only method capable of helping to determine nonuse as well as total economic values for mangrove wetlands.

NONMARKET VALUATION

As previously discussed, market price valuation methods theoretically and practically are unable to determine nonuse values and total values of complex ecological resources. Development, resource management, and damage assessment decisions that fail to account for nonuse value necessarily undervalue the affected environmental and natural resource. Traditionally, benefit-cost analyses have been used to determine the viability and acceptability of proposed projects and policy changes. Failure to include or accurately measure all benefits that individuals (and societies) derive from environmental amenities and natural resources systematically underestimates their value and promotes their loss and destruction.



Source: Adapted from Barbier (1994)

Figure 3. Mangrove Total Economic Value

ACTUAL AND CONTINGENT VALUATION

The methods employed by economists to reveal the economic value of environmental goods and services in general can be grouped into two categories based upon the data the methods use—see Table 1. One category of methods derives economic values for nonmarket resources based on the actual (past) market behavior of individuals. The other category of methods derives economic values based on the present (contingent) behavior of individuals as manifest through their selection among alternatives or contingencies (Kaplowitz and Hoehn 1997). The objectives driving the economic valuation study and the availability of data help determine the most appropriate methodology for the economic valuation of environmental and natural resources.

Economists and others use nonmarket valuation techniques to incorporate environmental and natural resources' economic values into planning and decision making.

Nonmarket valuation methods can help reveal economic values by either observing individuals' behavior or by directly questioning them. Hedonic methods derive economic values for environmental and natural resources by discerning price differentials associated with environmental goods (bads) in well functioning markets. Travel cost and contingent market methods use direct questioning techniques (surveys) to collect information that reveals how much individuals pay or would be willing to pay for an environmental good or service.

Comparison of Actual and Contingent Methods

Actual market behavior based valuation methods use data from already completed activities. These activities include market purchases and recreation choices. A limitation with these approaches is that people's past activities do not necessarily indicate or predict present and/or future values of environmental and natural resource changes. In fact, it is safe to say that individuals' actual behavior regarding environmental and natural resource will change, for all sorts of reasons, in the future. The simple reality that environmental and natural resources are scarce may result in behavior and resource values very different in the future than those "revealed" by current or past practices. For example, a historically little-used park or resource site may become much more desirable, prized, and used as alternative resource sites are lost.

Actual market behavior valuation methods rely to a great extent on econometric models of how people's behavior vis-à-vis environmental and natural resources "reveal" their valuation of such resources. These models are specified by researchers and based on theoretical assumptions and limited information. That is, economists decide on: (1) what

data to use, (2) how to specify and design economic valuation models, (3) how to analyze the data, and (4) how to interpret the results so as to reach their conclusions. When using actual market behavior methods, actual resource beneficiaries are far removed (both temporally and spatially) from the process of “valuing” the proposed environmental change.

Contingent market valuation methods focus on respondents’ present valuation of a proposed change in some specified level of environmental and natural resource quality and quantity. After informing respondents of various aspects and elements of the present situation and the proposed change(s), contingent valuation instruments ask respondents to select their preferred alternative. That is, individuals are given an array of information and asked to use that information in conjunction with their beliefs, understanding, priorities, and preferences to select the alternative that they most prefer. In this way, CV respondents decide themselves what is important and reveal their economic values for proposed changes in the level of environmental and natural resource benefits.

Therefore, decision makers, when relying on actual market-behavior-based valuation methods, place substantial reliance upon analysts’ assumptions, techniques, and interpretation of the relationships between actual past behavior, individual’s valuation of environmental and natural resources, and the proposed policy. In contrast, contingent behavior methods allow resource beneficiaries themselves to determine what factors are important to themselves when making the trade-offs between different levels of environmental amenities and economic costs. While researchers and “experts” provide information to CV respondents on the environmental and natural resources and the impacts of proposed policies, the respondents themselves decide how to weigh this and

other information when they make their choices. As a result, decision makers relying on contingent market methods must be careful that the instruments and methods used are unbiased and accurate.

Explicit and Implicit Values

As Table 1 illustrates, methods for measuring the value of environmental assets can also be categorized based on the type of value estimates generated. Explicit valuation measures are derived from preferences for goods and services that are revealed directly through observing market prices paid or through willingness to pay questions that directly ask respondents to assign a monetary measure to the benefit/service in question.

Alternatively, implicit valuation measures are derived from observations of what people do. Individuals' behavior is used to draw some inferences about or "reveal" their economic valuation of a particular environmental service/benefit. Underlying both explicit and implicit valuation methods are the same behavioral assumptions (optimizing behavior) that enable economists to compute measures of the economic value. That is, economics assumes that individuals know what makes them "better-off" and that they make choices that in some way they believe are beneficial.

While use of actual market behavior valuation methods can produce reliable and valid data on changes in environmental and natural resource values, they are limited, theoretically and methodologically, to measuring certain use values of resources. Since nonuse values are independent of resource use, valuation methods that rely upon resource use or individuals' actual market behavior necessarily fail to capture nonuse values.

CONTINGENT VALUATION METHODS

The contingent valuation method [CV or CVM] elicits economic values, estimates of willingness-to-pay [WTP] or willingness-to-accept compensation [WTA], for environmental amenities and natural resources using carefully designed and administered surveys (See Mitchell and Carson 1989). Respondents do not have to conceptualize value in terms of money for CV to generate reliable economic estimates of value. CV works by asking individuals to explicitly or implicitly place values on environmental and natural resources.

Contingent market behavior methods directly include the resource beneficiaries themselves in the valuation process. Unlike the actual market behavior methods, the contingent behavior method specifies the quality and quantity of environmental goods and services to be valued but makes no a priori decisions on how individuals actually value goods and services. The contingent behavior methods lets the affected individuals weigh and value the given alternatives. This contrasts with actual market behavior methods where researchers decide what data and what decision-making model to use in estimating the value of a resource change.

CV presently is the only valuation method capable of shedding light on potentially important nonuse values and as a result, the only method able to reveal total economic values. An additional strength of contingent valuation is the method's ability to accommodate a range of policy impacts, address nonuse values, and generate results comparable to other techniques. Its use of specially designed surveys enables researchers to examine components, separately or in aggregate, of proposed policies and natural

resources. Furthermore, CV does not require direct linkages to be made with market transactions. However, CV's theoretical foundation is the same foundation underlying all economic valuation methods—the analysis of individuals' choices in light of knowledge and information about such choices.

CV STUDY DESIGN

Research has shown that CV study design is critical for generating reliable and valid economic estimates of value (NOAA 1993). However, “there is no standard approach to the design of a contingent valuation survey” (Portney 1994). Like other types of survey research, CV studies must adhere to generally accepted survey research methodology and procedures. Additionally, CV studies need to meet the requirements necessary to generate useful economic data. Mitchell and Carson, in their classic *Using Surveys to Value Public Goods*, caution that:

[T]he [CV] survey must simultaneously meet the methodological imperatives of survey research and the requirements of economic theory. To meet the methodological imperatives requires that the scenario be understandable and meaningful to respondents and free of incentives which might bias the results. To meet the requirements of economic theory a survey must obtain the correct benefit measures for the good in the context of an appropriate hypothetical market setting. (1989, 17)

CV studies share several well-defined common elements. All CV questionnaires contain: (1) a scenario or description of the (hypothetical or real) policy or program; (2) a mechanism for eliciting value or choice from the respondent; and (3) questions that elicit information on the socioeconomic characteristics of the respondents. The socioeconomic data obtained during the CV interview process coupled with econometric analysis helps

researchers understand, evaluate, and validate the survey results (Portney 1994; Mitchell and Carson 1989).

Many researchers have focused on different components of CV methodology to assess the theoretical and practical strengths and weakness of the technique. However, the efforts of the recent NOAA panel of Noble laureate economists represent a profound and thorough analysis of the efficacy of CV. The panel's recognition of CV's ability to generated useful and reliable data was based, in part, on a synthesis of the most current thinking and research on CV (NOAA 1993). The NOAA panel reached the conclusion that CV can generate reliable and valid economic estimates. Because of some its reservations about CV, the panel suggested some guidelines for using CV for natural resource damage assessment in the United States. Paul Portney (1994), a member of the NOAA panel, summarizes some of the panel more important guidelines:

- (1) CV should rely on **personal interviews** not telephone or mail surveys;
- (2) CV should **elicit WTP** to prevent harm when there has been no harm yet;
- (3) CV should use the **referendum format (dichotomous choice)**. That is, ask respondents how would they vote, yes or no, for a proposed program if it would raise their taxes a specified amount. The panel believed that "yes and no" choices are more realistic than open-ended maximum valuation questions;
- (4) CV must use an accurate and understandable scenario that describes the expected effects of the proposed program;
- (5) CV studies must remind respondents of budget constraints, that their WTP for the program would reduce the amount that respondents would have for other things;
- (6) CV studies must remind respondents of substitutes available for the good or service in question; and
- (7) Applications of CV should include follow-up questions to ensure that respondents understood what they were asked and to learn the reasons for their answers.

The foregoing theories, concepts, and guidelines provide a general framework for undertaking good CV studies. However, by necessity, no two CV studies can be the same. A great deal of preparation, planning, fieldwork, and development effort is needed to construct a CV instrument and implementation plan that meets CV's dual methodological requirements. There is no generally accepted method for developing a CV instrument and study that necessarily meets these dual methodological requirements. Therefore, this dissertation focuses on evaluating whether the use of qualitative research methods can be helpful in the design of CV studies in developing countries that, among other things, use accurate and understandable scenarios and describe believable effects of the proposed programs.

CV IN DEVELOPING COUNTRIES

The ability of CV to estimate economic value of natural resources has resulted in its use worldwide in policy analysis and policy formation (Munasinghe 1994; Kopp 1993). Carson et al. (*Bibliography*, 1994) reference more than 2000 CV papers and studies from more than 40 countries. CV studies have been used to address a broad range of topics--from the Exxon Valdez oil spill damage (Carson et al. 1992) to water and sewer service projects in developing countries (Hoehn and Krieger 1994; Whittington et al. 1992). It does seem true that the use of contingent valuation often proves more intractable to use in developing countries. However, the application of this technique in developing countries is increasing (Aylward and Barbier 1992).

In the developing world, water and sewer service has received a good deal of attention by domestic and international governments and donor agencies. Because of the

absence of well-functioning water and waste treatment markets in developing countries, CV have been used to assess the value and merits of alternative schemes for delivery of these goods and services. Such studies have to some degree enabled decision makers to evaluate the relative merits of a range of proposed projects and pricing mechanisms. an examination of CV studies of water and sewer services in developing countries demonstrates the flexible and changing nature of the method. These cases and others (e.g., Seijo et al. 1995) highlight the need for culturally sensitivity and improved CV design methods for use in developing countries.

The importance of respondents' understanding and scenario acceptance in CV is undisputed (e.g., Mitchell and Carson 1989; NOAA 1993). However, examples of CV questionnaire preparation, drafting, testing, and implementations in developing countries demonstrate the need for improvement. Under-substantiated, self-serving claims too often have been relied upon by practitioners' to "validate" CV results and "demonstrate" that CV respondents' understood and accepted proffered CV scenarios. The absence of "objective" data to validate CV design and results in developing countries is particularly troubling in light of the difficulties recognized of respondents' understanding and acceptance of CV scenarios. Researchers in Mexico report anecdotal evidence of high levels of mistrust, inability to comprehend questions, and failure to apprehend CV scenarios in developing countries (Miguel Angel Cabrera, personal conversations, Mérida, Mex., Nov. 1995).

Water and sewer CV studies in the developing world help to further illustrate the problem. Briscoe et al. (1990) look at how family characteristics affect demand for water service and willingness to pay for such service in Brazil. Briscoe et al. specifically point

Out the problem that individuals may not understand or correctly perceive the characteristics of the good or service described by the interviewer. Yet, Briscoe et al. rely on vague "reports" by their interviewers that respondents "appeared to give serious and thoughtful answers" as sufficient evidence that respondents understood and accepted the CV scenario and payment vehicle.

Dale Whittington and his colleagues have conducted a number of water and sewer CV studies for the World Bank and others over the years. Their work has taken place in Haiti, Ghana, Nigeria, and elsewhere in the developing world (e.g., Whittington et al. 1990, 1992, 1993). Whittington et al. (1992) evaluates rural households' willingness to pay for public taps and private connections to improved drinking water systems in Nigeria. Whittington et al. (1992) cite "indirect evidence" of interviews and follow-up questions as demonstrative of the absence of strategic bias and of the validity of their WTP estimates. However, Whittington et al. (1992) do not report, systematically describe, or analyze the nature, character, or quality of the "indirect evidence."

Whittington et al. (1993) use CV to estimate household demand for improved sanitation in a Kumasi, Ghana. Although mentioning the use of different tests of the reliability and validity of their study and the WTP bids, Whittington et al. (1993) seem to rely solely on an examination of valuation data from the completed CV instrument. By identifying no obvious outliers (estimates of value far outside the predominate range of the majority of bids) outliers, Whittington et al. (1993) posit that "respondents gave implausible or hypothetical answers, or that they acted strategically" (1544).

However, the mere absence of wide variance in respondents' bids (i.e., absence of outliers) does not necessarily indicate that respondents understood and accepted as

plausible the valuation scenario or the proposed policy. It simple means that respondents gave similar answers. Perhaps, cultural norms or values, not entirely economically relevant forces, are responsible for the range of bids. It is equally possible that strategic responses and unrealistic bids can result in apparently uniform bids. Conversely, the presence of a wide range of bids, without further examination and explanation, does not necessarily indicate unreasonable or unrealistic estimates of value. Whittington et al. (1993) include an appendix with examples from their CV instruments' opening statements and WTP questions. Such information as well as the reproduction of the CV instrument and scenarios allows critical readers to apprehend some of the strengths and weaknesses in particular studies (NOAA 1993). However, without some understanding of the cultural differences and perceptions, an examination of the instrument remains superficial.

As CV methodology has evolved in developed countries, so too has its applications in developing countries. This is readily apparent in Hoehn and Krieger (1995) study of the value of municipal water and sewer service delivery in Cairo, Egypt. Incorporating the recommendations of the NOAA panel and building on the work of Carson et al. (DDT, 1994), Hoehn and Krieger make extensive use of focus groups, one-on-one pretests, and pilot studies with debriefing questions to design CV instrument(s). The result appears to be a CV instrument that seems to promote and verify respondents' understanding, acceptance, and economic consideration of the proffered scenarios. Additionally, Hoehn and Krieger include open-ended debriefing questions to test respondents understanding in the final CV survey instruments. Reporting much of the substance of their pretests, Hoehn and Krieger demonstrate an iterative approach to CV questionnaire design in a developing country. It should be noted that Hoehn and Krieger

(1995) had an unusually large budget in order to conduct their sophisticated study. Not only were they able to conduct a CV study, but they also were able to conduct other economic valuation studies to provide an economic floor and ceiling to verify the reasonableness of WTP estimates of value. However, most valuation studies in developing countries will have neither the time nor the resources available for a study on par with Hoehn and Krieger (1995). Yet, the use of an iterative design process, qualitative research methods, and the incorporation of checks of respondents' understanding and acceptance appear to be promising and perhaps necessary components for future CV studies in developing countries.

CV IN YUCATÁN

Mexican researchers have begun to incorporate nonmarket valuation methods in their studies of Yucatecan coastal resources. Because of the absence of well-functioning markets for coastal resources, Mexican researchers have started to focus on using CV. Researchers at CINVESTAV, the research institute and graduate school of México's Instituto Politécnico Nacional's [IPN], recently conducted a pilot project examining the economic value of Campeche's coastal mangrove wetlands (Seijo et al. 1995).

To see if they might help capture some of the nonuse value of the mangrove wetlands, Seijo et al. administer a questionnaire including a WTP question to inhabitants of the Isla del Carmen. This preliminary work of Seijo et al. supports the idea that CV survey can be successfully undertaken in a developing country. However, Seijo et al. report many difficulties, including problems associated with asking poor people about monetary values, a general distrust of governmental programs, and designing effective

Instruments (Juan Carlos Seijo, Jorge Eúan, Miguel Cabrera, and Eduardo Perez, personal conversations, Nov. 1995 and Jan. 1996). The challenge remains to incorporate and **validate** the methodological advances typified by NOAA (1993), Hoehn and Krieger (1995), and Carson et al. (1994) in CV studies in developing countries.

As mentioned, Seijo et al. (1995) tries to incorporate a CV study questionnaire on **the economic** value of ecological services into their study of Campeche's mangrove **ecosystem** for PEMEX (Mexico's petroleum industry) and EPOMEX (Gulf of Mexico **Ecology**, Fisheries, and Oceanographic Program). Unfortunately, the results of this study **are unavailable** for dissemination. However, this attempt by Mexican researchers to **include** some measure of mangrove ecosystem's nonmarket economic value highlights the **recognition** that such values are important and need to be accounted for. The authors do **acknowledge** the difficulty of designing and implementing CV studies in a developing **country**. Although positive economic values were generated for some of the enumerated **ecological** functions of Campeche's mangrove ecosystems, a review of the CV instrument, **methods**, and procedures used by Seijo et al. reveal the nascent state of the art of CV **research** in the Yucatán (e.g., Miguel Angel Cabrera, personal conversations, Mérida, **Mex.**, Jan. 1996).

Hernandez-Flores (1995), in establishing the framework for his study of the **socioeconomics** of Yucatecan coastal communities, specifically recognizes the importance of **determining** the "total economic value of resources associated to [*sic*] the communities" (5). Hernandez-Flores calls for the use of CV to help determine the existence and **ecological** service (i.e., nonuse) values of lagoon and coastal resources. However, **Hernandez-Flores** also points out that the use of CV in Mexico is new. He believes that

Much work still remains in developing methods for designing and implementing CV studies that can produce reliable and valid economic estimates of environmental values in Mexico (Alvaro Hernandez-Flores, personal conversation, Mérida, Mex., Jan. 1996).

CV DESIGN METHODS

Some CV literature addresses questions pertaining to the efficacy of CV survey design. Most of their studies examine whether a particular format or design change produces estimates that conform with economic theory. Studies have examined the use of different value elicitation formats (e.g., open, dichotomous), the problem of embedding effects, and questions of scope (e.g., Brown et al. 1996; Carson and Mitchell 1993). Curiously, while almost all economists depend upon data originally collected using survey questionnaires, only a handful of economists have actually focused any attention on survey design and implementation issues. That is, economists generally rely upon sociologists, cognitive psychologists, and other social scientists to advance the generally accepted state-of-the-art of survey research (e.g., Hutchinson, Chilton, and Davis 1995; Schkade and Payne 1994; Schwarz 1997).

V. Kerry Smith (1993) points out that the current stage in CV research needs to integrate the psychological and economic dimensions of framing CVM questions with conventional practices in survey design, implementation, and analysis. As Smith puts it:

[S]tudies highlight how little we know about measuring the amounts of environmental amenities (or services), and therefore how important qualitative analysis of people's perceptions of the problem can be to the framing of the commodity in a CVM study....[R]egardless of the underlying model of CVM responses, understanding how people perceive environmental commodities is essential for obtaining plausible responses to any questions asked of them. (Smith 1993, 16-18)

Determining the necessary and sufficient elements of reliable and valid CV studies **remains** a challenge. Implementation methods range from visiting research sites with **instruments** that have been constructed elsewhere to intensive (and expensive) iterative **use** of on-site visits, key-person interviews, focus groups, debriefing questions, pretests, **and** instrument rewrites and retests (e.g., Carson et al., *DDT* 1994; Hoehn and Krieger 1995). To some extent, the process of CV problem conceptualization, questionnaire **design**, pretesting, and implementation is subject to the “artistry” (and expertise) of **practitioners** (Richard Carson, personal conversation, 1995; Alan Randall, personal **conversation**, 1995; John Hoehn, personal conversation, 1995).

The CV literature refers, with varying degrees of enthusiasm, to focus group **interviews** and pretests as methods sometimes used to help frame resource issues, define **terms**, and draft CV questionnaires (e.g., Boyle et al. 1994; Carson et al., *DDT*, 1994; **NOAA** 1993). Focus groups are a qualitative research method that allows researchers to **learn** about issues, concerns, and perceptions from a group discussion lead by a moderator (**Morgan** 1997; Krueger 1994). Pretesting, until recently, has been associated primarily **with** statistical analysis of pilot study data. That is, CV design testing most often has **involved** not more than a field-test of the final draft CV questionnaire and an examination **of the** frequency and distribution of responses for obvious signs of difficulties (Carson et al., *DDT*, 1994).

However, “pretesting” in its broader (and perhaps more useful) connotation can **and** does refer to a wide range of research activities that can be conducted to test and **improve** the research design and the development of CV survey instruments. As Mitchell **and** Carson (1989) specifically point out, some of the activities that should be considered

for inclusion in CV pretesting include: focus group interviews, tape-recorded individual interviews, systematic debriefing of respondents, and minisurveys (Mitchell and Carson 1989). In their contribution to the debate on evidence of embedding effects in some CV studies, Loomis, Lockwood, and DeLacy (1993) use two focus groups “to test comprehension of terms” before they use “formal pretests” to evaluate the survey instruments.

Some CV practitioners increasingly call for the use of focus groups. Bennett and Carter believe that:

in designing further CVM questionnaires, it is of paramount importance that the communication aspects of the exercise are fully assessed. The most important vehicle for this is the focus group. The complexity of the communication aspects of a CVM questionnaire requires the in-depth analysis afforded by focus groups. The alternative, simple pretesting of a questionnaire, does not give the respondent the opportunity to discuss reactions with other respondents. (1993, 91)

Bennett and Carter go on to point out that focus groups can help achieve much more than just fine tuning of the wording of the questionnaire. They assert that focus groups can be used to assess the ‘commodity range’ of the good or service so that an appropriate framing strategy can be developed. That is, researchers can learn from focus groups how best to describe, explain, and understand the impact that the questionnaire has on the saliency of the subject matter (Bennett, J. M., and M. Carter. 1993).

There has also been an increase in the use of one-on-one interviews to pretest draft survey questionnaires. These one-on-one interviews center on learning from respondents about their answers to draft CV instruments. Debriefing questions, answers to open-ended questions and sometimes, some form of content analysis, has been used in attempts

to facilitate a systematic examination of various aspects of the efficacy of CV questions and study designs .(e.g., Carson et al., *DDT*, 1994; Hoehn and Krieger 1995). However, neither the use of focus groups nor one-on-one pretests have been universally accepted or applied by CV practitioners. Few CV studies provide a uniform or objective basis for peer review of CV study design or respondent understanding and acceptance.

The importance of systematic and adequate CV design, testing, and verification has been long recognized (Mitchell and Carson 1989). Yet, generally accepted and externally verifiable pretesting procedures remain to be agreed upon. Boyle et al. (1994) examine whether the size of the environmental good being valued biases respondents' valuation estimates. Boyle et al. conclude that CV survey design needs "formal investigation and should not be relegated to subjective pretesting decisions for each new application" (Boyle 1994, 81).

Interestingly, Schkade and Payne (1994), following-up on the migratory waterfowl CV experiment of Desvousges et al. (1992), introduce the use of a verbal protocol procedure of "thinkalouds" to examine what respondents think about when formulating CV responses. Schkade and Payne reveal that CV respondents, when forced to pay attention to the questions, reflect on economically relevant trade-offs and consider the size of the environmental change (See also Carson and Mitchell 1993). Schkade and Payne (1994) suggest that verbal protocol procedures and other qualitative methods (including content analysis) may play an important role in CV questionnaire design and evaluation.

Hutchinson, Chilton, and Davis (1995) believe that the adoption of focus groups and verbal reports by CV practitioners should increase the reliability and widen the scope of CV applications. They believe that the use of these research techniques "should result

in a more informed survey instrument which places respondents in a much stronger position to construct meaningful values” (108).

Anthropologist James Spradley (1979) was able to take the intuitive process of ethnographic research and create/describe a systematic process for capturing, analyzing, presenting, and replicating meaningful qualitative data. Spradley crafted a sequence of procedures and question types (e.g., "grand tour" and "mini-tour" questions) into a specified research sequence called the ethnographic interview. Since his work, the ethnographic interview has facilitated the systematic collection, recordation, and use of important qualitative data. Spradley (1979) advanced anthropology by introducing his systematic ethnographic research process. Perhaps the systematic application of qualitative research methods can advance the efficacy of economic valuation methods of environmental and natural resources in developing countries.

QUALITATIVE RESEARCH AND SURVEY DESIGN

Qualitative research methods collect data other than numbers and stress the importance of context, setting, and frames of reference (Marshall and Rossman 1989). Qualitative research's multiple techniques include: direct observation, semi-structured interviews of key informants, group meetings, and diagramming. Such techniques enable researchers to identify key socioeconomic sectors, concerns, and other useful data. Stewart and Shamdasani (1990) point out that qualitative research methods provide data that arise in a natural or indigenous form because they allow respondents to use their own words, categorizations, and perceived associations.

Fowler (1995) explains that in recent years there has been increased attention given to the evaluation of survey questions from the cognitive and interactional perspectives. It seems that,

The basic idea is that before a question is asked in a full-scale survey, testing should be done to find out if people can understand the questions, if they can perform the tasks the questions require, and if interviewers can and will read questions as worded. (Fowler 1995, 104)

One of the obstacles to the use of qualitative methods are researchers' misconception or misapprehension about qualitative research.

[O]n the one hand, focus groups seem so simple as an idea, it is hard to take them seriously. On the other hand, it is unusual for a researcher, no matter how seasoned in a particular area, to say that at least a few focus group discussions at the beginning of a study were not valuable....Listening to what people have to say invariably broadens a researcher's perspective about the realities to be studied or how people think about them. (Fowler 1995, 105)

There are many ways qualitative research may be used to help design better survey instruments. Qualitative research can, among other things, help (1) examine the assumptions about the reality about which people will be asked, and (2) evaluate assumptions about vocabulary, the way people understand terms or concepts that will be used in the survey instruments. Researchers point out that focus groups are an extraordinarily efficient way to obtain a great deal of information relevant to the design of survey questions. They note how people with no previous experience with focus groups are routinely amazed at how much they can learn about the subject they are studying and how to ask questions (Morgan 1997, Fowler 1994). Fowler (1994) asserts that,

The level of investment is so small, compared to the effort involved in most surveys, and the payoff so big, it is hard to explain why every survey does not begin with some focus group discussions. (110)

Converse and Presser (1986) believe that the crafting of a questionnaire involves intellectual preparation of all sorts. They recommend an exploratory inquiry that involves can involve 'in-depth' interviews with members of the target population in addition to a 'focused discussion group.' Converse and Presser think that such exploratory inquiries can be especially of value "when a target population is likely to have special perceptions, problems, and idioms that may be relatively foreign to the investigator" (1986, 50). They go on to note that, "Unfortunately, most of us are too likely to neglect this preliminary phase of exploration."

According to Rea and Parker (1992), prior to developing a survey questionnaire, it is necessary to gather information about the subject matter under investigation from interested parties and key individuals. Because social science research spans so many disciplines, Rea and Parker believe that with or without a research team of experts, the investigators must gather preliminary information about the issues of importance from interested parties and key individuals as a prelude to the development of survey questions. Rea and Parker go on to state that, "Foremost among these preliminary information-gathering techniques is the focus group" (1992, 34).

Sudman, Bradburn, and Schwarz (1996) point out the necessity for researchers to appreciate respondents' cognitive process and way of understanding questions. Qualitative methods can assist in the process. They believe that focus group interviews are "an efficient first step in determining how some of the key concepts being studied are understood and retrieved by potential respondents" (Sudman, Bradburn, and Schwarz 1996, 259). They point out how researchers listening to focus groups are often alerted to issues that they might otherwise have missed or ignored.

QUALITATIVE METHODS

Qualitative research means different things to different people. For some researchers, the distinction between quantitative and qualitative research is a function of the methods used for data collection (e.g., in-depth interviews, focus groups, and participant observation). For others, qualitative research does not depend on data collection methods. Rather, qualitative research is any research that produces findings not arrived at by means of statistical procedures or other means of quantification (Strauss and Corbin 1990).

For the purpose of this dissertation, the definition of qualitative research relies on both the manner in which information is acquired and the nature of the information so acquired. There are numerous names used for the variety of qualitative research methods. However, Bryman points out that qualitative research methods:

all fundamentally refer to the same thing: an approach to the study of the social world which seeks to describe and analyze the culture and behavior of humans and their groups from the point of those being studied. (1988, 46)

Strauss and Corbin emphasize the strengths of qualitative research to uncover and understand what lies behind a phenomenon, to gain novel and fresh slants on things, and to give intricate details of phenomena that are difficult to convey with quantitative methods (1990, 19). That is, qualitative studies are especially suited to “identifying *unanticipated* phenomena and influences” (Maxwell 1996, 19).

Qualitative research and methods differ from quantitative approaches because of their fundamentally different foci and objectives. Unlike quantitative research’s concern with numbers, precision, and generalizability, qualitative research attempts to develop an understanding of why people act or feel the ways they do.

Qualitative and quantitative methods are not simply different ways of doing the same thing. Instead, they have different strengths and logics and are often best used to address different questions and purposes. The strengths of qualitative research derive primarily from its inductive approach, its focus on specific situations or people, and its emphasis on words rather than numbers. (Maxwell 1996, 17)

Qualitative research focuses on learning the deeper reasons behind situations, how people feel, and why they act or fail to act. Outsiders through the use of qualitative methods can develop an understanding of how people perceive and understand the world around them. Bryman reminds us that:

The most fundamental characteristic of qualitative research is its express commitment to viewing events, action, norms, values, etc. from the perspective of the people who are being studied....The strategy of taking the subject's perspective is often expressed in terms of seeing through the eyes of the people you are studying. (1988, 61)

As a result of qualitative research methods' strength in acquiring knowledge, vocabulary, and insights from the perspective of their subjects, it has increasingly been used for survey research design. Qualitative studies are especially well-suited for survey questionnaire design. The use of exploratory qualitative studies by survey and experimental researchers has been extremely helpful in the design of their questionnaires and the identification of variables for experimental investigation (Maxwell 1996).

Qualitative research has been used for years by social scientists in developing countries. Perhaps the best known examples of the use of qualitative research in developing countries are the myriad instances of anthropological studies. Ethnographic interviews as well as participant observation are a mainstay of cross-cultural investigation (Spradley 1979). Qualitative research methods have also been used in developing countries to design survey questionnaires.

In their study of Rwandan farmer's adoption of conservation practices, Ndiaye and Sofranko (1994) use informal group discussions (sondeos) and a subsequent formal survey to collect their information. Ndiaye and Sofranko are able "to gain insight into farmers' problems, perceptions, and strategies through informal discussions in small group sessions" (1994, 39). Ndiaye and Sofranko believe that what qualitative research may lack in terms of specificity and quantitative detail, is compensated for, by its provision of insight into how local beneficiaries view the problems and potential solutions. They also underscore the importance of qualitative research methods to served as a priori tests of questions to be included in the survey instrument.

FOCUS GROUPS

Focus group interviews are "among the most widely used research tools in the social sciences" (Stewart and Shamdasani 1990, 9). While the subject matter of focus groups widely varies, focus groups share certain characteristics. Krueger asserts that focus groups have six characteristics or features that relate to the ingredients of a focus group: "(1) people, (2) assembled in a series of groups, (3) possess certain characteristics, and (4) provide data (5) of a qualitative nature (6) in a focused discussion" (1994, 16). Although focus group research can produce quantitative data, focus groups almost always are conducted in order to collect primarily qualitative data. Stewart and Shamdasani see this as a distinct advantage because "focus groups produce a very rich body of data expressed in the respondents' own words and context" (1990, 12).

A focus group is a carefully planned discussion that is designed to obtain the participants' perceptions on a defined area of interest in a permissive, nonthreatening

environment (Krueger 1994). Focus groups are informal discussion sessions in which a skilled moderator leads a group of individuals in an in-depth discussion to discover their attitudes, opinions and knowledge of particular issues (Hutchinson, Chilton, and Davis 1995). As Morgan puts it, “The hallmark of focus groups is their explicit use of group interaction to produce data and insights that would be less accessible without the interaction found in a group” (1997, 2). While there are researchers who choose to differentiate between different types of groups, group interviews, and focus groups, this dissertation follows Morgan’s (1996, 1997) preference for an inclusive approach. Focus groups are:

a research technique that collects data through group interaction on a topic determined by the researcher. In essence, it is the researcher’s interest that provides the *focus*, while the data themselves come from the *group* interaction. (Morgan 1997, 6)

The size, structure, and conduct of focus groups have been discussed and examined by many researchers and scholars (e.g., Morgan 1997, Krueger 1994, Stewart and Shamdasani 1990). They typically are conducted with approximately 7 to 10 people and led by a skilled interviewer. The participants discuss a particular topic under the direction of a moderator who promotes interaction and assures that the discussion remains on the topic of interest. The discussion is comfortable and often enjoyable for participants as they share their ideas and perceptions. Group members influence each other by responding to ideas and comments in the discussion.

Focus group “size can range from as few as 4 to as many as 12. The size is conditioned by two factors: It must be small enough for everyone to have opportunity to share insights and yet large enough to provide diversity of perceptions” (Krueger 1994,

17). Small focus groups of 4 or 5 participants may afford more opportunity to share ideas, but the limited size also restricts the total number of ideas generated. The smaller focus groups—sometimes called *mini-focus groups*—have a distinct advantage in their logistics. Small groups can be easily accommodated in restaurants, private homes, and other environments where space is at a premium (Krueger 1994, 17).

Researchers point to having a good moderator as a the key to assuring that a group discussion goes smoothly. The focus group moderator generally is well trained in group dynamics and interview skills” (Stewart and Shamdasani 1990, 9-10). While it is a good idea to have topic or question guide that the moderator follows, focus groups can involve high or low-moderator involvement. Moderators begin by introducing the topic in an honest and fairly general fashion and then, to varying degrees, follow the question/topic guide and probe participants for their input (Morgan 1997). In general, low-moderator-involvement groups are of interest to social science researchers.

Focus groups have been used at virtually any point of research programs. However, they are particularly useful for exploratory research and tend to be used early in a research project to be often followed by other types of research that provide more quantifiable data from larger groups of respondents (Stewart and Shamdasani 1990). When not used as self-contained qualitative data gathering methods, focus groups often serve as a source of preliminary data in quantitative research projects (Morgan 1997). Some of the common uses of focus groups are: obtaining general background information about a topic of interest and learning how respondents talk about the phenomenon of interest. Such use of focus groups “may facilitate the design of questionnaires, survey

instruments, or other research tools that might be employed in more quantitative research” (Stewart and Shamdasani 1990, 15).

Focus groups, which are a qualitative research tool, have had a long history of utilization in some disciplines, particularly psychology. Their use in economics is less widespread. The CV literature does highlight problems of information provision and respondent knowledge, comprehension and cognition. These must be dealt with in order to design good CV surveys and studies. Focus group interviews in the survey design and piloting stages of CV studies may be conducted “to inform researchers of respondents’ level of knowledge, attitudes and opinion.” (Hutchinson, Chilton, and Davis 1995, 100).

Tools from psychology and cognitive survey design (focus groups and verbal reports) can be used to reduce complex environmental goods and services into meaningful commodities and scenarios that respondents can value. “Focus groups are increasingly being used in the development of CVM surveys for complex environmental goods although guidance on their proper use is very much lacking in the CVM literature” (Hutchinson, Chilton, and Davis 1995, 101).

INDIVIDUAL INTERVIEWS

Individual interviews (also called unstructured, exploratory, intensive, in-depth, and depth interviews) are guided conversations whose goal is to elicit from the interviewees (also called informants) rich, detailed materials that can be used in qualitative analysis.

Individual intensive interviews seeks to *discover* the informant’s *experience* of a particular topic or situation and seeks to find out what kinds of things exist in the first place (Lofland and Lofland 1995). Oppenheim believes the purpose of an exploratory interview is: “to

develop ideas and research hypotheses rather than to gather facts and statistics. It is concerned with trying to understand how ordinary people think and feel about topics of concern to the research” (1992, 67).

Weiss (1994) asserts there are seven reasons for conducting individual depth interviews. According to Weiss, qualitative interviews are appropriate for: (1) developing *detailed descriptions* about an event or development; (2) integrating *multiple perspectives* on an organization, development, or event; (3) *describing process* of human enterprise; (4) developing *holistic descriptions* of complex entities; (5) learning how *events are interpreted*; (6) *grasp understanding from the inside*; and (7) *identify variables and hypotheses* for quantitative research.

In-depth interviews sacrifice “uniformity of questioning to achieve fuller development of information are properly called qualitative interviews” (Weiss 1994, 3). Qualitative interviewing, whether called in-depth, exploratory, or something else, provides researchers (outsiders) with access to the observations of others and can teach outsiders about people’s interior experiences, what people perceive and how they interpret their perceptions. Furthermore, through qualitative interviews we can learn about settings that would otherwise be closed to us: foreign societies, exclusive organizations, and the private lives of couples and families (Weiss 1994).

The advantages that individual interviews offer stem from the close relationship between interviewer and informant (Morgan 1997). Some researchers assert that this dynamic puts an added burden on informants to explain themselves to interviewers and therefore more elaboration on responses take place with little interviewer input (Agar and MacDonald 1995). Cognitive psychologists probably would point to the tacit assumptions

underlying how people converse as favoring individual interviews in getting respondents to volunteer information.. One such principle is the “cooperativeness” principle that includes a maxim that enjoins speakers to make relevant contributions to an ongoing conversation (Sudman, Bradburn, and Schwarz 1996). Another factor that may favor individual interviews is when the research goal is to gain an in-depth understanding of a person’s opinion and experiences. Instead of each participant having a small percentage of time during which a group meets to discuss the topic, an individual in an individual interview has the entire duration of the qualitative interview and attention of the interviewer to reveal and share concerns, issues, and perspectives.

With exploratory interviews almost nothing is standard. According to Oppenheim,

At most the interviewers will have a ‘hidden agenda’, a handful of headings or topics around which they will seek to direct the interview as unobtrusively as possible....The job of the depth interviewer is thus *not* that of data collection but *ideas* collection. (1992, 67)

It is believed that using in-depth, exploratory interviews can greatly broaden and deepen the original plan of the research, throw up new dimensions to be studied, suggest many new ideas and hypotheses, important differences between groups of respondents. Depth interviews can help in the formation of the research problem, in the articulation of dimensions and hypotheses and in the details of instrument building (Oppenheim 1992).

In the qualitative interview the respondent provides information while the interviewer is responsible for directing the respondent to the topics that matter to the study. The findings of the qualitative interview will usually be supported by quotations and case descriptions. However, “usually we can produce numerical data from qualitative interview studies that have explored the same area with different respondents, although we

may have to engage in a time-consuming and cumbersome coding procedure” (Weiss 1994, 3-4).

GROUP VIS-À-VIS INDIVIDUAL INTERVIEWS

Focus groups can be linked with individual interviewing in a number of ways. They may be used in tandem, series, or independently. Either method can be used as a first step exploratory effort to better inform the other method’s design and implementation. That is, focus groups can be used to help determine the starting point and questions for individual interviews and vice versa, individual interviews can help generate focus group discussion guides. Additionally, each one of these qualitative interview methods can be used to supplement the application and understanding of the other. One method could be used to help provide a basis for selecting particular populations for the other method’s application. Lastly, focus groups can be combined with individual interviews to use one as a follow-up to the other. That is, focus groups can be used to develop a better sense of the interrelations of topics raised in interviews. Likewise, follow-up individual interviews can be used to help provide depth and details on topics that were only broadly discussed in group interviews. They may also be used to learn more about perspectives that may have been underrepresented in the groups (Morgan 1997).

Focus groups and individual interviews are both qualitative research methods. Focus groups rely upon group interaction in order to reveal participants’ similarities and differences of opinion. Individual interviews collect more in-depth information from respondents and require an analysis of individuals’ statements to reveal similarities and differences. The group dynamic of focus groups means that interviewers have less control

and interviewees have less time to share their particular perspective. Morgan (1997) points out that typically groups using less structured approaches make better exploratory research vehicles while individual interviews allow for more the development of more in-depth understanding of people's opinions and experiences.

The question of whether the two methods produce similar data "has been the subject of more speculation than systematic research" (Morgan 1997, 13). Merton et al. (1990) proposed a research design to use both methods by interviewing half the people from a sample with one method first and the other half with the other method first. According to Morgan (1997), only Wight (1994) seems to have followed such a design. Wight (1994) examines young men and their relationships with the opposite sex. Categorizing respondents' remarks and claims as "macho" or "sensitive," Wight finds that respondents refer to the opposite sex using sensitive responses when they are individually interviewed first. Otherwise, Wight finds that respondents use their macho vocabulary.

In reviewing her work as well as Wight's, Kitzinger (1994a; 1994b) reaches the conclusion that the differences detected between the results of focus groups and individual interviews may be more a function of context than validity. That is, Kitzinger points out that the differences do not necessarily raise questions about the validity per se of either focus group or individual interview results. She asserts that the differences may well be explainable based upon people's behavior. If people actually act differently in groups from the way they act individually, then they may demonstrate those sorts of differences in group and individual interviews. Therefore, if one is interested in individual behavior or perceptions then the use of data from group interviews might not be best suited for that

inquiry. Similarly, a research interest in group behavior or perceptions might not be well served by data from individual interviews (Morgan 1997).

S U M M A R Y A N D C O N C L U S I O N

Developing countries have a limited and threatened supply of environmental and natural resources. In order to make the best decisions about the use and disposition of their environmental and natural resources, decision makers ought to consider the total economic value of such resources. A large component of economic value attributed to the environmental and natural resources of developing countries does not appear in market prices or well-functioning markets. Furthermore, a potentially large share of environmental and natural resource value is nonuse value. Therefore, the use of the contingent valuation method is necessary in order to determine the total economic value of complex environmental assets, like mangrove wetlands, in developing countries.

CV depends on the use of sophisticated survey questionnaires to generate estimates of environmental and natural resource values. The application of CV in developing countries has not demonstrated the important necessity that respondents actually understood and accepted the proffered resource scenario(s) and policy change(s). Researchers to draft better, more understandable survey questionnaires increasingly use qualitative research. Two such methods are individual interviews and focus groups. These methods, each with theoretical strengths and weaknesses, can provide researchers with insights into how people understand, perceive, and interact with the world around them.

Therefore, this dissertation explores the systematic use of focus group and individual interviews as ways to learn about local beneficiaries nomenclature, perceptions, issues, and concerns in an effort to pilot a design methodology for nonmarket economic valuation study in a developing country.

CHAPTER 3

METHOD

This chapter presents the research design, the subjects, and the procedures used to examine the efficacy of qualitative research methods for designing environmental and natural resource economic valuation questionnaires in Yucatán, Mexico. The study involved several phases of fieldwork including the multiple use of focus groups and individual interviews. The modified 2 x 2 research design used two qualitative research methods with male and female respondents from two villages, each dependent upon the same ecosystem. The design allowed for intra and inter-community evaluation of the data gathered (See Figure 4).

DESIGN AND SUBJECTS

The research study collected information from local resource beneficiaries on their perceptions, uses, and understanding of a complex environmental and natural resource. Such information is important for drafting and implementing reliable and well-functioning questionnaires for the economic valuation of environmental and natural resources. For example, in order for contingent valuation studies to generate reliable and valid economic estimates of value, respondents must, among other things, (1) understand what it is they are being asked to value, (2) accept the plausibility of the proposed policy change and

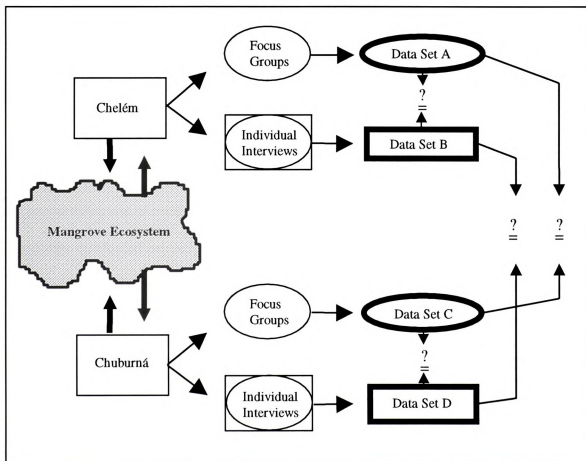


Figure 4. Research Design

payment scenarios, and (3) answer the value elicitation questions in an honest, non-strategic manner (Portney 1994; NOAA 1993; Mitchell and Carson 1989). Therefore, designers of CV questionnaires must understand how respondents perceive, understand, and use the environmental and natural resources under examination to design effective and valid research instruments. The dissertation compared the efficacy of two qualitative research methods (focus groups and individual interviews) for collecting such information in a developing country.

DESIGN OF STUDY

The research design of the dissertation evolved over a period of time. Driven by a desire to evaluate the use of nonmarket valuation methods in developing countries, the candidate conducted extensive pre-dissertation research as well as funding efforts. As a result of those efforts, the Chelém Lagoon research site, financial support, and in-country logistical support for the dissertation research were identified. In turn, the candidate was able to develop a research design with two objectives: (1) the use of qualitative methods in a developing country to learn about complex environmental and natural resources from the perspective of local beneficiaries, and (2) the evaluation of the relative strengths and weaknesses of using different qualitative research methods (focus group and individual interviews) in a developing country.

Pre-Dissertation Research and Funding

Because of the candidate's advanced degree in Latin American studies and Spanish-language skills, efforts were made to identify an appropriate environmental and natural resource management problem in a Latin America country as well as to secure funding

and logistical support for the dissertation fieldwork. A pre-dissertation research fellowship from the Michigan State University [MSU] Office of International Studies and Programs [ISP] and a travel grant from the MSU Institute of International Agriculture facilitated a field visit to Yucatán, Mexico in fall 1994.

During the pre-dissertation trip, the candidate visited potential research sites and met with researchers and scholars working on a myriad of environmental and natural resource problems in the Yucatán Peninsula. Some of the researchers interviewed at that time included: Dr. Marcelino Avila of the International Center for Research in Agroforestry [ICRAF]; Dr. Rodrigo Migoya of the Mexican NGO Pronatura; Dr. Juan Jiménez of the Universidad Autónoma de Yucatán; and Dr. Juan Carlos Seijo of CINVESTAV. These meetings and others provided a solid basis for subsequent dissertation funding and research proposals.

In spring 1995, both the Inter-American Foundation [IAF] and the Organization of American States [OAS] awarded the candidate dissertation research fellowships to investigate nonmarket economic valuation methods for coastal resources in Yucatán, Mexico. These fellowships together with matching funds from MSU's College of Agriculture and Natural Resources [CANR], ISP, and Graduate School were sufficient to underwrite the expenses associated with the dissertation fieldwork research.

Research Design

Preliminary dissertation field research on the Yucatecan coast as well as meetings with researchers in Mérida revealed substantial concern for the management, preservation, and health of the Yucatán's fragile mangrove ecosystems. Staff members at Pronatura, the

Mexican environmental protection agency SEMARNAP, and CINVESTAV all identified the Progreso area mangrove ecosystem as under threat from overuse, improper management, and an absence of reliable ecological and economic information (Susan Rojas, Juan Carlos Seijo, and Jorge Eúan Avila, personal conversations, Mérida, Mexico, fall 1994 and winter 1995). As a result of those meetings, site visits to the Yucalpetén estuary and discussions with Ph.D. committee members, Chelém Lagoon and its communities were selected as the research site for the dissertation.

The choice of the Chelém Lagoon area as the research site conformed with the overall goals of the dissertation. Examination of inhabitants of the Yucalpetén estuary would make it possible to (1) learn how local resource beneficiaries perceive, understand, and use a complex environmental and natural resource (i.e., the mangrove wetland) that might benefit the drafting of economic valuation questionnaires, and (2) evaluate the efficacy of qualitative methods for accomplishing that task in a developing country (i.e., Yucatán, Mexico). Subsequent in-country fieldwork, collaboration with in-country researchers, doctoral committee meetings, and a conference for IAF Ph.D. fellows and advisors in Guatemala helped finalize the research design.

Modified 2 x 2 Design

As Figure 4 illustrates, the research design for this dissertation consists of parallel efforts to collect data using two different qualitative methods with members of each of two communities that border the same ecosystem. That is, a set of focus group data and a set of individual interview data on people's nomenclature, issues, concerns, and understanding regarding the same mangrove ecosystem were obtained from community

members of Chelém and community members of Chuburná, both located on Chelém Lagoon.

The communities of Chelém and Chuburná were selected because of their socioeconomic similarities, their proximity to Chelém Lagoon, and their historical dependence of that mangrove ecosystem for varying components of their livelihoods. The focus on these two villages was supported by the available census and other data (INEGI 1992; Paré and Fraga 1994), expert opinions (e.g., Drs. Eduardo Batllori San Pedro and Dr. Juan Carlos Seijo of CINVESTAV), and preliminary focus groups with members from several other populations bordering the Chelém Lagoon (e.g., Progreso and seasonal residents). (See the discussion and Table 7 below).

The two qualitative research methods, focus groups and individual interviews, were selected because of their theoretical and practical similarities as survey design tools; their relative ease of application; and the similarity of the data that they each produce. Both focus groups and individual interviews use relatively unstructured approaches to learn from respondents about their perspectives, use, and understanding of the world around them (Morgan 1997; Weiss 1994). Furthermore, both methods allow for interviews to be audiotape recorded and later transcribed. Finally, both methods can potentially be used in developing countries in relatively timely and cost-effective ways, a critically important point if either method is to be used in conjunction with efforts to conduct economic valuation studies in developing countries.

Although presented in Table 4 in its simplest form as a 2 x 2 research design, the actual research design allowed for additional layers of analysis. Table 5 and Table 6 illustrate some additional data sets and levels of analysis allowed for by the actual

Table 4. Simple 2 x 2 Data Sets

	Focus Groups	Individual Interviews	Community Total
Chelém	A	B	A+B
Chuburná	C	D	C+D
Method Total	A+C	B+D	

Table 5. Modified 2 x 2 Data Sets

	Focus Groups		Individual Interviews		Community Total	
	Male	Female	Male	Female	Male	Female
Chelém	A_M	A_W	B_M	B_W	A_M+B_M	A_M+B_M
Chuburná	C_M	C_W	D_M	D_W	C_M+D_M	C_W+D_W
Method Total	A_M+C_M	A_W+C_W	B_M+D_M	B_W+D_W		

Table 6. Some Possible Tests of Data

Test	If	Then
Across Methods	$A = B$	Focus Groups = Ind. Interview
	$C = D$	Focus Groups = Ind. Interview
	$A+C = B+D$	Focus Groups = Ind. Interview
Across Communities	$A = C$	Chelém = Chuburná
	$B = D$	Chelém = Chuburná
	$A+B = C+D$	Chelém = Chuburná
Across Gender	$A_M = A_W;$ $B_M = B_W$	Chelém Men = Chelém Women
	$C_M = C_W;$ $D_M = D_W$	Chuburná Men = Chuburná Women
	$A_M+C_M=A_W+C_W;$ $B_M+D_M=B_W+D_W$	Men = Women (across communities)
	$A_M+B_M=A_W+B_W;$ $C_M+D_M=C_W+D_W$	Men = Women (across methods)

research design. A layer of analysis not captured in the simple 2 x 2 design and specifically accounted for by the project design was an examination of possible gender differences. It was assumed that, all else being equal, men from these communities might have different experiences, perceptions, ideas, concerns, and understanding of the mangrove ecosystem than women of those communities. Therefore, focus groups and individual interviews were conducted in both communities that controlled for the gender of the participants (See Table 5).

This research design allowed for the collection of data in a way that enabled the possible examination of data across methods, across communities, and across gender (See Table 6). As a result of the added layer of gender to its design, the dissertation research design is referred to as a modified 2 x 2 design.

SUBJECTS

To conduct this study, multiple panels of focus groups and individual interviews needed to be conducted. The goal was to select, in an unbiased manner, individuals from two similar but distinct populations for participation in either focus groups (segregated by gender and locale) or individual interviews. As mentioned, site visits and consultation with other researchers working in the Yucatán were used initially to identify the research site. Census and other data were used to identify the two particular populations and to confirm their similarities (e.g., Paré and Fraga 1994; INEGI 1992). Once the two populations were selected, a purposeful sampling method was then used to select the actual participants.

Populations

The coastal communities of the Yucatecan coast include villages, towns, and cities of varying size as well as numerous enclaves of seasonal residents. In 1992, Mexico's National Institute of Statistics, Geography, and Information (INEGI) began to publish the results of their 11th General Census (INEGI 1992). Much of the socioeconomic data used to select the target populations was based on that data. Chelém Lagoon was selected as the environmental and natural resource to be the nominal subject of the study. Chelém and Chuburná were selected as the target populations because of their similarities and the fact that they both border and rely upon the same ecosystem.

The Yucalpetén estuary extends westerly from Progreso. As the distance from Progreso increases, the frequency and size of year-round communities decrease. The first "village" west of Progreso is Yucalpetén. Hence, the name Yucalpetén estuary. However, Yucalpetén, for the most part, is now a part of Progreso. It is the location of the safe harbor, commercial fishing fleets, and an active Mexican naval station. About 7 km west of Progreso, is the village of Chelém. Chuburná is located about 8 km further west from Chelém along the coastal fringe (See Figure 1).

Table 7 summarizes some of the socioeconomic characteristics of Chelém, Chuburná, and Progreso. As will be demonstrated, the villages are both relatively poor subsistence fishing communities that have some infrastructure. Progreso on the other hand, is a large port city with a growing commercial and industrial base. According to the 1990 census data, Chelém and Chuburná had approximately 400 and 200 households respectively, while the port city of Progreso has more than 5000 households.

Table 7. Select Population Characteristics

Locale	Population	Women	Fishing Licenses*	Literacy (>15yrs)	Not Local Born	<1 min. salary*	1-2 min. salaries	2-5 min. salaries	Homes	People per Home	Sewer/ Septic
Progreso	23,688	12,050 (51%)	2964 (25% of men)	64%	10%	7%	11%	11%	5324	4.45	76%
Chelém	2,180	1,065 (49%)	160 (14% of men)	54%	1%	16%	10%	5%	375	5.81	58%
Chuburná	1,244	591 (48%)	132 (20% of men)	58%	1%	14%	11%	4%	214	5.81	41%

Sources: INEGI (1992);* Paré and Fraga (1994)

* Minimum salary in Mexico for factory work was reported to be 15 pesos per day. That is about \$2 per day (exchange rate 7 pesos/\$).

Not only are the villages similar in terms of the magnitudes of their population, but as Table 7 illustrates, the villages also appeared to be similar in their socioeconomic composition. Certainly, the villages seem to have much more in common with one another than they do with Progreso. For example, virtually everyone along the coastal fringe when asked about their livelihood reported fishing to be their primary source of income. However, the type of fishing varies as do the levels of legal compliance. In some areas, fishing refers to being a crew member on a large commercial trawler, in other areas it means walking in the mudflats of the wetland retrieving small shellfish. According to Paré and Fraga (1994), between 14 and 20 percent of the male population of the villages had government issued fishing licenses while 25 percent of the male population of Progreso reported having such licenses. It seems that the occupations of villagers is more alike with one another than with the people of Progreso.

The level of education also underscores the similarities of the two villages. The literacy rates reported in the villages were between 54 and 58 percent. This contrasted with the literacy rate of 64 percent reported by respondents in Progreso. Dramatic differences between the villages and Progreso seem related to earnings, living conditions, and place of origin. In 1990, 10 percent of the population of Progreso reported having been born elsewhere. At that time, both villages of Chelém and Chuburná reported only 1 percent of their populace having been born elsewhere. Since 1990, the worsening economic situation and financial crisis in Mexico have reportedly increased the rate of coastal migration. However, there are no data available to quantify this migration. All accounts by researchers and others suggest that migratory inflow has increased in the

study area along the same line as historical patterns (Paré and Fraga 1994; Dr. Batllori, personal conversation, Mérida, Mexico, July 1996).

The residents of Progreso reported higher 1990 earnings than the residents of both Chelém and Chuburná. As Table 7 illustrates, a greater percentage of the villages' residents reported earning less than the equivalent of one federally established minimum salary (about 2 dollars/day) than the residents of Progreso. Furthermore, 18 percent of Progreso earned less than 2 minimum salaries while 11 percent of Progreso earned between 2 to 5 minimum salaries. This contrasts with the villages where roughly 25 percent of the population earned less than 2 minimum salaries and only 5 percent of the population earned between 2 to 5 minimum salaries.

Finally, the 1990 census data on the types of homes and living conditions of the communities also revealed the similarities of the two villages as well as their differences from Progreso. The data showed that both villages have similar home occupancy rates as well as sewer/septic system hook-up rates. Both Chelém and Chuburná reported, on average, 5.81 people per home. This is higher than the average 4.45 people per home reported for Progreso. Likewise, the percentage of homes in the villages of Chelém and Chuburná reportedly connected to sewer or septic systems were 41 and 58 percent, respectively. These rates were much lower than the 76 percentage of homes in Progreso that reported being connected to sewer or septic systems.

As a result of an examination of the available census and other demographic data as well as in-depth discussion with in-country researchers working on resource management issues along the Yucatecan coastline, Chelém and Chuburná were selected as the two populations for the dissertation study. These two villages have populations with

similar types of occupations, literacy rates, economic opportunities, composition, and living conditions. They both border and depend upon the same mangrove ecosystem and both have been affected by changes in the use, management, and vitality of Chelém Lagoon.

Samples

Patton (1990) describes some 15 different types of sampling that can be possibly used in qualitative research. Most sampling in qualitative research is not probability sampling but rather nonprobability sampling. In probability sampling, each member of a population has the same chance of being chosen for the study. This allows for statistical generalizing to the population of interest. Nonprobability sampling use subjective judgments to determine the units of the population to include in the sample (Henry 1990). Nonprobability sampling includes purposeful sampling or criterion-based selection. That is, strategies that chooses particular settings, people, or events deliberately to provide information (Maxwell 1996). Henry (1990), in his discussion of probability sampling, conceded that,

nonprobability sampling is the only recourse for obtaining data in certain situations. Limited resources, inability to identify members of the population, and need to establish the existence of a program could justify the use of a nonprobability sample. (24-25)

Weiss made the point that many qualitative studies do not use samples but rather they use “panels” of knowledgeable informants. That is, researchers select respondents because the respondents are “uniquely able to be informative because they are expert in an area or privileged witnesses to an event” (1994, 17). Weiss asserts that qualitative research studies do not need to be concerned too much with sampling. According to Weiss, qualitative research enables outsiders to learn by examining the people who can

provide the information the study requires. The information, not the number of people, drives qualitative research.

There are at least four different possible goals of purposeful sampling according to Maxwell (1996): (1) achieving representativeness of setting, individuals, or activities (conclusions represent typical member); (2) adequately capturing the heterogeneity in the population (conclusions represent range of variation); (3) examination of extreme cases (crucial test of theory); and (4) establish controlled comparisons (illuminate reasons for differences).

No matter what the goal of purposeful sampling, considerable knowledge of the setting, research relationship with participants, feasibility of data collection, and ethics should be taken into account. Ultimately, the research question must be considered in light of the practicality of recruiting participants. Since the intent of virtually all focus groups is to make some conclusion about populations of interest, groups must consist of representative members of such populations. The researcher must match the sample used to the objectives of the research (Stewart and Shamdasani 1990).

Probability Sampling

An effort was made to explore the viability of alternative sampling methods. Probability sampling methods usually require the use of a “list” or other mechanism to identify all the members of the population(s). These lists are then used in conjunction with a mathematical or statistical selection method to identify the sample population to be studied. Random sampling, which is almost synonymous with probability sampling, is done so that each member of the target population has an equal opportunity of being selected to participate in the study. Examples of “lists” that have been used for probability

sampling include: telephone directories, membership rosters, maps, and even Global Positioning System (GPS) coordinates.

Along the coastal fringe westward from Progreso, few families have telephones and telephone directories are virtually non-existent. Mexican voter registration and other such information was not available for use by researchers or the public. Other official information, such as land title, car registrations, and fishing licenses were neither available nor applicable for the majority of members of the target populations. As already mentioned, virtually all men in Chelém and Chuburná report fishing as their primary source of livelihood. However, as Table 7 notes, only about 17 percent of the men in these villages have fishing permits issued by the Secretariat of Fishing. Even if the permit information were available, it would not be sufficient. Neither official nor commercial records or lists were not available for use by the candidate for sampling purposes.

Further complicating matters, there were no accurate area or street maps of this region and there has been considerable change in the area since the last regional map. Although references to more recent aerial photographs of the area were located at INEGI in Mérida, they were unavailable for review until well-after the field-research was completed. Efforts to develop a house by house system for sampling were further frustrated by the absence of clearly marked and numbered residences and streets. It was simply not possible to devise a sampling procedure that would permit a truly systematic random selection process.

Purposeful Sampling

As a result of the difficulties in developing a probability sampling frame and the research design to use qualitative research methods, a purposeful sampling strategy was designed.

To control for possible differences in gender and community experiences, it was decided that participants for focus groups would be recruited so that groups would be composed of individuals of the same gender and from the same community. Such a sampling scheme fits within generally accepted practice of qualitative research.

Qualitative researchers usually study a single setting or a small number of individuals or sites by using theoretical or purposive rather than probability sampling (Maxwell 1996). Accordingly, there is no magic number of focus groups or individual interviews that should be conducted. The number of focus groups and individual qualitative interviews should be sufficient so that it is clear that nothing new is being learnt in the last session (Morgan 1997; Maxwell 1996; Weiss 1994). Well-regarded qualitative studies have used as few as 1 to as many as 12 interviews with members of one population. However, since the data analysis methods used in this study required a comparison of not only the quality but quantity of respondents' contributions, an effort was made to collect more than sufficient information from both men and women using both methods in both locales.

Initially, efforts were also made to further control for socioeconomic status but this proved too difficult. Most villagers and their homes displayed no obvious indicators of differentiable socioeconomic status. In the villages, although of course there are individuals who are better off than some, it was hard to identify an objective manner to identify and recruit focus groups and individual interviews of such individuals. No doubt a longer term, more anthropological study could identify such individuals and families. However, that sort of study was outside of the objectives of the dissertation.

The sampling strategy adopted was a purposeful one. Research assistants canvassed randomly selected sections of the target communities at staggered times in their efforts to recruit participants. The research assistants were instructed to recruit a certain number of men/women from a particular village for participation with a focus group later that day or the next. If unable to identify sufficient numbers of participants of one gender, the research assistants could recruit members of the opposite gender for a subsequent focus group session.

All potential participants were told that a university project was seeking their opinions and feedback on their environmental and natural resources. They were also told that there were no correct or incorrect responses. Furthermore, they were instructed that their participation was voluntary but that it would be extremely helpful and appreciated. The confidentiality of individuals' participation was assured as well. Because of different cultural norms and expectations, inducements were not offered to focus group participants as is done elsewhere (e.g., the United States). It turns out that many people of the Yucatán would be insulted by such "bribes" to have a conversation.

Overall 12 focus groups and 19 individual interviews were conducted in Chelém and Chuburná. The focus groups consisted of between 3 to 6 people of the same gender from the same community. Although there may arguably be some bias having a male moderator for all of the focus groups, the segregation of focus groups by gender attempted to create environments where women might not be inhibited from participation. Table 3 shows a breakdown of the focus group and individual interviews by type, locale, and gender. Altogether, 68 people were interviewed either individually or in groups. Because of the qualitative nature of the study and the inability to collect a random sample

of participants together with their socioeconomic data, no attempt is made to generalize findings based upon the substance of the interviews to different populations.

The initial phase of focus group interviews consisted of 5 groups in Chelém (2 of women) and 4 groups in Chuburná (2 of women) (See Table 8). Preliminary indications from these groups that women offered responses to the researchers' questions topics of conversation regarding the mangrove wetland that were substantially the same as the responses of groups of men resulted. This resulted in a relaxation of the necessity to have equal numbers of male and female groups and interviews. Gender was still accounted for, but it was decided that the groups and interviews did not have to be in exact proportion with the two populations. Table 8 breaks down the sample of focus groups and individual interviews by phase and by gender.

Table 8. Phases of Focus Groups and Interviews

	Chelém				Chuburná				Total			
	Male		Female		Male		Female		Male		Female	
FOCUS GROUPS												
Phase	I	II	I	II	I	II	I	II	I	II	I	II
Subtotal	3	1	2	1	2	1	2	0	5	2	4	1
No. Conducted	4		3		3		2		7		5	
INDIVIDUAL INTERVIEWS												
No. Conducted	8		2		7		2		15		4	
TOTAL	12		5		10		4		22		9	

The final number of focus groups and individual interviews was arrived at because it was felt that no new information was being learned in the later sessions. Following the qualitative researcher's maxim that one needs as many interviews so as nothing new is

being learnt in the last session (Morgan 1997; Maxwell 1996; Weiss 1994), the total number of focus group interviews were stopped at 12 (Chelém 7, Chuburná 5) and individual interviews were stopped at 19 (Chelém 10, Chuburná 9).

Generalizability

Unlike quantitative research where researchers hope to be able to make generalizations to much larger populations, qualitative researchers most often do not generalize beyond the settings or informants studied. However, qualitative studies can be used to make qualified generalizations when certain conditions exist. Firstly, qualitative studies, such as this dissertation, can have *face generalizability*. That is, there is no obvious reason *not* to believe the results apply more generally. Secondly, the generalizability of qualitative studies may be based on the development of a theory that can be extended to other cases. While the characteristics of respondents and the study can provide credibility to generalizations from qualitative studies, none permit the kinds of precise extrapolation of results to defined populations that probability sampling allows (Maxwell 1996).

PROCEDURES

As described above in Table 2 and elsewhere, the research program consisted of a series of field research components and the analysis of the qualitative data obtained from focus groups and individual interviews. Using purposeful sampling, an attempt was made to recruit participants that represented a cross-section of members from the two communities to facilitate learning about the attitudes, perceptions, concerns, and understanding of resource beneficiaries regarding the shared mangrove ecosystem.

UCRHS REVIEW

In accordance with Michigan State University and federal regulations, the dissertation research project was submitted for review by the University Committee on Research Involving Human Subjects [UCRIHS], an institutional review board, before data collection began. Pursuant to those regulations, no data collection can begin until UCRIHS approval of the proposed project has been received. The committee evaluates proposed research projects in light of the rights and welfare of the project's human subjects.

Because of high rate of illiteracy in the research site, the cultural aversion to signing official-looking documents, and the oral nature of the focus group and individual qualitative interviews, standard written consent forms used in the United States did not seem appropriate for the dissertation project. The UCRIHS reviewer questioned the originally proffered language for verbally obtaining subjects' informed consent. After consultation with the UCRIHS reviewer, an acceptable verbal consent form was drafted. UCRIHS approved the dissertation project as adequately protecting the rights and welfare of its human subjects and its methods to obtain informed consent on February 2, 1996. The doctoral candidate subsequently used the revised consent format with all respondents (See Figure 6 for example of language used).

RECRUITMENT

Following the purposeful sampling frame discussed above, research assistants recruited participants for focus groups and later for individual interviews. These research assistants were university students that had previously worked for INPROMER on qualitative

research efforts in the Yucatán. During Phase I of the focus group interviews research assistants were assigned to randomly selected areas of the target communities and instructed to recruit a particular number of men/women of apparently higher/lower socioeconomic status for focus groups to be held later that day or the next. During this phase, individuals from Progreso, the various seasonal populations, as well as villagers from Chelém and Chuburná were asked to participate in focus group interviews. Because of the difficulty and subjectivity (and apparent irrelevance) of identifying individuals by the high/low socioeconomic characteristic, the decision was made early in the recruitment process to drop that criterion as a selection criterion. This decision was further reinforced when the decision to focus on the villages of Chelém and Chuburná.

The research assistants canvassed their particular section of the community—going door-to-door, stopping in local establishments, engaging people in parks, etc.—in their effort to recruit focus group participants. Informants were only told of the general nature of the project, that it was for a university study, and that their opinions and input would be greatly appreciated. Informants were instructed where and when to meet for the focus groups. The groups often were conducted in a centrally located restaurant or a private home rented for use by the researchers. As mentioned above, no inducements, financial or otherwise, were provided to individuals for their participation.

The same basic recruitment method was followed for conducting the individual qualitative interviews with the exception of interviewing individuals in public places. Because one-on-one interviews more closely resemble intimate conversations as well as the face-to-face experience of CV survey questionnaires, it was decided to approximate the one-on-one environment during the individual interviews. The research assistants

were instructed to attempt to go door-to-door of peoples homes to recruit and conduct individual qualitative interviews. Individuals or family members of individuals that had participated in the study's focus groups were precluded from being respondents in individual interviews.

The absence of street signs, house numbers, and other mechanisms for systematic coverage of the communities made the task of recruitment difficult. However, it should be reported that, in general, the community members of Chelém and Chuburná were extremely welcoming and cooperative. The research assistants, focus group moderators, and doctoral candidate all experienced the warm and hospitality of the villagers of Chelém and Chuburná. They, like the residents, also got to experience the frustration with poor public transportation and telecommunication systems in the region. In the end, 68 people from the two villages were recruited and interviewed (in groups or individually) during approximately four weeks of actual interview activity.

INSTRUMENTATION

In qualitative research, the primary instrumentation of the research project is the human observer. In the case of focus groups, this observer is the moderator. For individual interviews, the observer is the interviewer. In order to have confidence in the data collected, there must be confidence in the quality, consistency, and accuracy of human observers and the mechanisms used to collect such data.

Focus Groups

For these reasons, an in-country professional focus group moderator was hired to conduct the focus groups. After interviewing and meeting with potential focus group moderators,

the candidate hired Mr. César García Lozano of INPROMER, a Mexican market research company, to conduct the focus group sessions. Mr. García is a professional qualitative researcher engaged in market research for a wide variety of consumer products throughout Mexico and the world. Mr. García regularly conducts focus groups for Mexico's largest tobacco, liquor, brewing, and soft drink concerns. And his work has received praise from United States-based international conglomerates. His training as a clinical psychologist and prior experience with focus groups in the Yucatán made him a good choice as moderator.

The candidate met several times with Mr. García during the preliminary stages of the project to discuss methods and expectations as well as design the focus group guide. Initially, the moderator and candidate conducted some practice focus groups with individuals selected from Progreso. These sessions were used as training sessions where a variety of approaches to asking questions and a variety of subject matters were explored. Likewise, it was during this time that the preliminary discussion guide was developed for use with subsequent focus group session.

The research practice followed was that after each focus group, the moderator, the candidate, and the research assistants met to discuss their impressions, observations, and points of interest. During these post session debriefing discussions, support of developing themes, new knowledge, and possible ways to get future participants to address the research concerns were discussed. Not only did these sessions allow for useful and timely feedback for the moderator, they also enabled the research assistants and candidate to experience first-hand how respondents characterized their relationship(s) with the ecosystem and their problems and concerns. Furthermore, the debriefing sessions

provided a perfect opportunity to refine the study guide and non-directive probes and prompts of qualitative research. As a result, the focus groups and debriefing sessions were helpful on many levels. Not only did they enable the researchers to compare their observations, hints, and suggestions but also they were valuable mechanisms for preparing the research assistants for the individual qualitative interview component of the project.

Individual Interviews

Research assistants trained and employed by Mr. García of INPROMER conducted the individual interviews. Ms. Marta Elena Carbajal (Marta) and Ms. María del Carmen Jaimes (Carmen), both university students, had worked extensively with Mr. García on a various qualitative marketing research projects throughout Mexico. They have, among other things, conducted taste tests, packaging design studies, and market analyses for beer, tobacco, and liquor products in the Yucatán. Ms. Carbajal and Ms. Jaimes received additional training, instruction, and supervision by both Mr. García and the candidate throughout the course of the research project.

Ms. Carbajal and Ms. Jaimes not only helped recruit participants for the focus groups but also, as mentioned above, assisted with and participated in the debriefing following the focus group sessions. As a result, the research assistants developed an understanding of the subject matter, the research questions, and the non-directive probes and prompts used in the study. During the actual individual qualitative interviews, the candidate accompanied the research assistants on a random, alternating basis. That is, the candidate would observe an interview conducted by one research assistant, would debrief the research assistant after the interview, and offer the research assistant suggestions and

comments before locating the other interviewer for observation. The candidate would then observe, debrief, and assist the other research assistant with her next interview.

This system of in-field observation and debriefing was aimed at increasing the degree of conformity across different interviewers. Likewise, at the end of each day, both research assistants, the focus group moderator, and the candidate would all meet to discuss the findings, difficulties, and questions of the day. As a result of the training, interview observation, and daily debriefing sessions, it is believed that a high degree of inter-interviewer consistency was maintained for the individual qualitative interviews.

Interview Guide

As mentioned, an interview guide was developed for use during the focus group interviews and the in-depth individual interviews. The candidate initially designed the guide in the field after extensive discussions with key informants from the coastal area and researchers at CINVESTAV and Pronatura. Figure 5 illustrates a facsimile of an English language version of the initial interview guide prepared by the candidate. It should be noted that native Spanish speakers conducted all of the interviews in Spanish. The original guide was organized thematically according to the resource economic literature on sources of values associated with mangrove wetlands. Although referred to through out the focus groups and individual interviews, the initial interview guide gave way to a modified or short-form interview guide.

The practical or short-form interview guide illustrated by Figure 6 grew out of the necessity of having some uniform questions and respondents' hesitation to maintain spontaneous conversations on the research topic areas. As a result, the research

**Peoples' Understanding of the Coastal Zone: The Present, Past, and
Future Value of the Wetlands of Progresso**

Thematic Guide

- a) Products they may obtain from wetland:
 - i) fish
 - ii) shrimp
 - iii) chivita
 - iv) crab
 - v) wood
 - vi) fruit
 - vii) salt
 - viii) honey
 - ix) others
- b) Services they may receive (directly/indirectly) from the wetland
 - i) recreation
 - ii) water filtration
 - iii) flood protection
 - iv) bird & fish habitat
 - v) hatchery/fishery locations
 - vi) habitat for endangered and rare species
- c) Conversion of wetland to other uses (benefits & costs)
 - i) Urbanization-permanent residences, vacation residences, roadways, stores, etc.
 - ii) Industrialization-salt, fish, clothing, petroleum factories
 - iii) Nature reserves or national parks-restricted use and access
 - iv) Farms-agriculture or aquaculture concerns
- d) Existence Value
 - i) Value for future generations to have the wetlands-characteristics that they would like their children to see, experience, use. etc.
 - ii) Value to have possible use of wetland in the future-aspects of wetland they would like to have for possible use in future.

It is desired to ascertain what people know, how they describe what they know, how they understand the ecological and social systems, and what is important about the wetland to them.

Before focusing on specifics, begin by asking a general open-ended question about the Wetland in general. At the end of the conversation, return to this question and address the specifics learned during the session.

Figure 5. Initial Interview Guide

Good day/afternoon, my name is _____ of INPROMER and we are doing a study to learn about the opinions and thoughts of the people of this area on natural resources and the environment. This discussion is completely voluntary and will take about an hour or so. There is complete confidentiality. There are no right or wrong answers. If there is a question that you do not want to answer you don't have to answer and we'll go on. You can leave the interview at any time with penalty. Do you agree to proceed?

I appreciate your helping us. Is it all right, if I audiotape record our meeting?

1. How do people live in this village?
2. The area that is on the opposite side from the sea, what is it called?
3. How would you describe [that area]? What is?
4. Can people live from what they obtain from [that area]?
5. What things do people get from [that area]?
6. What are the principle benefits from {that area}?
7. Do you believe [that area] should be protected and/or conserved?
8. How could [that area] be made more productive?
9. Would you be in favor of an effort to improve [that area]?
10. In what way could [the area] be improved? How could you contribute?
11. Do you have confidence in a program for improving [the area]?
12. Who (e.g., government agency/university/private business) would you have the most confidence in for undertaking an improvement project?

Figure 6. Modified Focus Group Guide

assistants, focus group moderator, and candidate worked on a modified interview guide for the focus groups. The modified guide identified a few specific questions that could be used to engage the participants in a conversation in areas relevant to the research question.

Additionally, the daily debriefing sessions among the research assistants, Mr. García, and the candidate resulted in additional questions and themes that were attempted to be explored. During focus group interviews and individual interviews, attempts were made to ask respondents to recount their last use or a typical day's use of the mangrove resource. This sort of "grand-tour question" (Spradley 1979) was used to get respondents to volunteer information that revealed their underlying values, difficulties, and realities associated with their ecosystem. As the researchers learned more about various aspects of the ecosystem, efforts were made to learn more, if possible, about them. For example, as it became apparent that the safe harbor channel drastically altered the ecological balance of the estuary, researchers probed for respondents' understanding of relative costs and benefits of the project, how and why the project came about, and other changes that affected them and the ecosystem. The modified focus group guide was used for the individual interviews.

Guide and Question Observations

The research methods were qualitative and as such no discussion guide could be strictly followed without interfering with the natural dynamics of conversation underlying both methods. Efforts were made to address most of the important themes with each group and in each interview. The vagaries of individual personalities and group dynamics more often than not necessitated straying from the discussion guides. However, such guides

helped interviewers and moderators continually focus the discussions onto topics of interest for the dissertation research.

The dissertation research was grounded in economic theory regarding environmental and natural resource valuation. Initially, the researcher developed an extensive set of possible questions that aimed to address all of the possible use and nonuse values respondents held for the mangrove ecosystem. For example, the literature identifies a wide range of use values, indirect use values, and nonuse values attributable to mangrove wetlands. Some initial focus groups were conducted in Progresso to help the candidate and his research assistants determine the saliency and relevance of the various possible use, indirect use, and nonuse questions. Based upon those preliminary focus groups, the researchers were able to narrow the range of question topics.

The interview guides illustrated above, while important in training and instructing the moderator and interviewers, do not reflect the actual language or order of the questions asked of respondents. As mentioned above, an ethnographic approach to learning about respondents' perceptions, knowledge, and concerns was adopted. Focus groups and interviews used big tour questions such as: How do you live?, What do you do here?, and What is this area called? The sessions also used mini-tour questions to elicit further information on topics of interest to the researchers (those relevant to the economic research objectives). These mini-tour questions included: Can you describe a typical day of fishing for me?, What are the *bordos* you mentioned and how do they affect your everyday life?, and When you can't fish in the sea because of the weather (or there are no fish) what do you do? These sorts of ethnographically based questions and the use of

nondirective prompts to elicit information helped to reveal information about the sources of resource values that were most important and relevant to respondents.

Combining of an ethnographic approach to questioning with the qualitative methods led to an evolution of the actual questions used and information learned. The interview guide continually evolved as did the moderator and interviewers' question choice and phrasing. While the grand tour questions of the final groups and interviews were similar to those of earlier sessions, the mini-tour questions and follow-ups continually changed. As information about a particular resource value, use, or problem became apparent to the researchers, efforts were made to elicit new or different information with the mini-tour follow-up questions. This approach to preliminary analysis for economic valuation studies seemed particularly useful in revealing the array of resource services that respondents seemed to value. Likewise, it enabled the researchers to reach some preliminary conclusions about the apparent absence of respondents' concern with other values attributable by to the mangrove wetlands.

FOCUS GROUPS

The focus group interviews conducted for the dissertation research project ranged in size from 4 to 7 participants. As discussed above, the doctoral candidate prepared a focus group guide in collaboration with Mexican natural resource researchers. The guide was then discussed at length with the professional focus group moderator and ultimately modified for use with both the focus groups and individual interviews. Mr. García conducted all of the focus group interviews with the assistance of the doctoral candidate.

The focus groups were held in participants' homes, local eating establishments, as well as a centrally located home that was rented for use by the researchers. All participants were told of the voluntary nature of their participation as well as the strict confidentiality of their participation and their responses. Informed consent was received from participants in conformity with UCHRIS approval. Audiotape recording of the sessions did not begin unless all of the participants consented to the audiotape recording of the interviews. Unlike focus groups in the United States, Mexican cultural practices precluded investigators from giving participants enticements or compensation for their participation. It seems that people in this part of Mexico would be offended by an offer of goods or money in exchange for "having a conversation."

Only after both the moderator and the candidate were satisfied with the interview guide, the training of research assistants, and the facilities for the group sessions, did the recruitment of actual focus groups begin. The focus groups lasted between 40 minutes and 2 hours. On average, most of the focus group sessions took a little more than an hour.

The focus groups began with the participants meeting the moderator, the candidate, and the research assistants that recruited them at the designated interview site. Participants were offered a cold beverage and snacks as they were asked to take a seat around a large table. Additional beverages and snacks were available throughout the sessions. After all the invitees had arrived or 10-15 minutes had passed from the designated start time, Mr. García made the preliminary introductions and got the focus group session underway.

After explaining the goals of the project in the most general terms, Mr. García, followed the approved format and asked participants for their informed consent to be interviewed. Next, participants were asked if it would be all right to audiotape record the session. With those preliminaries out of the way, the moderator began to develop a rapport with the group. Invariably, Mr. García would begin by asking the participants a broad open-ended question such as “What do you do here?” or “How do you live here?” Although there was a focus group discussion guide, the dynamics of each group often prevented certain areas from receiving equal treatment. The moderator maintained an engaged but impartial role as he tried to encourage all of the participants to contribute to the discussion and address the points of research interest. At various times, Mr. García successfully used his being from another part of Mexico as an excuse for asking participants to explain their feelings, uses, understanding, and problems concerning Chelém Lagoon.

Because of the research interest in possibly using CV in conjunction with the valuation of the mangrove wetland of Chelém Lagoon, Mr. García occasionally would ask participants a hypothetical questions about some possible changes, change agents, uses, or status of Chelém lagoon. Some of these hypotheticals involved a private change agent (e.g., a fish processing concern), some involved governmental change agents (e.g., the Mexican navy or the national government), and some involved universities (e.g., UADY or CINVESTAV). These were all attempts to test the plausibility of using hypotheticals with the target populations.

As mentioned, interview guides for the focus groups were developed and continuously modified. However, the actual interviews and question orders did not follow

a strict pattern. Every attempt was made to inquire, in several ways, about the participants' uses, perceptions, opinions, and experiences vis-à-vis the Chelém Lagoon and its environs. Likewise, attempts were made to include all participants and their opinions in the discussions. The community setting did present some interesting challenges and the researchers needed to adapt as circumstance required. For example, participants' family members sometimes interrupted sessions and events in the area sometimes caused a participant to excuse themselves.

At the conclusion of each focus group, participants were thanked and given the name, address, and telephone number of a nearby Mexican collaborator should they need or desire to contact the researchers in the future. Often, participants asked if they could be of further help and even offered on a number of occasions to take the researchers out in boats to see the expansive mangrove ecosystem.

INDIVIDUAL INTERVIEWS

Nineteen individual qualitative interviews were conducted with community members from Chelém and Chuburná. Initially at the dissertation proposal stage, the use of individual qualitative interviews was considered as a means for validating the finding and conclusions drawn from the focus groups. However, as the research design developed, so too did the role of using individual interviews in the dissertation. Not only, were individual interviews used to test the findings of focus groups but also their use was also an effort to compare and contrast the strengths and weaknesses of the two qualitative research methods in a developing country setting.

As discussed above, respondents were recruited by canvassing randomly selected sections of the communities. Individuals were canvassed primarily by going door to door. When individuals were recruited from public places, they were asked if there was a quiet place that they could be interviewed. Efforts were made to place the respondents in the individual interviews in circumstances that approximated the circumstances of a face-to-face survey. Interview participants were told that the study was sponsored by a university, that their participation was voluntary, and that their identity and responses would be kept confidential. Respondents were also asked if their interviews could be audiotape recorded.

The qualitative interviews were generally 30 minutes long and not highly structured. Like the focus group interviews, a script with several key research questions/topics was used for the individual interviews. However, the free flowing nature of qualitative interviewing required interviewers to introduce the discussion topics as they were able. The interviewers of the individual interviews attempted to encourage informants to freely volunteer information as opposed to asking for responses to closed-ended questions. At the end of the interview, respondents were thanked for their participation and were instructed how to contact the researchers if they had additional questions or comments.

DATA COLLECTION

Regardless of the type of study being conducted, attention should be paid to how the data are collected, independent of the form that they might take (Rudestrom and Newton 1992). Data recording has two elements—fidelity and structure. Fidelity is the accuracy

of the data collected as compared to the original phenomenon being recorded, while structure refers to the constraints of the data collection method used. For example, a written survey is a highly structured form of data collection that may have more or less fidelity depending on whether it was administered face-to-face, by mail, or via the telephone. Some typical choices for qualitative research data collection include the use of diaries, field notes, videotape recording, and audiotape recording.

The candidate did use field notes, debriefing notes, and notes from meeting with experts and decision makers in the region to help design the study, interpret some responses, and develop a better understanding of the ecosystem of Chelém Lagoon and the people dependent upon it. However, the primary data of the focus groups and individual interviews were audiotape recorded. The candidate chose to use audiotape recordings of all interviews because of recordings' high fidelity and little structure. That is, responses would be accurately captured and respondents would not be constrained by written forms or awkward pauses in conversations as their comments were written down. This practice conforms with the recommendations of Morgan (1997), Weiss (1994), and other qualitative researchers.

The use of audiotape recordings was particularly helpful because it allowed for the typing of accurate transcripts for subsequent use in data analysis (Strauss and Corbin 1990; Krippendorff 1980). The candidate to protect against data loss first duplicated the audiotapes. Then the original tapes were transcribed (in the original Spanish) following a format that allowed for differentiation between utterances by respondents and those by the moderator (interviewer). The transcriptions were then converted into a text-based computer file format so that they could be read by a variety of computer software

programs. The text-based computer files of the transcripts were then reviewed for accuracy by a research assistant as well as by the candidate. These verified transcripts of the focus groups and individual interviews became the data used in subsequent data analyses.

DATA ANALYSIS

Although data and information from many sources and of a variety of types were collected during the many stages of the research program, the transcripts of the focus groups and individual qualitative interviews formed the primary data source analyzed in this dissertation. The audiotape recordings and corresponding transcripts of the interviews were labeled to indicate their date, location, type of interview, as well as the gender and number of respondents. As mentioned, the tapes were then duplicated and transcribed into computer files for use with a variety of computer software programs.

The initial step in qualitative analysis is reading the interview transcripts. Then the analyst has several options. Maxwell put those options into three groups: “memos, categorizing strategies (such as coding and thematic analysis), and contextualizing strategies (such as narrative analysis, individual case studies, and ethnographic microanalysis)” (1996, 78). Each of these groups have relative strengths and weaknesses. The usefulness of categorization is that it helps outsiders to understand the particular individuals and their situations under investigation. However, Maxwell makes the point that questions about similarities and differences across settings or individuals needs some contextualizing of the categorizing strategy in order to place things in proper perspective.

The general data analysis plan involved several steps. They included: reading the transcripts to get a “feel” for themes, issues, and concerns; performing open and then axial coding on a subset of transcripts; using the axial codes and the themes revealed by them to develop a thematic coding system; coding every transcript using a uniform coding system; and analyzing the frequencies and cross-tabulations of the various themes (codes) within and between sets of transcripts.

CODING

A main categorizing strategy in qualitative research is coding or doing some form of content analysis. However, the goal of qualitative research is not to produce simply counts of things, but to “fracture” the data and rearrange it into categories that facilitate the comparison of data within and between categories (Maxwell 1996; Strauss 1987). Krippendorff (1980) who wrote the preeminent work on content analysis emphasized the importance of content analysis to be used to reveal symbolic phenomena. As Krippendorff (1980) pointed out, content analysis: (1) is fundamentally empirical in orientation, exploratory, concerned with real phenomena, and predictive in intent; (2) transcends conventional notions of content as an object of concern and is linked to conceptions of symbolic phenomena; and (3) is developing a methodology of its own that enables researchers to plan, communicate, and to critically evaluate a research design. Therefore, the dissertation used a systematic scheme to code the data and analyze it in order to understand the phenomena of import to the local beneficiaries as well as to potential designers of valuation studies.

The first step in the analysis of the data collected using focus group and individual interviews was to read the transcripts. Then the task was to begin the coding process. The process of developing a coding scheme drew on existing literature on the possible sources of mangrove wetland values and the elements necessary for designing a CV study. This initial grounding in the literature is one manner to initiate what Strauss and Corbin (1990) refer to as grounded theory analysis of qualitative data. That is, a subset of data (an interview or two) was selected for open coding-each word or so was coded using an unstructured, scheme that roughly fit into the theoretical framework of economic valuation on nonmarket resources. To do this, the transcripts were loaded first into HyperRESEARCH.

HyperRESEARCH is a qualitative computer software package that enables researchers to use unlimited numbers of unstructured coding schemes with textual data. This helped by allowing the coding and recoding of units of text as the research progressed. As a result, certain themes among the codes became apparent. However, the inability of the software to facilitate comparisons for groups of codes as well as the software's inability to generate counts, frequencies and cross-tabulations analyses was frustrating. This led the candidate to try a different qualitative research software package that is well-regarded by qualitative researchers-QSR NUD·IST.

QSR NUD·IST allowed for the importation of the transcripts as source material for analysis. Unlike HyperRESEARCH, QSR NUD·IST did not allow unstructured coding schemes. As a result, the previous coding scheme associate with the transcripts had to be re-conceptualized to fit the inverted tree scheme of coding categories used by QSR NUD·IST. While this programs ultimately failed to allow the candidate to conduct

sufficiently sophisticated numerical analysis of the codes, it did provide a wonderful opportunity to read, label, and formally develop a coding scheme for the transcripts.

Although these programs were ultimately unsuccessful in allowing for the computation of the desired cross-tabulations and frequency tables, they both helped develop the system of codes ultimately used with the data. Finally, the transcripts were each coded by hand using a uniform coding scheme. The codes and their frequencies were recorded for each transcript in a Microsoft® Excel workbook. When coding of all of the transcripts was complete, the Excel workbook file was converted and subsequently loaded into SPSS for the required multiple response data analysis.

CROSS-CASE ANALYSIS

Together with the contextualizing of narrative analysis, the categorizing activity of coding the transcripts allows for cross-case analysis. That is, groups of respondents and their data can be examined for similarities and differences. The data, by rearranging it into categories, can be used to understand the individuals and situations. In this study, data were eventually grouped according to interview type (focus group or individual interview), gender (male or female), and location (Chelém or Chuburná).

Particularly interesting and theoretically relevant observations about the “findings” of the focus groups and interviews as represented by the presence and relative frequency of particular codes were used to begin the statistical analysis of the data. The data set produced by the transcription and coding of the focus group and individual interviews allowed for examination on many layers. In particular, data were examined based on the nature of the interview (focus group/individual), locale of respondents

(Chelém/Chuburná), and gender (male/female). Significant similarities and differences between and across these layers were sought out in the analysis. In particular, cross-tabulations and frequency analysis were performed. In this manner, it was hoped to undertake a cross-case analysis of the qualitative data learned using both focus groups and individual qualitative interviews in the two communities of Chelém and Chuburná.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

This chapter presents an analysis as well as the findings of the data collected from focus groups and individual qualitative interviews in the villages of Chelém and Chuburná.

During the field research component of the dissertation, more than 40 individual interviews and focus groups were conducted in and around the area of Chelém Lagoon (See Appendix A). When transcribed, the focus groups and individual interviews produced over 500 pages of data. While much has been written about how and why to conduct qualitative research, little has been written about what to do with the data after the research has been conducted (Vaughn, Schumm, and Sinagub 1996).

As previously discussed, the limitations of the fieldwork and data collection did not enable the researchers to obtain age, gender, income, education, occupation, and other socio-economic data on each individual respondent. This information would have been extremely useful in developing a better understanding of the communities and in interpreting the various results of this study. However, the absence of this information does not diminish the value of the information learned.

This dissertation uses a purposeful research design together with an analytical procedure that combines qualitative research's "grounded theory" approach and some basic analytical techniques. Using open and then axial coding, a set of selective codes for

the data was developed. This selective coding scheme was applied to all of the qualitative data collected from the villages. The coded transcripts were used to construct a database that allowed for the systematic analysis of the frequencies and cross-tabulations of code categories and responses by transcript, across methods, across communities, and across genders.

B A C K G R O U N D

QUALITATIVE DATA ANALYSIS

According to Yin (1989), “data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence, to address the initial propositions of a study.” The initial objectives and hypotheses of a study dictate the form or forms of data analysis.

Qualitative research, by its nature, dictates different approaches to data analysis than quantitative methods. The dissertation and its focus on evaluating the efficacy of alternative qualitative methods required the development of an analytical procedure that built on standard qualitative data analysis and allowed for cross-method examination.

Grounded Theory

Strauss and Corbin (1990) developed and articulated one leading approach to qualitative data analysis—grounded theory. Their approach systematically and iteratively examines qualitative data to reveal the themes and relationships between those themes apparent in the data. In other words, the analysis of qualitative data is process of several types of coding activities. Strauss and Corbin describe a process that works with the data and

applies different types of codes or label to different units of data—words, phrases, paragraphs.

Strauss and Corbin suggest that by analyzing qualitative data researchers are able to reveal grounded theories—that is, relationships between and information about phenomena under investigation. An iterative process, they instruct, reveals such understanding. The process involves three types of coding practices: (1) open coding, (2) axial coding, and (3) selective coding. According to Strauss and Corbin, such a method of analysis allows researchers to break down qualitative data, to conceptualize, and to put the data back together in new ways. They believe that through the use of memos, and other methods of documenting decisions, qualitative analysts can support conclusions reached about the meaning of the data. While Strauss and Corbin seem to generally disapprove of the use of mathematics and statistics for qualitative data analysis, other qualitative researchers explicitly recognize the usefulness of such analytical methods with qualitative data (e.g., Krippendorff 1980; Lederman 1990).

Analytical Methods

Still widely acknowledged as the leader in the field of content analysis, Krippendorff (1980) developed an intricate method of coding and counting qualitative data sources. For example, Krippendorff and others have used transcripts of media broadcasts as data sources for testing various hypotheses by analyzing word frequencies and the relationships between word occurrences. Krippendorff, in his treatise *Content Analysis* (1980), laid out a data recording process, analytical techniques, and the inferential constructs necessary to undertake content analytical research. This method may be applied to a variety of

qualitative data sources. More than 15 years later, *Content Analysis* is still in print and researchers are still using Krippendorff's methods.

Lederman (1990) suggested a convenient framework for classifying the types of analytical methods that can be used with qualitative data. According to Lederman, several different and not necessarily mutually exclusive analytical methods may be used for qualitative data analysis. These analytical approaches to qualitative data analysis were grouped by Lederman into four categories: (1) coding data into predetermined categories (2) developing categories based on data and then coding data, (3) using the data as a basis for summary statements that capture the main ideas, and (4) interpreting the data through intensive analytic techniques.

Lederman's first category—coding into predetermined categories—resembles the use of qualitative data as a surrogate for survey or other highly structured research with a priori notions of individuals' range of responses. The classifications and range of possible response categories are constructed prior to reviewing the actual data. Lederman's second category of analysis—developing categories based on the data—roughly approximates the approach advocated by Strauss and Corbin (1990). That is, the data is looked to, examined, and categorized based upon what is learned from the data itself. The third type of analysis categorized by Lederman (1990)—extracting summary statements—is probably the most widely used approach to qualitative data analysis. The general use and acceptance of extractive statements as qualitative data analysis probably reflects the ease with which this sort of “analysis” can be accomplished. However, this approach is certainly susceptible to claims of inherent subjectivity and researcher bias. The use of “typical” statements, while instructive and often persuasive, does not, in and of itself, offer

objective bases for evaluating the representativeness of such statements. Lederman's fourth category—intensive analytic techniques—include traditional forms of content analysis and other methods of using mathematical and statistical tools to analyze qualitative data.

Analysis Objectives

Krueger (1994) has pointed out some key elements that should underlie any analysis of qualitative data regardless of analytical methods selected. Krueger asserted that the strength of qualitative data analysis is that the analytical framework allows for the examination of underlying phenomena. According to Krueger (1994), analysis of qualitative data should allow researchers to: (1) find the big ideas, (2) consider the choice and meaning of words, (3) consider the context(s) of qualitative data collection, and (4) consider the consistency of responses.

Big Ideas

Krueger (1994) and other qualitative researchers (e.g., Weiss 1994) believe that big ideas or themes emerge (become apparent) as researchers examine and work with multiple data sources and identify convergence of ideas and issues among several groups and/or participants. That is, by continuously reviewing and studying the information obtained from the various participants, certain overall themes, issues, and concerns should become apparent to the outside observer. These themes may or may not be specifically recognized by the participants and they may or may not be specifically addressed by every group or participant. However, qualitative data analysis allows and even requires researchers to

extract and derive the major ideas and themes of respondents stemming from the topic(s) of discussion.

Words and Meaning

As Krueger (1994) noted, the examination of qualitative research findings also allows researchers to consider the words and language that participants choose to discuss and to address the various issues and themes. That is, qualitative researchers should be able to focus on the language, meaning, and manner respondents use to communicate. The research focus may be aimed at both everyday language use as well as language use as it relates to a specific topic or subject of interest to researchers. Researchers can also use qualitative data analysis to reveal the underlying meanings of the words and language used by respondents.

Context and Consistency

Likewise, Krueger (1994) pointed out the ability and need for qualitative data analysis to determine and account for the extent to which the participants' comments were influenced by the context in which they were made. That is, qualitative data analysis can and should examine and be sensitive to the type of interview, the composition of the group (if any), and other factors that might influence the quality and character of the data. Furthermore, qualitative data analysis should, according to Krueger (1994), examine and account for the consistency of responses (or lack thereof) throughout and across interviews. That is, the analysis of qualitative data needs to account for the extent to which responses appear to vary across interviews, methods, and locations. Vaughn, Schumm, and Sinagub (1996) stressed the importance for qualitative data analysis to determine the extent of consistency of responses across interviews.

As a result of the foregoing, the data analysis undertaken in this dissertation attempted to meet several goals. The qualitative data was analyzed so that the researcher could develop an understanding of the “big ideas”; appreciate the words and meanings of respondents; and evaluate the context effects and consistency of responses (Krueger 1994). The dissertation used a coding procedure that drew on the grounded theory approach of Strauss and Corbin (1990) and analyzed the codes using statistical methods recognized by Krippendorff (1980) and others. This approach enabled the researcher to assess the efficacy of using the two qualitative methods in a developing country.

CODING PROCEDURE

As already mentioned, the qualitative data (focus groups and individual interviews) were transcribed for coding and further analysis. The coding procedure used two different types of qualitative computer programs (HyperRESEARCH and QSR NUD-IST). Then the candidate developed a spreadsheet of the open and axial codes in Microsoft® Excel. Finally, a database of selective codes and information about each transcript was compiled using SPSS. This coding procedure roughly followed the coding scheme prescribed by Strauss and Corbin (1990). That is, it moved from coding virtually every wordND of some of the transcripts (open coding) to the development of coding schemes that captured categories and themes (axial and selective coding).

Open Coding

At first, a subset of transcripts was randomly selected for open coding. Almost every word of four transcripts was coded without any structure. The theoretical and practical design considerations of CV studies did provide a theoretical framework for coding.

However, no fixed, prearranged codes were used. Respondents' words, ideas, issues, and contributions were coded using terms that accurately described them or that placed them in a like group of similar utterances. To do this, the software program HyperRESEARCH was used.

HyperRESEARCH allows transcripts to be flexibly coded once they are imported into the program. To import files, they must be converted from their word processing and other formats into text only files. Using text macro programs, the text files were reformatted so that uppercase and lowercase letters reflected interviewer and respondent utterances, respectively. These text only versions of the transcripts were then loaded into HyperRESEARCH. The HyperRESEARCH software allows words, sentences, paragraphs, and even entire transcripts to be coded using an ever expanding list of codes. The codes may be applied to units of text identified only by their position relative to other text units in the file. This system allowed multiple codes to be applied to text units of varying and overlapping size. Furthermore, it allowed the researcher to focus on and label the words and meanings of the respondents without being constrained by a coding structure or hierarchical format.

When the initial open coding of the sub-sample of transcripts was finished, there were numerous and sometimes repetitive codes. More importantly however, certain themes, ideas, issues, and word usage had become apparent to the candidate and in the codes themselves. The open codes developed using HyperRESEARCH could be listed either in order of their appearance in the text or in alphabetical order (See Figure 7 and Figure 8). Review of the codes created during the open coding with HyperRESEARCH permitted the beginning of the reorganization of data using codes/categories. Such

CHELEM - Sort by Ref. - Febia

CaseName	CodeName	CodeLocation	CodeType
Febia	MEN	char 1 to 17871 of page 1 of FEBENG1A.TXT	TEXT
	CHELEM	char 2 to 17871 of page 1 of FEBENG1A.TXT	TEXT
	FEBRUARY	char 2 to 17871 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Way of Life	char 84 to 113 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Way of Life	char 122 to 167 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Fishing Import	char 174 to 498 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Small Boats	char 207 to 308 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Very Important	char 207 to 308 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Coastal	char 208 to 308 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Fishing Effort	char 315 to 330 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Coastal 1to2hrs	char 337 to 448 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Coastal most do	char 401 to 560 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Fishing Partici	char 455 to 562 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Middlemen	char 565 to 962 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Sell Catch	char 569 to 2072 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Middlemen I	char 570 to 617 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Direct Sales	char 1041 to 1822 of page 1 of FEBENG1A.TXT	TEXT
	LACK OF MEANS Direct S	char 1043 to 1228 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Sell Catch Dir	char 1043 to 1823 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Direct Sales	char 1130 to 1184 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga	char 1913 to 2040 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Subsistence	char 1913 to 2132 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Coastal alternativ	char 1914 to 2040 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga nets	char 1914 to 2072 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Last Resort	char 1914 to 2132 of page 1 of FEBENG1A.TXT	TEXT
	SURVIVAL bc Cienaga	char 1938 to 2040 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION What is Ciena	char 2191 to 2209 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Sea Water circu	char 2192 to 2861 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Crab	char 2216 to 2270 of page 1 of FEBENG1A.TXT	TEXT
	PUERTO Crab Fishing	char 2216 to 2472 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Creek	char 2217 to 2270 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Crab	char 2217 to 2272 of page 1 of FEBENG1A.TXT	TEXT
	PUERTO Sea Water enter	char 2350 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Sea Water circu	char 2479 to 2862 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga nets	char 2819 to 2984 of page 1 of FEBENG1A.TXT	TEXT
	PUERTO Fishing nets	char 2819 to 2984 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga mullet	char 2866 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga seabass	char 2867 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Way of Life	char 2867 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Catch	char 2984 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 2984 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Cienaga Usef	char 3190 to 3624 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 3191 to 3526 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use seasonal	char 3255 to 3690 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Overfishing	char 3323 to 3624 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Depletion no cont	char 3323 to 3772 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use all year	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use seasonal	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga no altern	char 4115 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	LACK OF MEANS So Chivi	char 4195 to 4330 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga importa	char 4510 to 4764 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 4643 to 4671 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga mullet	char 4672 to 4766 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga nets	char 4672 to 5371 of page 1 of FEBENG1A.TXT	TEXT
	QUESTION Mullet Use	char 4771 to 4804 of page 1 of FEBENG1A.TXT	TEXT
	MULLET Use bait	char 4813 to 5371 of page 1 of FEBENG1A.TXT	TEXT
	MULLET Use eating	char 4974 to 5123 of page 1 of FEBENG1A.TXT	TEXT
	LACK OF MEANS So Chivi	char 5586 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Coleccion last res	char 5631 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Chivita no equip	char 5631 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 5676 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga nets	char 5676 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 5676 to 6087 of page 1 of FEBENG1A.TXT	TEXT
	LACK OF MEANS So Chivi	char 5677 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Depletion	char 5760 to 5932 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 5760 to 6017 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 5761 to 5932 of page 1 of FEBENG1A.TXT	TEXT

Figure 7. Sample Open Codes by Location

CHELEM - Sort by Name - Feb1a

CaseName	CodeName	CodeLocation	CodeType
Feb1a	BELIEVE Co not Gov	char 13289 to 13526 of page 1 of FEBENG1A.TXT	TEXT
	BELIEVE Co not Gov	char 13756 to 14184 of page 1 of FEBENG1A.TXT	TEXT
	CHELEM	char 2 to 17871 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Catch 0	char 11155 to 11503 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Catch	char 2984 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Catch	char 8593 to 9199 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Colection last res	char 5631 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Depletion no cont	char 3323 to 3772 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Depletion	char 5760 to 5932 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Meat Removal	char 8665 to 9201 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Meat Removal	char 8800 to 9330 of page 1 of FEBENG1A.TXT	TEXT
	CHIVITA Overfishing	char 3323 to 3624 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Boat Shelter	char 6181 to 6364 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Cleaned	char 16836 to 17382 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Crab	char 10506 to 11148 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Crab	char 2216 to 2270 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Crab	char 2217 to 2272 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Creek	char 2217 to 2270 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Dried Out 4 hom	char 12090 to 12404 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Firewood	char 9080 to 9602 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Fish Ponds pote	char 14420 to 14936 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Fish Ponds pote	char 17500 to 17859 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Important sustai	char 11510 to 11711 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Important sustai	char 16836 to 17382 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Important sustai	char 5939 to 6015 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Improve contribl	char 17389 to 17860 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Improve contribl	char 17500 to 17859 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Last Resort	char 1914 to 2132 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Salt	char 9609 to 10272 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Sea Water circu	char 2192 to 2861 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Sea Water circu	char 2479 to 2862 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Shallow	char 6401 to 6624 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Subsistence	char 11510 to 11711 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Subsistence	char 1913 to 2132 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tortoise	char 7811 to 7897 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism fishing	char 14317 to 14413 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism flaming	char 13118 to 13282 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism poten p	char 13289 to 13528 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism potentl	char 12322 to 12482 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism potentl	char 17500 to 17859 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Tourism talk	char 12672 to 12887 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use all year	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use seasonal	char 3255 to 3690 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Use seasonal	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 3191 to 3526 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 4018 to 4463 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 5676 to 6087 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 5760 to 6017 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 5975 to 6015 of page 1 of FEBENG1A.TXT	TEXT
	CIENAGA Useful	char 6182 to 6364 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Direct Sales	char 1041 to 1822 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Direct Sales	char 1130 to 1184 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Middlemen I	char 570 to 617 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Middlemen	char 565 to 962 of page 1 of FEBENG1A.TXT	TEXT
	COMMERCE Sell Catch	char 569 to 2072 of page 1 of FEBENG1A.TXT	TEXT
	CRAB Octopus Bait	char 6745 to 6978 of page 1 of FEBENG1A.TXT	TEXT
	FEBRUARY	char 2 to 17871 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Chivita no equip	char 5631 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 11155 to 11505 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 2984 to 3183 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 4643 to 4671 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 5676 to 5753 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 5761 to 5932 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 8236 to 9198 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga chivita	char 8800 to 9200 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga crab	char 17500 to 17859 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga crab	char 6744 to 7144 of page 1 of FEBENG1A.TXT	TEXT
	FISHING Cienaga importa	char 4510 to 4764 of page 1 of FEBENG1A.TXT	TEXT

Figure 8. Sample Open Codes by Name

reorganization, the key to axial coding, began to reflect the conditions, context, action/interactional strategies and consequences revealed by the transcripts and open codes. However, the volume of transcripts that needed to be axial coded and systematically analyzed using analytical methods made subsequent use of HyperRESEARCH inappropriate. While a researcher-designed hierarchy of axial codes could be used in HyperRESEARCH, inputting and applying such a scheme to more than 30 transcripts proved troublesome. Furthermore, the inability of HyperRESEARCH to perform analytical analyses among and between the more than 30 transcripts (cases) led the researcher to use a different qualitative software package for the axial coding of the transcripts.

Axial Coding

The next step in the coding of the transcripts after open coding had been accomplished was the development and use of axial codes for all the transcripts. In axial coding, the analytical focus is on putting codes together in ways that make connections between categories. To accomplish this a coding paradigm is developed and utilized that involves accounting for conditions, context, action, strategies, and consequences (Strauss and Corbin 1990). In axial coding subcategories or properties of phenomena or conditions are grouped accordingly. That is, codes are linked together to help the researcher with theme analysis and concept development.

To develop a set of axial codes, the candidate used the qualitative research software package QSR NUD-IST. This program offered the promise of greater analytical tools than HyperRESEARCH as well as a well-structured coding framework. The focus

group and individual interview transcripts were loaded as text files into NUD-IST. The complete list of all of the open codes used (See Figure 8) were grouped and organized by the candidate in ways that made sense according to both the economic and qualitative research the literature. These codes were then entered into NUD-IST's hierarchical coding array. Figure 9 illustrates how myriad open codes were organized by themes and categories using the inverted-tree structure of NUD-IST. After all of the codes developed for use in the initial open coding efforts were incorporated into the axial coding scheme, several additional transcripts were selected for axial coding. The axial coding of these additional transcripts revealed the need for some new codes that were placed in the appropriate place in the coding structure.

Following the advice of Maxwell (1996), the candidate began to test the planned data analysis methods well before finishing all of the coding. While able to retrieve instances in selected transcripts when a particular code or codes were used, NUD-IST unfortunately did not facilitate the type of in-depth analytical analysis desired for the dissertation. This discovery, while frustrating, did not negate the usefulness of NUD-IST in developing an axial coding scheme. After coding a few more transcripts to ensure that the coding scheme was complete, the candidate moved on to applying selective codes to all of the transcripts and building a database using Microsoft® Excel.

Selective Coding

The candidate developed a selective coding scheme that systematically related axial codes and categories and that fit the literature after he was satisfied with the axial coding scheme. "This final integration is not much different than axial coding. It is just done at a

Q.S.R. NUD.IST Power version, revision 3.0.4d GUI.
Licensee: Department of Sociology.

PROJECT: CHELEM, User Michael Kaplowitz, 4:12 pm, Nov 14, 1996.

```

(1) /Resource
(1 1) /Resource/Lagoon
(1 1 1) /Resource/Lagoon/Direct Use
(1 1 1 1) /Resource/Lagoon/Direct Use/Consumptive
(1 1 1 1 1) /Resource/Lagoon/Direct Use/Consumptive/Fishing
(1 1 1 1 1 1) /Resource/Lagoon/Direct Use/Consumptive/Fishing/Chivita
(1 1 1 1 1 2) /Resource/Lagoon/Direct Use/Consumptive/Fishing/Shrimp
(1 1 1 1 1 3) /Resource/Lagoon/Direct Use/Consumptive/Fishing/Sea Bass
(1 1 1 1 1 4) /Resource/Lagoon/Direct Use/Consumptive/Fishing/Crab
(1 1 1 1 1 5) /Resource/Lagoon/Direct Use/Consumptive/Fishing/Mullet
(1 1 1 1 2) /Resource/Lagoon/Direct Use/Consumptive/Wood
(1 1 1 1 3) /Resource/Lagoon/Direct Use/Consumptive/Livestock
(1 1 1 1 4) /Resource/Lagoon/Direct Use/Consumptive/forestry
(1 1 1 1 5) /Resource/Lagoon/Direct Use/Consumptive/agriculture
(1 1 1 1 6) /Resource/Lagoon/Direct Use/Consumptive/hunting
(1 1 1 2) /Resource/Lagoon/Direct Use/Nonconsumptive
(1 1 1 2 1) /Resource/Lagoon/Direct Use/Nonconsumptive/recreation
(1 1 1 2 2) /Resource/Lagoon/Direct Use/Nonconsumptive/tourism
(1 1 1 2 3) /Resource/Lagoon/Direct Use/Nonconsumptive/research
(1 1 1 2 4) /Resource/Lagoon/Direct Use/Nonconsumptive/navigation
(1 1 2) /Resource/Lagoon/Indirect Use
(1 1 2 1) /Resource/Lagoon/Indirect Use/flood control
(1 1 2 2) /Resource/Lagoon/Indirect Use/storm protection
(1 1 2 3) /Resource/Lagoon/Indirect Use/external support
(1 1 3) /Resource/Lagoon/Nonuse
(1 1 3 1) /Resource/Lagoon/Nonuse/existence
(1 1 3 2) /Resource/Lagoon/Nonuse/bequest
(1 2) /Resource/Gulf
(2) /Issues
(2 1) /Issues/Jobs
(2 2) /Issues/Alternatives
(2 3) /Issues/Agent
(50) /Question
(100) /Data
(100 1) /Data/Subjects
(100 1 1) /Data/Subjects/Gender
(100 1 1 1) /Data/Subjects/Gender/Female
(100 1 1 2) /Data/Subjects/Gender/Male
(100 1 2) /Data/Subjects/Age
(100 1 2 1) /Data/Subjects/Age/18-26
(100 1 2 2) /Data/Subjects/Age/26-36
(100 1 3) /Data/Subjects/Job
(100 1 3 1) /Data/Subjects/Job/Fisher
(100 1 3 1 1) /Data/Subjects/Job/Fisher/Open Sea
(100 1 3 1 1 1) /Data/Subjects/Job/Fisher/Open Sea/Octopus
(100 1 3 1 1 2) /Data/Subjects/Job/Fisher/Open Sea/Fish
(100 1 3 1 1 3) /Data/Subjects/Job/Fisher/Open Sea/Other
(100 1 3 1 2) /Data/Subjects/Job/Fisher/Lagoon
(100 1 3 1 2 1) /Data/Subjects/Job/Fisher/Lagoon/Chivita
(100 1 3 1 2 2) /Data/Subjects/Job/Fisher/Lagoon/Crab
(100 1 3 1 2 3) /Data/Subjects/Job/Fisher/Lagoon/Sea Bass
(100 1 3 1 2 4) /Data/Subjects/Job/Fisher/Lagoon/Mullet
(100 1 3 2) /Data/Subjects/Job/Painter
(100 1 3 3) /Data/Subjects/Job/Mason
(100 1 3 4) /Data/Subjects/Job/Factoryworker
(100 1 5) /Data/Subjects/Locale
(100 1 5 1) /Data/Subjects/Locale/Chelem
(100 1 5 2) /Data/Subjects/Locale/Chuburna
(100 1 5 3) /Data/Subjects/Locale/Progresso
(100 1 5 4) /Data/Subjects/Locale/Season
(100 1 6) /Data/Subjects/Intrvw-Type
(100 1 6 1) /Data/Subjects/Intrvw-Type/Group
(100 1 6 2) /Data/Subjects/Intrvw-Type/Individual
(100 2) /Data/Economic
(100 2 1) /Data/Economic/Fishing
(100 2 1 1) /Data/Economic/Fishing/Lagoon
(100 2 1 2) /Data/Economic/Fishing/Open Sea
(100 2 2) /Data/Economic/Factory

```

Figure 9. Sample Axial Coding Scheme

higher more abstract level of analysis” (Strauss and Corbin 1990, 117). The axial codes developed using NUD-IST were used as to construct a final set of “selective” codes. Because qualitative theory building was not the primary objective of the analysis and because information relative to economic valuation of natural resources was one of the research’s objectives, the final coding scheme focused on resource beneficiaries’ use, value, understanding, control, and scenario acceptance regarding the mangrove wetlands.

Excel Spreadsheet

The mechanics of going from open codes and axial codes to selective codes involved a several step process. First all of the transcripts were coded using the open and axial codes generated from analysis of the selected samples. In those instances that the coding scheme was deficient, new codes or categories were inserted. Once a transcript was coded, the results of this process were entered into a Microsoft® Excel workbook. Each code/category was given its own worksheet and the particulars of each transcript (e.g., interview type, number of respondents, locale, etc.) and a record of each instance of the presence of a particular code was recorded to classify responses in the Excel spreadsheet. Table 9 lists the 87 codes or responses categories used in the Excel file. Figure 5 illustrates an example of how the range of respondents’ comments were captured and codified using the axial classifications and the Excel file.

In total, the Excel file helped to track and organize the wide range of responses for roughly 90 categories of responses for more than 40 interviews. Each coding category recorded the range of comments for that code as well as the frequency for that type of comment for all the transcripts. After the open and axial codes, the range of responses, their frequencies, and other particulars were recorded in the Excel spreadsheet; further

Table 9. Categories of Responses in Excel Spreadsheet

Locale of Interview	Ciénaga changes b/c Puerto de Abrigo
Type of Interview	Ciénaga changes b/c DUMAC dikes
Sex of Participant(s)	Chivita
Age of Participant(s)	Typical day
Home Town of Participants	Chivita how one makes a living
Number of Participants	Chivita who makes their living
Length of Interview	Tourists attracted to Ciénaga
How people live here	Flamingoes
Fishing types	Tourists here
Do many fish	Tourism scenario
What else do people do	Flamingo scenario
What fish do they catch	Vacationers why come here
When do they fish where	Vacationers go to Ciénaga
Fewer fish now	Vacationers know Ciénaga
Sea v. Wetland for fishing, etc.	Vacationers changes over time
Compare locales	Hypothetical invest in tourism
Problems people face	Hypothetical if no Ciénaga
If no fish, what then	Hypothetical fill in Ciénaga
Best fish	Hypothetical develop Ciénaga
ciénaga names	Hypothetical support for fish farm
Ciénaga characteristics	Hypothetical factory and clean Ciénaga
Ciénaga increase fish	Hypothetical NGO clean
Ciénaga fish and stuff	Hypothetical factory and fill Ciénaga
Ciénaga what else important	Hypothetical 2 companies 1 clean Ciénaga
Ciénaga other species	Hypothetical 2 companies jobs v. clean
Ciénaga & seafish	Hypothetical NGO clean but contribute
Ciénaga future	Hypothetical 2 companies clean v. homes
Ciénaga if no Chivita	Hypothetical close Ciénaga
Ciénaga fishing	Hypothetical jobs v. access
Ciénaga conserve or convert for other things	Hypothetical close Ciénaga who gets hurt
Ciénaga benefits who	How make change
Ciénaga area productive	Believe plans for change
Ciénaga salt extraction	Who would you believe
Ciénaga wood extraction	Where would you meet
Ciénaga how viewed	Who controls roads
Ciénaga beautiful	Who controls garbage
Ciénaga non economic value	What about other areas
Ciénaga flood control	Restrictions on Ciénaga work
Ciénaga who controls it	Restrictions on certain species
Ciénaga who lives there	Restrictions how work
Ciénaga 1 st impression	Restrictions on octopus
Ciénaga conserve or fill for homes	Restrictions on octopus work
Ciénaga benefits if healthy	Interesting Notes
Ciénaga changes b/c Gilbert	Economic Data & Numbers

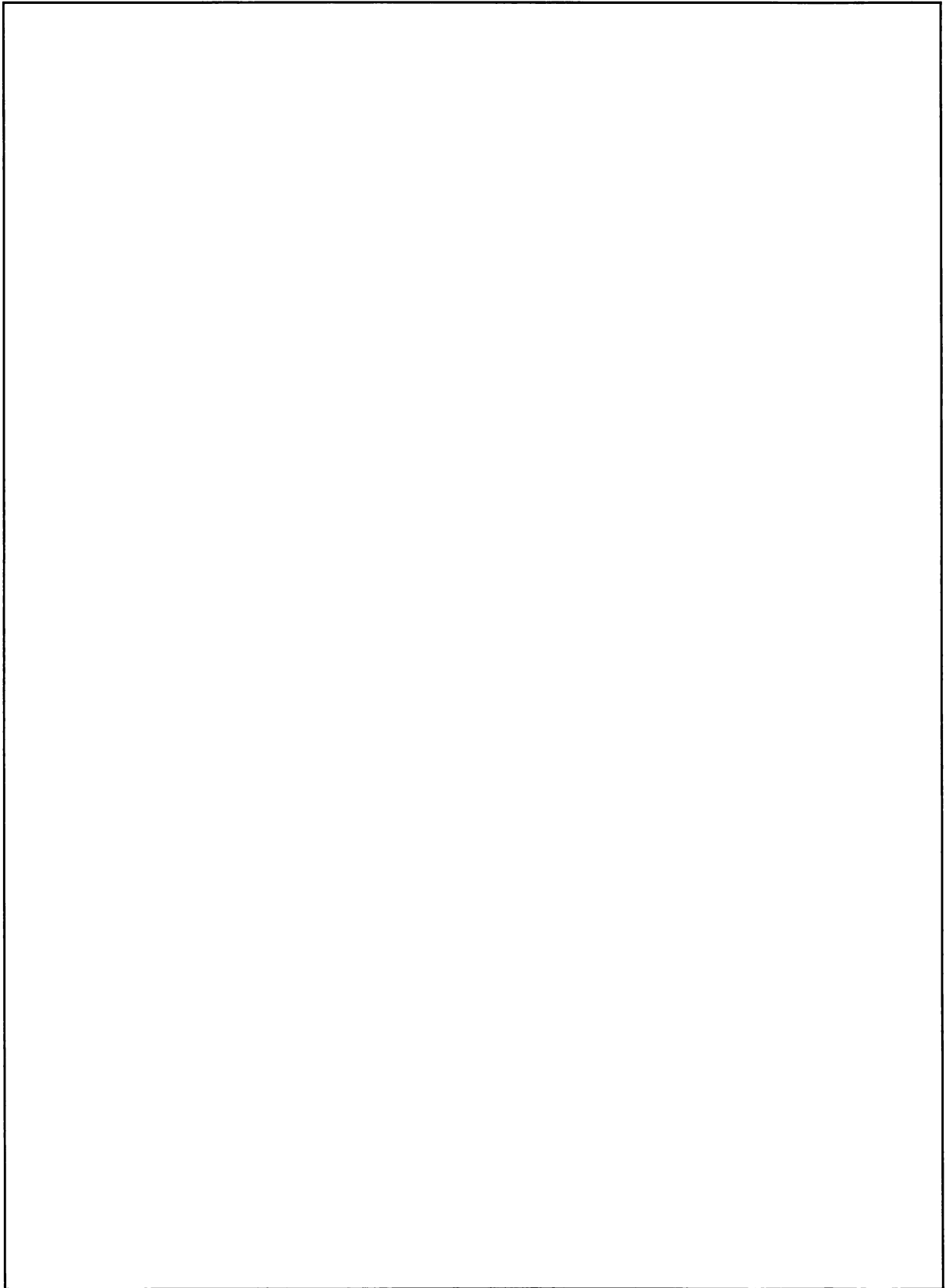


Figure 10. Sample Excel Category Worksheet

reduction and selective coding of the transcripts was undertaken using SPSS. The Excel file of axial codes provided a means for not only recording interesting findings, economic data, and comments of particular interest, it also allowed for the quantification of a wide range of responses. This database formed the basis for the final, selective coding scheme and helped support the data analysis later performed. By grouping the codes into theoretically consistent categories and by allowing multiple responses for each code (variable), the roughly 90 categories used in the Excel spreadsheet were able to be transformed into 36 codes (variables) in a SPSS database.

SPSS Database

The Excel database, representing the open and axial codes derived from the qualitative data, was subsequently used to derive the selective codes to be analyzed. To do this, the approximately 90 codes (some having as many as 20 response alternatives) were studied, rearranged, and regrouped into about 30 theoretically and contextually appropriate categories and response alternatives. Table 10 below summarizes the codes and respective meanings that were derived and selected. Appendix B lists the actual codes (variables) and response alternatives used in the SPSS data file. Appendix C is a copy of the final SPSS database used in the analyses which follows.

The process of code reduction, consolidation, and selection was time-consuming and difficult. Transcripts were re-examined to check the validity of the original codes and the accuracy of the selective coding scheme. While the ability to directly check the textual context of coded text was lost with the switch from the qualitative software packages of HyperRESEARCH and NUD·IST to Excel and SPSS, a distinct advantage in statistical analysis was gained. The use of transcript identification numbers with the Excel and SPSS

Table 10. SPSS Selective Code Summary

Code	Meaning
cclass	Who uses Ciénaga
Chivita	Chivita as resource
chwork	Chivita hard work
cname1-4	What do they call wetland
cpercep1-3	How they see wetland
cprod1-6	What products/stuff from wetland
cserv1-2	What services from wetland
ctrails1-4	What traits of wetland
duissue1-2	What issues w/ DUMAC
dumac	Mention DUMAC
fewfish1-3	Why few fish
fish1-6	What fish do people catch
fishloc1-3	Where do people fish
flam	Flamingoes here
gender	Gender of respondents
helptour	Would tourism help
howlive1-4	How do people live here
id	Transcript id number
improve1-3	How could people improve wetland
length	Length of transcript
locale	Locale of interview
nonmkt1-3	Nonmarket benefits of wetland
partic	Number of participants
problem1-4	Resource Problems
puerto	Reference to safe harbor
puertob1-2	Benefits associate w/ harbor
puertoh1-2	Harms associated w/ harbor
recreate	Recreation in wetlands
restoct1-2	How do restrictions on Octopus work
restric	Are there restrictions
restwork	Wetland restrictions could work
rwhat1-3 r	What is restricted
whynot1-3	Why don't restrictions work
safenet	Wetland a safety net
tourism	What about tourism
type2	Focus group or individual interview

databases however did provide a reliable method to identify the desired cases and extracts therefrom to illustrate a particular point or characteristic.

As Appendix B illustrates, each code had a range of alternative response categories. Some codes had either yes or no responses, while others had In the cases when more than one response category was present in a transcript, the additional response categories were recorded in sequentially numbered duplicate codes. For example, some interviews discussed as many as six different types of fish caught for subsistence or economic gain. Therefore, six fish codes numbered one to six, each with the full array of fish responses, were defined for use in the SPSS database.

This format of allowing and accounting for “multiple responses” under a single code (variable) permitted the full range of responses to be considered in the analysis. It help to avoid artificially or subjectively limiting the analysis of the data. Likewise, including data on each interview’s location (Chelém or Chuburná), respondent gender, and type (focus group or individual) allowed for systematic examination of the context effects and consistency of responses across gender, interview type, and locale. The SPSS database, while capturing the range and essence of the qualitative data with its selective coding scheme, facilitated the statistical analysis among and between various subsets of 31 transcripts totaling more than 500 pages.

ANALYTICAL TECHNIQUES

Lederman (1990) provides a highly useful classification of the range of analytical approaches for analyzing qualitative data. The dissertation specifically incorporates two of those methods into its data analysis. First, following the Strauss and Corbin (1990)

grounded theory approach, a set of selective codes were developed and applied to the data and a database was created. Second, the data was interpreted through intensive analytic techniques focused on the database derived in the previous step. This intensive analytic analysis relied to a great extent on frequency and cross-tabulation analysis.

Krippendorff (1980) describes analytical techniques as ways to further analysis, exploration, and discovery of patterns and relationships. According to Krippendorff, analytical techniques: help to summarize data and represent them so that they can be better comprehended; allow the discovery of patterns and relationships in the data as well as the testing of hypotheses; and enable the comparison of data obtained from different methods. The two primary analytical techniques discussed by Krippendorff are frequencies and cross-tabulations.

Multiple Response Variables

One of the inherent problems of using statistical analysis with coded qualitative data is that the codes and categories are not necessarily mutually exclusive. That is, there may well be more than one response to a “question” or more than one issue, idea, or concern raised by respondents when discussing a particular theme. As a result, the coding of qualitative data, if true to the nature of the data itself, does not usually allow for organization of the responses into only one discrete category per code. However, it is possible to capture qualitative data and codes as categorical variables called multiple response variables.

Multiple response items may be thought of as “questions” (using the survey research terminology) or themes (codes) that accommodate more than one response. Because variables in SPSS (and any database) can have only one value per case, a strategy

must be used that allows for representing multiple choices. That is, a number of variables must be defined in such a way that a number of values for each case can be treated as one multiple response variable.

For the dissertation, it was decided to define themes, ideas, and other items identified through the coding process as having more than one response per case as response multiple variables. To do this several database variables were defined for each theme (e.g., HowLive1, HowLive2, etc.) and each of these variables were defined to have the same range of possible categories of responses (e.g., 1=fishing, 2=masonry, 3=factory, etc.). This allowed the coded data to be entered into the SPSS database and did not require further data reduction or loss. The multiple category approach allowed for all of the related database variables (e.g., HowLive1, HowLive2, etc.) to be grouped together as one multiple response variable (e.g., \$HOWLIVE) that represented the original qualitative code or theme. These multiple response variables could then be analyzed using SPSS. Such an approach accommodated the sometimes wide-range of responses discovered during the focus groups and interviews without limiting the number of responses that could be attributed to a single case or a particular theme.

Because standard statistical tests should not be performed with variables that violate the necessary assumptions underlying such tests, multiple response variables are not tested using standard statistical tests such as chi-squared analysis. However, multiple response variables can be systematically studied by examining various counts and percentages. In other words, the frequencies and cross-tabulations of the multiple response and other variables can be used in the analysis of the underlying phenomena. Such types of analyses are displayed in tabular form (Rodeghier 1996). Therefore, the

analytical analysis of the selective codes and their possible response categories generated through the iterative coding process was undertaken by using multiple response frequencies and multiple response cross-tabulations.

Frequencies

The most common form of representing data, frequencies, serve primarily the summarizing function of data analysis. That is, the numbers of incidents found in the sample are recorded and available for comparison and analysis (Krippendorff 1980). Frequencies by themselves do not necessarily mean much. However, interpreted against several standards, analysis of frequencies can be instructive. Krippendorff (1980) categorized the several standards researchers usually have in mind when looking at frequencies as the standard of uniform distributions, the standard of stable distribution, and the standard of unbiased representation.

When a variable's frequency is found to be either larger or smaller than the average of other variables, attention is warranted because frequencies are assumed to be uniform, on average, among different variables. Likewise, frequencies are ideally stable over time. Therefore, changes in frequencies that correspond to differences that can be identified in treatments (e.g., time, context, etc.) give rise to further consideration because of the presumption that frequencies are stable. Finally, comparisons of frequencies of samples that are larger or smaller than expected from the population in its entirety must be evaluated by explicit justifiable comparisons.

Cross-Tabulations

“Many researchers consider cross-tabulations the core of data analysis because so much...data is nominal or ordinal. Cross-tabulations display the joint distribution of two or more categorical variables” (Rodeghier 1996). Cross-tabulations count the number of times various combinations of values of variables occur. Control variables can be used to allow for cross-tabulation analysis of three or more variables at once (Norušis n.d.).

Cross-tabulation of the frequencies of co-occurrences of the values of one variable and the values of another represent data in terms of the relations between variables (Krippendorff 1980). Cross-tabulations allow for the investigation of the relationships between two or more variables. In his discussion of the use of cross-tabulations in content analysis, Krippendorff (1980) pointed to the value of using cross-tabulations to not only explore the relationships of variables within a data set but also to validate the results. Likewise, he suggested validating the data of one data collection method (content analysis) with data collected using other data collection methods.

FRAMEWORK FOR DATA ANALYSIS

The selections of analytical tools should not be confused with, nor mistaken for, the objectives of the research project. The framework for analysis should relate to and reflect the objectives of the research effort. As discussed above, Krueger (1994) spelled-out four general objectives for doing qualitative data analysis: (1) finding the big ideas, (2) consideration of the choice and meaning of words, (3) appreciation of context effects, and (4) evaluation of the consistency of responses. With those objectives in mind, a framework for analysis was developed to examine the efficacy of the two qualitative

methods of learning how local beneficiaries perceive, use, and understand their shared mangrove ecosystem.

Recall the research design discussed in Chapter 3 illustrated as Figure 4 and reprinted below as Figure 11. The design used two different methods (focus groups and individual interviews) with two similar but distinct populations (Chelém and Chuburná) dependent upon the same ecosystem, to learn about resource use, understanding, and issues. This design, in addition to permitting an examination of the major ideas, concerns, and understandings of local beneficiaries, provided the opportunity to also consider the context and consistency of the qualitative data uncovered during the analytical data analysis. The frequency of responses could be examined and compared across methods, across locales, and across gender. This enabled the evaluation of possible context effects and provided a measure of the consistency and representativeness of the various responses.

Furthermore, by following Krueger's qualitative data analysis objectives, the candidate could identify the selective codes and their corresponding issues and themes that represented big issue and word meaning items of interest. Further examination of such codes facilitated the development of a better understanding of the reality of the local beneficiaries and provided a basis for comparing the relative strengths and weaknesses of the two qualitative methods. Analytically evaluating selected codes helped identify some of the similarities and differences regarding resource use and perception in the two villages. This understanding was supported by further analysis that accounted for the context (interview type) and consistency (across methods and villages) of responses.

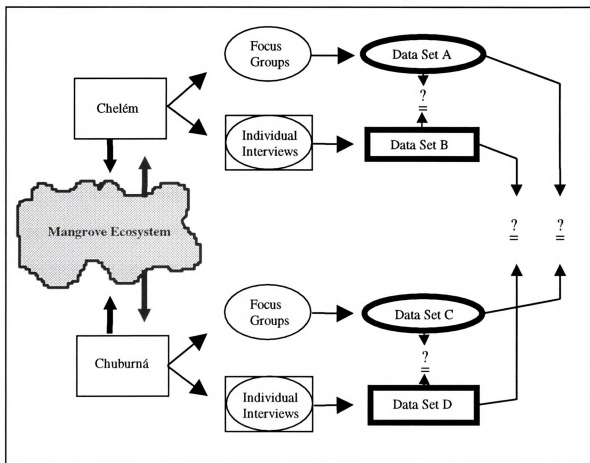


Figure 11. Research Design

The research design allowed for the examination of a variety of research hypotheses. This dissertation addresses a subset of the possible research questions. It is hypothesized that:

- (1) Focus groups yield similar information about environmental and natural resources to the information revealed from respondents using individual interviews within the same community.
(Referring to Figure 11, that $A = B$ and $C = D$);
- (2) Similar communities reveal similar information about common environmental and natural resources when focus groups are used.
(Referring to Figure 11, that $A = C$); and
- (3) Similar communities reveal similar information about common environmental and natural resources when individual interviews are used.
(Referring to Figure 11, that $B = D$).

The research design fit quite nicely with the qualitative data analysis framework suggested by Krueger (1994). That is, the selective codes and themes revealed by the focus group and individual interview data were used to both test the methodological hypotheses as well as meet the qualitative research objectives enumerated by Krueger (1994). Table 11 outlines the general framework used in the dissertation to meet the two-fold requirements of qualitative research analysis and the analytical analysis necessary to test the dissertation's research questions.

The framework used allowed for the candidate to explore the big ideas and word choices of respondents and also permitted consistency checks and evaluation of context effects that tested both the substantive and methodological hypotheses. This was done by comparing all of a code's categories for consistent response rates with the corresponding response rates by locale and by method. In other words, the distribution of responses in focus groups in Chelém for the \$HOWLIVE code (e.g., 1A_n) were compared to the

Table 11. Data Analysis Framework

		Big Idea				Word Choice
		How Live	Problems	Wetland Value	Resource Manage't	Wetland
Chelém	focus groups	1A _n	2A _n	3A _n	4A _n	5A _n
	individual interviews	1B _n	2B _n	3B _n	4B _n	5B _n
Chuburná	focus groups	1C _n	2C _n	3C _n	4C _n	5C _n
	individual interviews	1D _n	2D _n	3D _n	4D _n	5D _n

Note: n = each category option for each code

responses in individual interviews in Chelém (e.g., 1B_n) and with the responses for the \$HOWLIVE variable in focus groups in Chuburná (e.g., 1C_n). Similar comparisons were made with the individual interview data.

Comparisons of the data collected from the two communities using the two qualitative research methods allowed the researcher to both gain insight and understanding of local beneficiaries' view of mangrove ecosystem and test the efficacy of two qualitative research methods in a developing country.

RESULTS

The focus group and individual interviews revealed much about how local beneficiaries use, perceive, understand, and refer to their mangrove ecosystem. Certain themes were readily apparent after only a few focus group sessions; these included concern with the decrease in fishing productivity, a general distrust of the national government and its

projects, and a reliance, past and present, on the wetland ecosystem for survival. Other themes only became apparent to the researchers after conducting individual interviews. One in particular, local frustration with a Ducks Unlimited of Mexico, America, and Canada [DUMAC] project, only was brought up during the individual interviews in Chuburná..

During the focus groups and individual interviews, the candidate and his research assistants tried to note the words being used and the dynamics of the focus groups. It was apparent that the respondents had many different names for the ecosystem and its component parts. It was not uncommon for the same respondent to refer to the same species of fish by a Maya name, a common Spanish name, and a local Spanish name. Because the mangrove wetland itself was the subject of the study, attention was paid to the words people used to describe and call the wetland ecosystem. The more frequent names used for this area were wetland (ciénaga), estuary (ría), river (rio), and pond(s) (charcos).

Another general observation that was made at the time of conducting the focus groups and individual interviews concerned peoples' occupations. It seemed that virtually every male person referred to himself as a fisherman, relying on coastal or deep-sea fishing. However, further discussion often revealed that these same fishermen did not consider collecting chivita (a small shellfish) to be fishing but that they and their families spent a majority of their time collecting chivita in the wetland. With these observations and others, the candidate began the coding process described above as soon as the transcripts were finished and reviewed. The open, axial, and selective codes and their combinations were then entered into an SPSS database for analysis.

The results of the data analysis are, by necessity, limited to a subset of all possible combinations of variables and hypotheses. It is fair to say that more than 500 pages of transcripts can be coded in a variety of ways and that the instant effort is but one means for trying to understand the significance of what was learned. Furthermore, it represents only one of many possible ways to evaluate the relative strengths and weaknesses of using qualitative research methods in a developing country. To provide structure to the analysis, big issues or word meanings as described above are used as research foci. Doing so allowed for a systematic comparison of relative frequencies and cross-tabulation data of information learned from the two communities. This, in turn, allowed for some evaluative judgments as to the significance of apparent similarities and differences between what was learned in the two communities and the efficacy of the two research methods.

Selected “big ideas and themes”—how people live, problems people see, wetland value, and resource management—and “word meaning and use”—names for wetland—together with a look at gender differences are examined below. Each topic begins with a general discussion of the theme based on aggregate frequencies across communities, methods, and gender. Then the discussion moves to the cross-tabulation examination of the results broken down by interview type (focus group or individual) and locale (Chelém or Chuburná). Later the results will be analyzed in light of the research hypotheses.

HOW PEOPLE LIVE

The code (variable) \$HOWLIVE was designed to capture the range of respondents’ comments, characterizations, and ideas about how people in their area make a living. Originally, there were more than 15 open codes that in some way related to this theme.

The process of axial and selective coding allowed the creation of four categories that could accurately capture the range of responses—fishing, masonry/painting, work in Mérida/factories, and vacation season work. Another code, \$FISHLOC, was developed to capture respondents' comments on where they actually go fishing.

Two other variables are looked at under this theme—\$FISH and \$FORWHO. These variables tried to document comments on the types of fish caught by the resource beneficiaries and references to who uses the wetland. The idea that respondents see the wetland as a social safety net seems to have been well documented. However, one idea that seemed to pervade in all the qualitative research sessions that evaded coding was the sense that these communities have repeatedly learned how to survive in ever-changing natural resource and man-made circumstances.

Frequencies

Inspection of the frequencies associated with \$HOWLIVE, reported in Table 12, reveals that 100 percent of the focus groups and individual interviews identified fishing as the primary occupation. Less than half of the groups and interviews mentioned masonry or painting as an income source, with vacation season work mentioned by respondents in fewer than 40 percent of the transcripts. Factory work or commuting to Mérida was discussed in fewer than 20 percent of the interviews and only accounted for 10 percent of all responses.

Further analysis of the theme of how people live took place by noting where respondents reported doing their fishing. Table 13 lists the frequencies of the locations reported by respondents that they and their families fish. Respondents more or less

equally, and by a large majority, indicated that their fishing activities took place in the wetland and along the coast. Only 3 focus groups or interviews (12 percent) mentioned deep-sea fishing

The equal reliance on lagoon and coastal fishing is supported by analysis of the types of fish reported caught by the respondents. As Table 14 illustrates, the species reported caught most often, in 64 percent of cases, is the chivita, a small crustacean that is collected from the muddy bottom of Chelém Lagoon. The next most frequently caught species that was reported (61 percent of cases) was grouper, a sea dwelling fish. The other species receiving large percentages of responses followed the pattern of being split between lagoon and coastal species. Crab, shrimp, mojarra are caught in the lagoon while octopus, conch, and mullet are caught in coastal fishing.

In coding the transcripts, it was observed that on a number of occasions respondents discussed the wetland ecosystem, specifically the lagoon, as source of living for women and the poor. It was further observed that there were frequent references to the wetland providing subsistence to the communities. As a result, the code \$FORWHO was developed and used with all of the transcripts. Table 15 reports the frequencies of the occurrences the mention of the wetland as a social safety net and a place for women and the poor to earn a living. Interestingly, almost every transcript that mentioned the users of the wetland characterized the resource as providing some of a social safety net. In roughly half of the cases, women were singled out as the primary resource beneficiaries.

Table 12. How People Live

Category label	Count	Pct of Responses	Pct of Cases
Fishing	31	49.2	100.0
Masonry/Painting	14	22.2	45.2
Seasonal Work	12	19.0	38.7
Go to Mérida/Factories	6	9.5	19.4
	-----	-----	-----
Total responses	63	100.0	203.2
0 missing cases; 31 valid cases			

Table 13. Where People Fish

Category label	Count	Pct of Responses	Pct of Cases
coastal fishing	20	47.6	80.0
ciénaga fishing	19	45.2	76.0
deep-sea fishing	3	7.1	12.0
	-----	-----	-----
Total responses	42	100.0	168.0
6 missing cases; 25 valid cases			

Table 14. Fish Caught

Category label	Count	Pct of Responses	Pct of Cases
Chivita	17	17.5	70.8
Octopus	14	14.4	58.3
Grouper	14	14.4	58.3
Crab	11	11.3	45.8
Shrimp	9	9.3	37.5
Mullet	6	6.2	25.0
Mojarra	6	6.2	25.0
Conch	4	4.1	16.7
Sea Bass	4	4.1	16.7
Rubia	4	4.1	16.7
Lobster	3	3.1	12.5
Corvina	3	3.1	12.5
Parguitos	1	1.0	4.2
Squid	1	1.0	4.2
	-----	-----	-----
Total responses	97	100.0	404.2
7 missing cases; 24 valid cases			

Table 15. Wetland for Whom

Category label	Count	Pct of Responses	Pct of Cases
safety net	25	67.6	92.6
women	11	29.7	40.7
the poor	1	2.7	3.7
	-----	-----	-----
Total responses	37	100.0	137.0
4 missing cases; 27 valid cases			

Cross-Tabulations

Cross-tabulations allowed the further analysis of the various subgroups of research interest. Doing so facilitated the comparison of data obtained by different methods, within and between communities. To investigate whether the information on how people live in the research site learned during focus group (individual) interviews in Chelém and Chuburná, cross-tabulation analyses were performed.

First the variable \$HOWLIVE, representing “How People Live Here,” was examined by the locale (Chelém or Chuburná) of the interview and this data separated out by the data collection method (focus group or individual interview). The results of this cross-tabulation are reproduced in Table 16 and Table 17. While everybody mentions fishing as the way of life in the area, note how the distributions of responses differ. It seems that individuals more frequently mentioned reliance on seasonal work in individual interviews than during focus groups.

A similar analysis was performed for the code \$FISHLOC, which represented the locations where respondents mentioned they went to fish. The results of these cross-tabulations are reproduced in Table 18 and Table 19. Unlike the results of the \$HOWLIVE cross-tabulations, the \$FISHLOC cross-tabulations results appear to be substantially similar across methods, communities, and they are in line with the aggregate results reported in Table 13. People appear to equally rely upon coastal and wetland fishing for their livelihood.

Table 16. How People Live by Locale by Focus Group

\$HOWLIVE											
LOCALE	Count	I	Fishing	Masonry/	Go to		Seasonal			Row Total	
	Row	I		Painting	Mérida/		Work				
	pct	I			Factory						
		I	1	I	2	I	3	I	4		I
		-----+		-----+		-----+		-----+			
	1	I	7	I	5	I	2	I	2	I	7
Chelém		I	100.0	I	71.4	I	28.6	I	28.6	I	58.3
		-----+		-----+		-----+		-----+			
	2	I	5	I	2	I	2	I	0	I	5
Chuburná		I	100.0	I	40.0	I	40.0	I	.0	I	41.7
		-----+		-----+		-----+		-----+			
	Column		12		7		4		2		12
	Total		100.0		58.3		33.3		16.7		100.0
Percents and totals based on cases											

Table 17. How People Live by Locale by Individual Interview

SHOWLIVE											
LOCALE	Count	I	Fishing	Masonry/	Go to		Seasonal			Row Total	
	Row pct	I		Painting	Mérida/		Work				
		I			Factory						
		I	1	I	2	I	3	I	4		I
	-----	+	-----	+	-----	+	-----	+	-----	+	
	1	I	10	I	7	I	2	I	7	I	10
Chelém		I	100.0	I	70.0	I	20.0	I	70.0	I	52.6
		+	-----	+	-----	+	-----	+	-----	+	
	2	I	9	I	0	I	0	I	3	I	9
Chuburná		I	100.0	I	.0	I	.0	I	33.3	I	47.4
		+	-----	+	-----	+	-----	+	-----	+	
	Column		19		7		2		10		19
	Total		100.0		36.8		10.5		52.6		100.0
Percents and totals based on respondents											
31 valid cases; 0 missing cases											

Table 18. Fish Where by Locale by Focus Groups

\$FISHLOC									
LOCALE	Count	I coastal		deep-sea		ciénaga		Row Total	
	Row	I fishing		fishing					
	pct	I		I		I			
		I	11	I	12	I	13		
		I		I		I			
	-----+								
	1	I	5	I	1	I	5	I	6
Chelém		I	83.3	I	16.7	I	83.3	I	54.5
		-----+							
	2	I	4	I	0	I	4	I	5
Chuburná		I	80.0	I	.0	I	80.0	I	45.5
		-----+							
	Column		9		1		9		11
	Total		81.8		9.1		81.8		100.0

Percents and totals based on cases

Table 19. Fishing by Locale by Individual Interview

\$FISHLOC									
	Count	I	coastal	deep-sea	ciénaga				
Row	pct	I	fishing	fishing					Row
		I							Total
LOCALE		I	11	I	12	I	13	I	
		-----+		-----+		-----+		-----+	
	1	I	5	I	2	I	6	I	7
Chelém		I	71.4	I	28.6	I	85.7	I	50.0
		-----+		-----+		-----+		-----+	
	2	I	6	I	0	I	4	I	7
Chuburná		I	85.7	I	.0	I	57.1	I	50.0
		-----+		-----+		-----+		-----+	
	Column		11		2		10		14
	Total		78.6		14.3		71.4		100.0

Percents and totals based on respondents

25 valid cases; 6 missing cases

PROBLEMS PEOPLE SEE

During the discussions with the in-country experts about the problems being faced by the inhabitants of the Yucatecan coast near Progreso, the theme of population migration repeatedly came up. Many of the “experts” believe that the problems of the coastal area are a function of people moving to the coast from inland in search of a way to support themselves and their families. Interestingly, during the focus groups and individual interviews this theme came up. However, while people coming to the area to live is mentioned as one of the problems in the area, the more generic too many fishers is the reason given for there being so few fish to catch. Such a reason does not necessarily correspond with too much in-migration because the absence of regulations and the increase in commercial trawling fleet fishing were also major topics of discussion.

Frequencies

The code \$PROBLEM was designed to capture the nature of the problems identified by respondents. The six general groups of problems raised by respondents during their interview sessions were the decrease in coastal and fishing stocks, the increase in coastal migration, the construction of a DUMAC dike, unemployment, and the destruction of the local salt-extraction industry. As Table 20 illustrates, virtually all of the respondents (between 70-84 percent) talked about how bad the fishing had gotten in the both the sea and the lagoon. The next most frequent references were to people moving to the coast and to the DUMAC dike (33 and 29percent respectively).

Table 21 records the frequencies associated with respondents’ ideas on why there are so few fish today. The code \$FEWFISH tried to capture respondents’ ideas on why

there are fewer fish today. Although not necessarily mutually exclusive, the responses were grouped using six categories. The most frequent reason given was that there are too many fishers (70 percent of cases). However, respondents also mentioned the absence of regulations (40 percent of cases), the increase in the trawling fleet activity offshore (35 percent of cases), and the DUMAC project's negative impacts on the wetland's viability as a fishery (30 percent of cases).

Because the DUMAC project was only mentioned once in all of the focus groups and only really discussed by respondents in individual interviews, an effort was made to identify some of the problems associated with the project in the transcripts. The variable \$DUISSUE was developed for coding purposes. As Table 22 shows, while only 8 cases mentioned the DUMAC problem, the vast majority of those respondents blame the project for drying up the wetland (75 percent) and killing the fish in the wetland (75 percent). The other response, though only mentioned once, probably explains the stark economic reality of the project. Namely, only very few local people who are able to be hunting guides for the occasional duck hunter may see any gain from a project that is perceived by the majority of local people as hurting their well-being.

Table 20. What Problems Here

Category label	Count	Pct of Responses	Pct of Cases
Coastal fishing down	20	34.5	83.3
Lagoon fishing down	17	29.3	70.8
people coming here to live	8	13.8	33.3
DUMAC project	7	12.1	29.2
Unemployment	4	6.9	16.7
No more salt	2	3.4	8.3
	-----	-----	-----
Total responses	58	100.0	241.7
7 missing cases; 24 valid cases			

Table 21. Why Few Fish

Category label	Count	Pct of Responses	Pct of Cases
too many fishers	14	33.3	70.0
no regulations	8	19.0	40.0
trawling fleets	7	16.7	35.0
DUMAC project	6	14.3	30.0
weather	4	9.5	20.0
pollution	3	7.1	15.0
	-----	-----	-----
Total responses	42	100.0	210.0
11 missing cases; 20 valid cases			

Table 22. Problems with DUMAC Project

Category label	Count	Pct of Responses	Pct of Cases
drying up wetland	6	46.2	75.0
killing fish in ciénaga	6	46.2	75.0
only few guides gain w Ducks	1	7.7	12.5
	-----	-----	-----
Total responses	13	100.0	162.5
23 missing cases; 8 valid cases			

Cross-Tabulations

The cross-tabulations of the “problem” codes allowed for an examination of possible differences associated with interview method or location. First, the variable \$PROBLEM was examined. Table 23 and Table 24 breakdown the responses addressing the problems people see in the Chelém area by category, locale, and interview type. In general the responses are fairly consistent across communities and methods with the following exceptions. The loss of salt extraction was only raised in Chuburná (a center of the now defunct practice) and the DUMAC project being a problem was only mentioned in individual interviews.

Table 25 and Table 26 report the cross-tabulation of the \$FEWFISH variable by locale and interview type. It appears that the focus groups yielded different information with those respondents in Chelém focusing on the number of fishers competing for the diminishing resources. Two out of the three focus groups discussed the increase in trawling fleet activity and the number of people moving to the coast. These topics were not raised in the Chuburná focus groups. The other interesting result of the cross-tabulation of \$FEWFISH is the discovery that categories not mentioned during the focus groups were raised in both Chelém and Chuburná. For example, the DUMAC project, trawling fleets, too many fishers, and the absence of regulations were raised in individual interviews in Chuburná for the first time. Likewise, the absence of regulations was raised by 63 percent of the individual interviews while it had not been mentioned in the focus groups.

Table 23. Problems by Locale by Focus Group

\$PROBLEM													
LOCALE	Count	I	Coastal	Unemploy	No more	Lagoon	people	Row					
	Row pct	I	fishing	ment	salt	fishing	coming					Total	
		I	down			down	here						
		I	21	I	22	I	23	I	24	I	25	I	
	1	I	2	I	2	I	0	I	3	I	2	I	4
Chelém		I	50.0	I	50.0	I	.0	I	75.0	I	50.0	I	66.7
	2	I	1	I	2	I	1	I	2	I	1	I	2
Chuburná		I	50.0	I	100.0	I	50.0	I	100.0	I	50.0	I	33.3
	Column		3		4		1		5		3		6
	Total		50.0		66.7		16.7		83.3		50.0		100.0
Percents and totals based on cases													

Table 24. Problems by Locale by Individual Interview

\$PROBLEM													
LOCALE	Count	I	Coastal	No more	Lagoon	people	DUMAC						Row
	Row pct	I	fishing	salt	fishing	coming	project						Total
		I	down		down	here							
		I	21	I	23	I	24	I	25	I	26	I	
	1	I	10	I	0	I	5	I	4	I	1	I	10
Chelém		I	100.0	I	.0	I	50.0	I	40.0	I	10.0	I	55.6
	2	I	7	I	1	I	7	I	1	I	6	I	8
Chuburná		I	87.5	I	12.5	I	87.5	I	12.5	I	75.0	I	44.4
	Column		17		1		12		5		7		18
	Total		94.4		5.6		66.7		27.8		38.9		100.0
Percents and totals based on respondents													
24 valid cases; 7 missing cases													

Table 25. Why Few Fish by Locale by Focus Group

\$FEWFISH											
LOCALE	Count	I weather pollution trawling too many								Row Total	
	Row pct	I	fleets		fishers						
		I									
		I	1	I	2	I	3	I	4		I
		-----+	-----+	-----+	-----+	-----+	-----+	-----+			
	1	I	0	I	0	I	2	I	2	I	3
Chelém		I	.0	I	.0	I	66.7	I	66.7	I	60.0
		-----+	-----+	-----+	-----+	-----+	-----+	-----+			
	2	I	1	I	1	I	0	I	0	I	2
Chuburná		I	50.0	I	50.0	I	.0	I	.0	I	40.0
		-----+	-----+	-----+	-----+	-----+	-----+	-----+			
	Column		1		1		2		2		5
	Total		20.0		20.0		40.0		40.0		100.0

Percents and totals based on respondents

Table 26. Why Few Fish by Locale by Individual Interview

\$FEWFISH															
LOCALE	Count	I weather		polluted		trawling		too many		DUMAC		no		Row	
	Row	I		I		fleets		fishers		project		regula		Total	
	pct	I	1	I	2	I	3	I	4	I	5	I	6	I	
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+		
	1	I	2	I	1	I	1	I	8	I	0	I	5	I	8
Chelém		I	25.0	I	12.5	I	12.5	I	100.0	I	.0	I	62.5	I	53.3
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+		
	2	I	1	I	1	I	4	I	4	I	6	I	3	I	7
Chuburná		I	14.3	I	14.3	I	57.1	I	57.1	I	85.7	I	42.9	I	46.7
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+		
	Column		3		2		5		12		6		8		15
	Total		20.0		13.3		33.3		80.0		40.0		53.3		100.0
Percents and totals based on cases															
20 valid cases, 11 missing															

The DUMAC “problem” was further analyzed using cross-tabulations.

\$DUISSUE was examined by locale and by interview type as shown in Table 27 and Table 28. As those tables illustrate, the DUMAC issue, while known to some members of the Chelém, community, is an issue that almost every individual interviewed in Chuburná discussed and blamed for destroying the wetland and its fishery. It is also interesting to note that when the DUMAC issue was raised in the Chuburná focus group, it was raised in such a way that veiled the problem. As Table 27 indicates, the comments made in the group about the DUMAC project referred to the small number of people who might benefit from being hunting guides if the project worked according to plans. There was some mention that it was not working according to plans but no one voiced objections in the group like those raised in the individual interviews.

WETLAND VALUE

Since the genesis of the dissertation was a desire to improve economic valuation methods for nonmarket resources in developing countries, the candidate tried to pay particular attention to respondents’ comments that evidenced use and nonuse values associated with the mangrove ecosystem. The focus group moderator and the individual interviewers were instructed to try and get the respondents to discuss how they viewed and used the mangrove ecosystem. They were also instructed to use non-directive prompts to elicit as much information as possible without leading the respondents in a particular direction.

Most respondents expressed a great deal of reliance on the mangrove wetland for their subsistence. While characterizing themselves as fishing communities that live off of

Table 27. DUMAC Project by Locale by Focus Group

\$DUISSUE				
	Count	I only		
Row	pct	I few		Row
		I guides		Total
		I gain		
		I	4	I
LOCALE		-----+	-----+	
	2	I	1	I
Chuburná		I 100.0	I 100.0	
		+-----+		
	Column		1	1
	Total		100.0	100.0

Percents and totals based on respondents

Table 28. DUMAC Project by Local by Individual Interview

\$DUISSUE						
LOCALE	Count	I drying	killing			Row Total
	Row pct	I up	fish in			
		I wetland	wetland			
		I	0	I	1	
-----		+	-----	+	-----	+
1	I	1	I	0	I	1
Chelém	I	100.0	I	.0	I	14.3
		+	-----	+	-----	+
2	I	5	I	6	I	6
Chuburná	I	83.3	I	100.0	I	85.7
		+	-----	+	-----	+
Column		6		6		7
Total		85.7		85.7		100.0

Percents and totals based on cases

8 valid cases; 23 missing cases

the fruits of the sea, the villagers of Chelém and Chuburná revealed an almost year-round reliance on the fish and shellfish of Chelém Lagoon. The current economic crisis in Mexico and the absence of feasible alternatives made it difficult for the moderator and interviewers to explore nonuse values that local people may or may not have for the resource. It seemed that there was an overwhelming and understandable preoccupation of most respondents with the deteriorating ability of the mangrove ecosystem to support them and their families.

As a result of the iterative coding process, a variety of codes were developed for capturing responses under the theme of wetland value. \$CPROD attempted to capture references to goods respondents extracted from the wetland. \$NONMKT attempted to record instances that nonmarket goods were discussed. \$CSERV was designed to keep track of utterances that were concerned with wetland services. While \$CVIEW was used to record respondents' overview of the wetland in hopes of identifying evidence of nonuse or a domination of use values in respondents' discussions.

Frequencies

It was clear from the first interview that the big product of the wetland for the local resource beneficiaries was a small shellfish called chivita. As Table 29 illustrates 93 percent of the cases described chivita as a mangrove wetland resource. The next most frequently mentioned wetland good was crab. Crab is valued for its use as bait for octopus fishing. Throughout the year, people collect crabmeat to use and sell during octopus season. The other species mentioned mainly mullet, shrimp, bass, and mojarra, are much more sporadic.

Although flamingoes, by all accounts, only inhabit this locale for several months every couple years or so, local resource beneficiaries talked about the importance of the mangrove wetland as flamingo habitat. Discussions about flamingoes and their beauty were often hard to move away from. As Table 30 shows, 71 percent of the nonmarket goods mentioned by respondents were flamingoes. For most inhabitants of this region, ducks are not a source of food or livelihood. Therefore, talk about ducks in the nonmarket sense and seabirds were the next most frequently mentioned nonmarket goods that came through the interviews. The remainder of the nonmarket goods to receive mentions included endangered turtles, lizards, and parrots that inhabit the area. Market and nonmarket wetland services, in the traditional economic sense, were not addressed by every interview. However, almost 90 percent of respondents discussed the role of the mangrove wetland as providing a social safety net. A place where a family could turn to feed themselves when the weather for fishing in the sea was bad or there were no fish to be caught off-shore. As a result, \$CSERV was designed to measure such responses. Table 31 shows the overwhelming view expressed by respondents that the wetland provides a social safety net. It also shows that some respondents seem to value the storm protection afforded to their boats and others by having the mangrove lagoon in which to anchor their boats.

Finally, Table 32 documents the perceptions that the respondents expressed concerning the nature of the wetland. As would be expected with more than 88 percent of respondents articulating a view that the wetland is a social safety net, 80 percent of respondents spoke of the wetland as a source of their livelihood. Almost half of the respondents characterized the resource as being beautiful—some evidence of nonuse or

Table 29. Wetland Goods

Category label	Count	Pct of Responses	Pct of Cases
Chivita	26	29.5	92.9
Crab	15	17.0	53.6
Mullet	10	11.4	35.7
Shrimp	9	10.2	32.1
Bass	7	8.0	25.0
Salt but no more	6	6.8	21.4
Mojarra	3	3.4	10.7
wood	3	3.4	10.7
Corvina	3	3.4	10.7
crawfish	2	2.3	7.1
nothing	2	2.3	7.1
ducks	2	2.3	7.1
	-----	-----	-----
Total responses	88	100.0	314.3
3 missing cases; 28 valid cases			

Table 30. Nonmarket Goods

Category label	Count	Pct of Responses	Pct of Cases
Flamingoes	15	41.7	71.4
Ducks	7	19.4	33.3
Herons, gulls, & others	7	19.4	33.3
Turtles	3	8.3	14.3
Lizards	2	5.6	9.5
Parrots & others	2	5.6	9.5
	-----	-----	-----
Total responses	36	100.0	171.4
10 missing cases; 21 valid cases			

Table 31. Wetland Services

Category label	Count	Pct of Responses	Pct of Cases
social safety net	24	77.4	88.9
nothing bc DUMAC	4	12.9	14.8
storm protection (boats)	3	9.7	11.1
	-----	-----	-----
Total responses	31	100.0	114.8
4 missing cases; 27 valid cases			

Table 32. Wetland Perceptions

Category label	Count	Pct of Responses	Pct of Cases
Source of Livelihood	24	32.9	80.0
Beautiful	14	19.2	46.7
Threatened	13	17.8	43.3
Connected to Sea	11	15.1	36.7
System of Plants/Animals	11	15.1	36.7
	-----	-----	-----
Total responses	73	100.0	243.3
1 missing cases; 30 valid cases			

nonconsumptive use value. The other categories of this variable that were mentioned—threatened, connected to sea, and a system of plants and animals—illustrate a recognition of some of the changing characteristics of the resource.

Cross-Tabulations

When the wetland value variables were examined based on locale and interview type differences, an interesting pattern seemed to be revealed. It seems that, in general, for these variables, the information learned in the groups was more similar between communities than the information learned through the individual interviews. That is, groups of people from one village addressed in more or less the same frequency the same sets of information.

In examining the frequency of responses for people's view of the wetland (\$CVIEW) by locale and by interview method, Table 33 and Table 34 illustrate the similarities of the focus group information sets and the differences in the individual interview information sets between the two communities. That is, almost all of the same categories of ideas were addressed by methods (with the exception of wetland beauty), but their frequencies were noticeably different. This pattern is apparent in the other wetland value variables.

Table 35 and Table 36 examine the wetland service variable (\$CSERV) by locale and interview method. The big differences that were revealed by such analysis were not apparent when looking at the most frequently reported wetland service of providing a social safety net—a response mentioned in nearly all of the cases. However differences that may be associated with geographic location were revealed. Chelém is near the puerto

Table 33. Wetland Perception by Locale by Focus Group

\$CVIEW													
LOCALE	Count	I	Connect	System	Threat'd	Beauti-	Source	Row		Total			
	Row	I	to Sea	of Plant		ful	of Liv'g						
	pct	I		& Animls									
		I	1	I	2	I	3	I	5	I	6	I	
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Chelém	1	I	5	I	5	I	1	I	7	I	6	I	7
		I	71.4	I	71.4	I	14.3	I	100.0	I	85.7	I	58.3
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Chuburná	2	I	2	I	2	I	2	I	5	I	4	I	5
		I	40.0	I	40.0	I	40.0	I	100.0	I	80.0	I	41.7
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Column			7		7		3		12		10		12
Total			58.3		58.3		25.0		100.0		83.3		100.0
Percents and totals based on respondents													

Table 34. Wetland Perception by Locale by Individual Interview

\$CVIEW													
LOCALE	Count	I	Connect	System	Threat'd	Beauti-	Source	Row		Total			
	Row	I	to Sea	of Plants		ful	of Liv'g						
	pct	I		& Animls									
		I	1	I	2	I	3	I	5	I	6	I	
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Chelém	1	I	3	I	1	I	4	I	2	I	8	I	9
		I	33.3	I	11.1	I	44.4	I	22.2	I	88.9	I	50.0
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Chuburná	2	I	1	I	3	I	6	I	0	I	6	I	9
		I	11.1	I	33.3	I	66.7	I	.0	I	66.7	I	50.0
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----													
Column			4		4		10		2		14		18
Total			22.2		22.2		55.6		11.1		77.8		100.0
Percents and totals based on respondents													
30 valid cases; 1 missing cases													

Table 35. Wetland Services by Locale by Focus Group

\$CSERV							
LOCALE	Count	I	social	storm			Row Total
	Row pct	I	safety	protection			
		I	net				
		I	3	I	4	I	
-----+-----+-----+-----+							
Chelém	1	I	6	I	2	I	6
		I	100.0	I	33.3	I	60.0
	+-----+-----+-----+-----+						
Chuburná	2	I	4	I	0	I	4
		I	100.0	I	.0	I	40.0
	+-----+-----+-----+-----+						
Column			10		2		10
Total			100.0		20.0		100.0

Table 36. Wetland Services by Locale by Individual Interview

§CSERV							
LOCALE	Count	I	Social	storm	nothing		
	Row pct	I	safety	protection	bc		
		It			DUMAC		
		I	3	I	4	I	5
-----+-----+-----+-----+							
Chelém	1	I	9	I	1	I	0
		I	100.0	I	11.1	I	.0
+-----+-----+-----+-----+							
Chuburná	2	I	5	I	0	I	4
		I	62.5	I	.0	I	50.0
+-----+-----+-----+-----+							
Column			14		1		4
Total			82.4		5.9		23.5
							100.0

Percents and totals based on respondents

27 valid cases; 4 missing cases

de abrigo, safe harbor, leading from the sea to the wetland, Chuburná is further west. The lagoon is also much deeper in parts near Chelém than it is near Chuburná. In fact, since that construction of the DUMAC dike near Chuburná, there is no longer a direct passage way for seawater or boats from the sea to the lagoon. Furthermore, the general perspective in Chuburná as expressed above, is that the DUMAC project is drying up the wetland. These differences are apparent in the data reported in Table 35 and Table 36. Only people from Chelém mention storm protection as a service of the wetland and only residents from Chuburná mention DUMAC's destruction of the wetland as a useful resource.

A similar analysis of the wetland goods identified by respondents (\$CPROD) did not reveal such readily apparent disparities. However, Table 37 and Table 38 do reveal more similarities among the information learned in the focus groups in the two villages than the information learned in the individual interviews. It is also evident when focusing on the "salt no more," "nothing," and "wood" categories in the individual interviews that individual interviews in Chuburná revealed different sentiments about the goods of the wetlands from those interviews in Chelém.

RESOURCE MANAGEMENT

In exploring possible resource management approaches in use and acceptable to respondents, the candidate tried to have the respondents address avenues they viewed as helpful for wetland management in their area. One theme that came up was the possible use of restrictions (i.e., catch limits, seasons, and permits). This area of Mexico does have

Table 37. Wetland Products by Locale by Focus Group

Count Row pct	I	Shrimp	salt no more	Chivita	Mojarra	Mullet	Sea Bass	crawfish	Crab	ducks	wood	Row Total										
LOCALE	I	1	I	2	I	3	I	4	I	5	I	6	I	8	I	9	I	11	I	13	I	+
1	I	4	I	3	I	7	I	2	I	2	I	1	I	1	I	6	I	1	I	1	I	+
Chelém	I	57.1	I	42.9	I	100.0	I	28.6	I	28.6	I	14.3	I	14.3	I	85.7	I	14.3	I	14.3	I	+
2	I	2	I	2	I	5	I	1	I	3	I	2	I	1	I	4	I	1	I	1	I	+
Chuburná	I	40.0	I	40.0	I	100.0	I	20.0	I	60.0	I	40.0	I	20.0	I	80.0	I	20.0	I	20.0	I	+
Column	6	5	12	3	5	3	2	10	2	16.7	83.3	16.7	2	2	12	2	100.0	16.7	2	100.0	12	
Total	50.0	41.7	100.0	25.0	41.7	25.0	16.7	83.3	16.7	16.7	16.7	16.7	2	2	12	2	100.0	16.7	2	100.0	100.0	

Percents and totals based on cases

Table 38. Wetland Products by Locale by Individual Interview

Count	I	Shrimp	salt no	Chivita	Mullet	Sea Bass	Corvina	Crab	nothing	wood	Row								
Row pct	I	I	more	I	I	I	I	I	I	I	Total								
LOCALE	I	1	I	2	I	3	I	5	I	6	I	7	I	9	I	10	I	13	I
1	I	2	I	0	I	8	I	2	I	2	I	2	I	4	I	0	I	1	I
Chelém	I	25.0	I	.0	I	100.0	I	25.0	I	25.0	I	25.0	I	50.0	I	.0	I	12.5	I
2	I	1	I	1	I	6	I	3	I	2	I	1	I	1	I	2	I	0	I
Chuburná	I	12.5	I	12.5	I	75.0	I	37.5	I	25.0	I	12.5	I	12.5	I	25.0	I	.0	I
Column	3	1	14	5	3	5	3	5	2	1	16								
Total	18.8	6.3	87.5	31.3	25.0	4	18.8	31.3	12.5	6.3	100.0								

Percents and totals based on cases

28 valid cases; 3 missing cases

a functioning use restriction on coastal fishing for octopus. The octopus season, by all accounts, is strictly enforced by the authorities and observed by local fishers.

Everyone knows that octopus season begins in August and runs through early December. In fact, this lucrative fish is responsible for one of the problems previously identified by local beneficiaries—coastal migration. It seems that people from all over Mexico, many with no experience fishing or knowledge of how to swim, flock to the coast during octopus season to vie for a share of the catch. Unfortunately, there are virtually no other controls on the fishing effort, commercial or subsistence. Although a license for fishing on a commercial boat is required, many never even apply for such a license. The current state of affairs regarding fishery management has some Mexican marine ecologists concerned about the future of the coastal fishery. However, the season restrictions appear to be observed. Therefore, it was theorized that perhaps some type of use restrictions on the wetland might be acceptable to local beneficiaries for managing and maintaining the mangrove lagoon.

The other reoccurring problem raised by individuals in Chuburná was the DUMAC project. When the candidate had the opportunity to discuss this situation with Mr. Raul Lada, the president of Progreso municipality (roughly the county seat for Chuburná), he acknowledged that some discussions were ongoing concerning DUMAC. However, he referred me to his environmental attaché and noted that “experts” had been involved in the design and building of the project. The environmental attaché, later that day, met with the candidate and admitted that in theory the DUMAC dike system was a good idea. He explained that the dike should be operated in such a way as to control the amount of water entering and leaving the wetland. However, according to this minister, the project was

never completed and the ecological equilibrium of the wetland was destroyed. The minister explained how efforts were underway to ask DUMAC to repair the damage or allow the State to take control of the project.

Frequencies

In coding the data, the variable \$IMPROVE was developed to capture instances when respondents offered, described, and discussed various mechanisms for managing and improving their situation vis-à-vis the health of the mangrove wetland. The nature of their suggestions is tabulated in Table 39.

Table 39. How to Improve Wetland

Category label	Count	Pct of Responses	Pct of Cases
aquaculture (shrimp/crab/fish ponds)	12	40.0	54.5
use restrictions	6	20.0	27.3
Remove DUMAC	4	13.3	18.2
nothing will help	4	13.3	18.2
expert help/instruction	3	10.0	13.6
tourism	1	3.3	4.5
	-----	-----	-----
Total responses	30	100.0	136.4
9 missing cases; 22 valid cases			

Respondents overall voiced interest in the development of fish farms or other type of aquaculture as a way to improve their well being (55 percent of cases). In roughly one-third of the sessions respondents discussed the possibility of some sort of use restrictions to help maintain or improve the fishing in the mangrove lagoon. Interestingly, when improvement of the wetlands was discussed, several respondents (all in Chuburná) once again pointed-out their objections to and frustrations with the DUMAC project. In fact,

the candidate was told of a threat being made by the community to DUMAC via the President of the municipality that they remove the dike or it would be “blown-up.” Others expressed a sense of helplessness in identifying any mechanisms that might improve the health and well being of the mangrove ecosystem.

Since use restrictions are a classic change agent used in resource valuation scenario as well as policy studies, additional attention was paid to respondents’ discussions regarding fishing restrictions. As Table 40 illustrates, everyone is aware of the octopus restrictions with substantially fewer respondents mentioning some of the other existing use restrictions. The general consensus among respondents was that the only restriction that actually worked was the seasonal restriction on octopus. This is attributed

Table 40. What Restricted

Category label	Count	Pct of Responses	Pct of Cases
octopus	13	48.1	61.9
conch	7	25.9	33.3
shrimp (in wetland)	5	18.5	23.8
turtles	2	7.4	9.5
	-----	-----	-----
Total responses	27	100.0	128.6
10 missing cases; 21 valid cases			

to the stiff penalties (heavy fines and confiscation of property) and occasional enforcement. Most respondents knew a story of someone who had been caught catching or selling octopus out of season and receiving very heavy punishment.

However, when the discussions were steered toward the possibility of use restrictions being beneficial in the Lagoon, respondents uniformly voiced doubt about any such restrictions being enacted, much less being enforced. Some respondents pointed to the lack of enforcement of all the other prohibitions including the prohibition from fishing on or near the bridge (conduit) between the safe harbor and the lagoon. The candidate can attest to the fact that virtually around the clock people were fishing from the bridge and standing in the water with nets trapping all the fish and shellfish coming in or out of the lagoon through the only freely flowing passageway. This occurred despite warnings to the contrary posted all around the area. Other respondents pointed to the special relationship that local villagers had with the mangrove wetland. Some even mentioned the annual procession that some people took with an icon of Saint Mary from the local church around the lagoon in a colorfully adorned boat.

Table 41 records the responses for the \$RWHYNOT variable. This variable tried to capture responses that addressed why respondents thought that use restrictions in the mangrove lagoon would not work. After going through the iterative coding process, two categories of responses were arrived at—characterizations of the lagoon and access to it being essential for survival or disbelief that even if such rules could be enacted, they could not and would not be enforceable. The pervasive sentiment in the communities was that their survival depended upon free access to the wetlands and that no government could or would restrict their use of the wetlands.

Cross-Tabulations

The cross-tabulation analysis of the wetland management variables, in general, did not reveal marked differences. The exception was that the Chuburná interviews did not

Table 41. Why Wetland Restrictions Would Not Work

Category label	Count	Pct of Responses	Pct of Cases
subsistence/survival/no alternatives	16	66.7	76.2
lack of enforcement	8	33.3	38.1
	-----	-----	-----
Total responses	24	100.0	114.3
10 missing cases; 21 valid cases			

mention the possibility of use restrictions for improving resource management and they did emphasize the importance of removing the DUMAC project as a means for improving the mangrove wetland. Table 42 and Table 43 show that in group interviews, members of both communities seem to favor the introduction of some form of aquaculture. However, these conversations always seemed to coincide with a discussion of how the communities are poor, that they need expert help, and that this help must come from outside the community and rely upon funds from the “government” or elsewhere.

The cross-tabulation analysis of the \$RWHYNOT variable produced fairly uniform results across locales and across methods. As Table 44 and Table 45 illustrate below, in the focus group sessions more than 70 percent of the participants from Chelém and Chuburná identified both the importance of the wetland to the communities and the absence of enforcement as reasons restrictions would not work. In the individual interviews, respondents from both communities (more than 75 percent of the time) focused on the importance of the wetland for people’s survival as the reason for wetland restriction not to work or be implemented. The lack of enforcement was mentioned in fewer than 25 percent of the cases.

Table 42. Ways to Improve Wetland by Locale by Focus Group

\$IMPROVE												
LOCALE	Count	I aqua-		tourism	expert	use	nothing					Row
	Row pct	I culture			help	restr'n	will					Total
		I	1	I	2	I	3	I	4	I	6	I
		-----+		-----+		-----+		-----+		-----+		
	1	I	3	I	0	I	1	I	1	I	1	5
Chelém		I	60.0	I	.0	I	20.0	I	20.0	I	20.0	50.0
		-----+		-----+		-----+		-----+		-----+		
	2	I	5	I	1	I	1	I	1	I	1	5
Chuburná		I	100.0	I	20.0	I	20.0	I	20.0	I	20.0	50.0
		-----+		-----+		-----+		-----+		-----+		
	Column		8		1		2		2		2	10
	Total		80.0		10.0		20.0		20.0		20.0	100.0
Percents and totals based on respondents												

Table 43. Way to Improve Wetland by Locale by Individual Interview

\$IMPROVE													
LOCALE	Count	I aqua-	expert	use	Remove	nothing					Row		
	Row pct	I culture	help	Restr'n	DUMAC	will					Total		
		I	1	I	3	I	4	I	5	I	6	I	
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+			
Chelém	1	I	3	I	1	I	4	I	0	I	1	I	7
		I	42.9	I	14.3	I	57.1	I	.0	I	14.3	I	58.3
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+		
Chuburná	2	I	1	I	0	I	0	I	4	I	1	I	5
		I	20.0	I	.0	I	.0	I	80.0	I	20.0	I	41.7
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+		
	Column		4		1		4		4		2		12
	Total		33.3		8.3		33.3		33.3		16.7		100.0

Percents and totals based on respondents

22 valid cases; 9 missing cases

Table 44. Restrictions Would Not Work by Locale by Focus Group

\$RWHYNOT						
LOCALE	Count	I subsis-		lack of		Row
	Row pct	I tence/	I survival	I enforce-	I ment	
		I 1 I	I 3 I			Total
		-----+	-----+	-----+		
	1	I 3 I	I 3 I			4
Chelém		I 75.0 I	I 75.0 I			57.1
		+-----+	+-----+			
	2	I 2 I	I 2 I			3
Chuburná		I 66.7 I	I 66.7 I			42.9
		+-----+	+-----+			
	Column	5		5		7
	Total	71.4		71.4		100.0

Table 45. Restrictions Would Not Work by Locale by Individual Interview

LOCALE	Count	I subsis-		lack of		Row
	Row pct	I tence/	I survival	I enforc't		
		I 1 I	I 3 I			Total
		-----+	-----+	-----+		
	1	I 6 I	I 2 I			8
Chelém		I 75.0 I	I 25.0 I			57.1
		+-----+	+-----+			
	2	I 5 I	I 1 I			6
Chuburná		I 83.3 I	I 16.7 I			42.9
		+-----+	+-----+			
	Column	11		3		14
	Total	78.6		21.4		100.0

Percents and totals based on respondents
 21 valid cases; 10 missing cases

NAMES FOR WETLAND

As discussed above, not only is it one of the objectives of qualitative research to uncover the words people use and their meanings but it is elementary survey design methodology to use words and language that respondents and researchers both understand to mean the same thing. Therefore, the different names used in the Chelém Lagoon area to refer to the mangrove ecosystem seemed like an ideal theme for analysis. Not only would the research be able to help identify which words would be appropriate in subsequent studies, but respondents' word choice could be used in evaluating the efficacy of the two qualitative research methods.

The Yucatecan coastal area, like most of the peninsula, has a predominately Maya population. This influence and other cultural differences associated with the region made the candidate cognizant of the possibility of cultural barriers to effective communication. One of the reasons the research site was selected included the high degree of Spanish language speakers in the area. This enabled the candidate to directly converse with and listen to respondents. However, the prevalence of regional and local idiomatic expressions was a constant reminder that different words mean different things to different people. Because the mangrove wetland is important to the communities of Chelém and Chuburná, the coding procedure tracked the names used to refer to it. The variable \$CNAME was defined to measure the frequencies of the different references. Overall, four different categories for wetland names were used: *ciénaga* (wetland), *rio* (river), *ría* (estuary), and *charcos* (ponds). In English (and on some Mexican maps), the word lagoon (*laguna*) seems appropriate for the area. However, local people do not use that term very much.

Frequencies

As Table 46 illustrates, the vast majority of respondents refer to the mangrove ecosystem of Chelém Lagoon as *ciénaga* (wetland). More than half of the cases also used *ría* (estuary) and *rio* (river) to refer to the mangrove ecosystem. Other names, such as *charcos* (ponds), were used in less than 20 percent of the cases.

Table 46. Names for Mangrove Ecosystem (Chelém Lagoon)

Category label	Count	Pct of Responses	Pct of Cases
<i>ciénaga</i> (wetland)	27	38.6	87.1
<i>ría</i> (estuary)	20	28.6	64.5
<i>rio</i> (river)	18	25.7	58.1
<i>charcos</i> (ponds), etc.	5	7.1	16.1
	-----	-----	-----
Total responses	70	100.0	225.8
0 missing cases; 31 valid cases			

Cross-Tabulations

To better understand whether there were differences in name usage dependent on locale and to examine whether the data collection methods were a factor, cross-tabulation analysis of the \$CNAME variable were performed. As Table 47 and Table 48 show, there do seem to be differences in the two communities' word use as it relates to the mangrove ecosystem.

It seems that based on the focus group information (Table 47), the people of Chelém equally use the names *ciénaga*, *rio*, and *ría* to refer to the mangrove wetlands while the people of Chuburná prefer either *ciénaga* or *ría*. However, the individual:

interview data (Table 48) differs. There seems to be a preference in Chelém for the terms *ciénaga* and *ría*. While in Chuburná, the individual data seems to favor the use of *ciénaga* and *rio*.

GENDER DIFFERENCES

As previously discussed the research design to account for possible differences in the perspectives and realities of men and women in the study area. This was accomplished by composing the focus groups of people from the same village of the same gender and by individually interviewing men and women. The study's preliminary findings and the debriefing sessions with the focus group moderator and research assistants led to a consensus that the women's groups were yielding information substantially similar to that found in the male groups. Therefore, in light of the overall difficulty of recruiting participants of the study, the decision was made to relax the strict necessity of equal numbers of male and female groups and interviews.

In any event, systematic analysis of the focus group and individual interview data based on possible gender differences was undertaken. The limitations of cross-tabulation analysis of multiple response data only allow for a code (variable) to be examined in the context of no more than two other variables. Two codes (\$CNAME and \$PROBLEM) were selected for further examination regarding possible gender differences. This analysis is not meant to be dispositive of the presence or lack thereof of substantial gender differences. However, it is meant to demonstrate that some differences may (may not) be present and that this sort of layered analysis of data may be helpful in identifying some of those differences.

Names for Wetland by Gender

To look for possible gender differences in the words people use in the Chelém Lagoon area, a cross-tabulation analysis of \$CNAME by gender and locale was undertaken. The results of this analysis are illustrated below as Table 49 and Table 50. When the data are looked at this way, it seems as though the men and women of Chelém differ in their choice of names for the mangrove more than the men and women of Chuburná. That is, men in Chelém in two cases referred to the wetland as ponds (charcos) while the women there did not use that term. The data in Table 50 suggests that the men and women of Chuburná use the same terms for the wetland in roughly the same amounts.

The data was then looked at by cross tabulating the \$CNAME variable by gender and by interview method. In this way, it was hoped to detect differences that were correlated with the interview techniques used. The results of this analysis are reported below in Table 51 and Table 52. These results, while based on very small samples, seem more in line with the idea that the interview technique did not particularly favor or encourage more responses from men or from women. The range and frequencies of responses regarding the names used for the mangrove wetland are substantially similar when that \$CNAME variable is examined by gender for each of the two qualitative research methods.

Problems by Gender

Another attempt to detect differences between how men and women of the research area perceive of the mangrove ecosystem was undertaken with the cross-tabulation analysis of

Table 49. Names by Gender by Chelém

		\$CNAME									
		Count	I ciénaga		rio		ría		charcos		
		Row pct	I (wetland)		(river)		(estuary)		(ponds)		Row
			I		I		I		I		Total
			I	1	I	2	I	3	I	4	I
GENDER		-----	+	-----	+	-----	+	-----	+	-----	+
	0	I	4	I	5	I	3	I	0	I	5
female		I	80.0	I	100.0	I	60.0	I	.0	I	29.4
		+	-----	+	-----	+	-----	+	-----	+	-----
	1	I	9	I	5	I	10	I	2	I	12
male		I	75.0	I	41.7	I	83.3	I	16.7	I	70.6
		+	-----	+	-----	+	-----	+	-----	+	-----
	Column		13		10		13		2		17
	Total		76.5		58.8		76.5		11.8		100.0

Table 50. Name by Gender by Chuburná

		\$CNAME										
GENDER	Count	I		ciénaga		rio		ría		charcos		Row Total
	Row pct	I (wetland)		(river)		(estuary)		(ponds)				
		I		I		I		I		I		
		1	I	2	I	3	I	4	I			
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+			
female	0	I	4	I	2	I	3	I	2	I	4	
		I	100.0	I	50.0	I	75.0	I	50.0	I	28.6	
		+-----+										
male	1	I	10	I	6	I	4	I	1	I	10	
		I	100.0	I	60.0	I	40.0	I	10.0	I	71.4	
		+-----+										
	Column	14		8		7		3		14		
	Total	100.0		57.1		50.0		21.4		100.0		
Percents and totals based on respondents												
31 valid cases; 0 missing cases												

the \$PROBLEM variable. It was thought that perhaps, men and women differ in their view of what problems were of concern in the mangrove ecosystem.

Table 53 and Table 54 examine the problems raised by participants based on gender and locale. The small sample size makes it difficult to reach many conclusions. However, it does seem that there were some differences based on gender. Women of Chelém seem to be more concerned about the level of unemployment then the men of Chelém. While in Chuburná, the men had a larger list of problems facing the wetland ecosystem and communities then the problems raised by the women there. The women in Chuburná only mentioned three problem areas.

Table 55 and Table 56 look at the frequencies of the problems discussed by gender and interview type. Here the pattern seems to be that the focus groups of men and women each addressed the same categories in roughly the same frequencies. While, the individual interviews showed more diversity of responses for male then female responses, it can be said the responses for men and women from Chelém and Chuburná were substantially similar within each method of qualitative data collection.

Table 53. Problems by Gender by Chelém

		\$PROBLEM							
	Count	I Coastal	Unemploy	Lagoon	people	DUMAC		Row	
	Row	I fishing	ment	fishing	coming	project		Total	
	pct	I down	I	I down	I here	I			
		I 21	I 22	I 24	I 25	I 26			
GENDER		-----+							
female	0	I 3	I 2	I 2	I 1	I 0	I	4	
		I 75.0	I 50.0	I 50.0	I 25.0	I .0	I	28.6	
male	1	I 9	I 0	I 6	I 5	I 1	I	10	
		I 90.0	I .0	I 60.0	I 50.0	I 10.0	I	71.4	
		-----+							
Column		12	2	8	6	1		14	
Total		85.7	14.3	57.1	42.9	7.1		100.0	

Table 54. Problems by Gender by Chuburná

\$PROBLEM													
Count	I	Coastal	Unemploy	No more	Lagoon	people	DUMAC						
Row pct	I	fishing	ment	salt	fishing	coming	project	Row					
	I	down			down	here		Total					
	I	21	I	22	I	23	I	24	I	25	I	26	I
GENDER	----	+	----	+	----	+	----	+	----	+	----	+	----
0	I	2	I	0	I	0	I	1	I	0	I	1	I
female	I	100.0	I	.0	I	.0	I	50.0	I	.0	I	50.0	I
	+	----	+	----	+	----	+	----	+	----	+	----	+
1	I	6	I	2	I	2	I	8	I	2	I	5	I
male	I	75.0	I	25.0	I	25.0	I	100.0	I	25.0	I	62.5	I
	+	----	+	----	+	----	+	----	+	----	+	----	+
Column		8		2		2		9		2		6	
Total		80.0		20.0		20.0		90.0		20.0		60.0	

Table 56. Problem by Gender by Individual Interview

\$PROBLEM												
	Count	I	Coastal	No more	Lagoon	people	DUMAC					Row
	Row pct	I	fishing	salt	fishing	coming	project					Total
		I	down	I	down	here	I			I		
		I	21	I	23	I	24	I	25	I	26	I
GENDER		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	
	0	I	4	I	0	I	2	I	0	I	1	I
female		I	100.0	I	.0	I	50.0	I	.0	I	25.0	I
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	
	1	I	13	I	1	I	10	I	5	I	6	I
male		I	92.9	I	7.1	I	71.4	I	35.7	I	42.9	I
		-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	-----+	
Column			17		1		12		5		7	
Total			94.4		5.6		66.7		27.8		38.9	
Percents and totals based on respondents												
24 valid cases; 7 missing cases												

ANALYSIS OF RESULTS

The foregoing results provide an analytical basis to understand what the data from the Chelém Lagoon focus groups and individual interviews say. Furthermore, the results allow the testing of the research hypotheses. A system of data reduction and comparison as well as some uniform decision-making rules were used to accomplish the dual objectives of the study—learn from local people about the mangrove wetland and test the efficacy of two different qualitative research methods.

FRAMEWORK AND ANALYSIS

Because of the number of cases, variables, and response categories, some systematic method was needed to translate the results discussed above into a research frame that allowed analysis of the research questions. Recall that the data analysis framework discussed above and illustrated in Table 11 required a disaggregation of the data and a

comparison of the results, by theme, across methods and across communities. To accomplish this task, the results above for the primary variables of each theme were compiled in the Table 58 through Table 68.

In order to make evaluation and analysis of the results possible, as well as to allow a test of the several hypotheses, tables were constructed that summarized and highlighted the results for each principle variable. These tables were designed to allow for easy visual comparisons of the results by locale, interview method, and range of response categories. Because the number of valid cases varied for each variable, it was decided to report response frequencies both as the percentage and actual number of responding cases. In order to differentiate the results and allow for evaluation, the presentation of the results were subject to a number of possible treatments. As Table 57 illustrates, focus group results are differentiated from individual interview results by being shaded gray; categories that received response rates of 50 percent or more are bolded and boxed; and categories that were not raised by any cases are left blank.

Table 57. Data Comparison Key

<u>50% or more</u> of cases raised response category		BOLD %
<u>Less than 50%</u> of cases raised response category		normal %
<u>No cases</u> raised the response category		
Focus Groups:	Chelém	A
	Chuburná	C
Individual Interviews	Chelém	B
	Chuburná	D

The decision to categorize response rates into three categories ($\geq 50\%$, $< 50\%$, and no response) was based on the understanding that well-regarded qualitative researchers and research often use relatively few interviews to derive their data and findings—Krueger (1994) recommends the use of three focus groups as a rule of thumb; Weiss (1994) recognizes the validity of some qualitative studies with only one respondent; and Morgan (1997) believes that between three and five groups are usually adequate. A guiding principle of qualitative research is to stop interviewing at the point of “saturation”—“the point at which additional data collection no longer generates new understanding” (Morgan 1997, 56). Therefore, significant differences in the responses among the interviews are all that can reasonably be used for comparison. Whether an item was discussed at all during an interview is significantly different from interviews that make no mention of that idea. Likewise, if an item is mentioned in a majority of interviews (i.e., $\geq 50\%$), it probably can be differentiated from those items mentioned in other interviews but to a lesser extent (i.e., $< 50\%$). The goal here was not to decide which items were necessarily more important but rather to differentiate the level and breadth of information learned using the two methods.

Nine variables representing the five themes under investigation were selected for the analysis just described. These variables and their summarized results are described below. After the results and findings of the data comparisons are presented, the data is then used in the following section to test the dissertations’ research hypotheses.

How People Live

As Table 58 illustrates, the overwhelming response about how people live in the Chelém Lagoon area was fishing. However, Table 58 does highlight some interesting differences

between the methods and the communities. In Chelém, for example, it seems that both methods result in the same range of responses with similar frequency. However, in Chuburná, aside from the fishing responses, the focus groups addressed a wider range of responses than the individual interviews. Interestingly, the focus groups in Chuburná did not refer to seasonal work while the individual interviews did discuss such seasonal work.

Table 58. How People Live Data Comparison

		Fishing		Masonry		Go to Mérida		Seasonal Work	
		%	#	%	#	%	#	%	#
Chelém	A	100%	7	71%	3	29%	2	29%	2
	B	100%	10	70%	7	20%	2	70%	7
Chuburná	C	100%	5	40%	2	40%	2		
	D	100%	9					33%	3
Aggregate		100%	31	45%	14	19%	6	39%	12

31 valid cases, 0 missing cases

The second variable examined under the theme of how people live in the Chelém Lagoon area was the information that people provided about where they fish. Table 59 compares the data obtained for this variable. It is no surprise that respondents address coastal fishing and lagoon fishing almost the same. This is true in focus groups and individual interviews in both communities. What does stand out are the references to deep-sea (commercial) fishing in both focus group and individual interviews in Chelém and the complete absence of any mention of deep-sea fishing in the interviews in Chuburná.

Table 59. Where People Fish Data Comparison

		Coastal Fishing		Deep-Sea Fishing		Lagoon Fishing	
		%	#	%	#	%	#
Chelém	A	83%	5	17%	1	83%	5
	B	71%	5	29%	2	86%	6
Chuburná	C	80%	4			80%	4
	D	86%	6			57%	4
Aggregate		80%	20	12%	3	76%	19

25 valid cases, 6 missing cases

Typical Comments

Fishing....Some women take buses to Progreso and Mérida to work in the factories....They work in factories to support their families....There are no sources of work here except fishing and masonry work....Some people collect chivita. (ID# 16)

We fish in sea for octopus....When the season is over or there is bad weather or there are no fish, we fish in wetland....Now, most of the time, we fish for chivita in the wetland. (ID# 17)

Mostly fishing, when the weather is bad we fish in the wetland....Some people can get part-time work delivering soda, working in restaurants, or clearing land. (ID# 20)

Fishing....There used to be salt but that is no more....The fishing is very hard now, people go out for days and do not even make enough to cover their costs....Sometimes we can collect chivita but DUMAC closed the passage way on us and now there are few chivita. (ID# 31)

Problems People See

To address the information learned using the two methods about the problems people see affecting themselves and the mangrove ecosystem, further investigation and comparison of the results for the \$PROBLEM and \$FEWFISH variables were undertaken. Table 60 illustrates the comparison of response rates for the various categories of problems cited by respondents. The range of problems mentioned in both communities in the focus groups and in the individual interviews was the same within methods. That is, focus groups (individual interviews) addressed the same three (four) issues with the same frequency in both Chelém and Chuburná. The differences made clear in Table 60 are that individual interviews revealed more information (about a controversial project) than did focus groups.

Table 60. Problems Data Comparison

		Coastal Fish Down		Lagoon Fish Down		People Coming		DUMAC Project	
		%	#	%	#	%	#	%	#
Chelém	A	50%	2	75%	3	50%	2		
	B	100%	10	50%	5	40%	4	10%	1
Chuburná	C	50%	1	100%	2	50%	1		
	D	88%	7	88%	7	13	1	75	6
Aggregate		83%	20	71%	17	33	8	29	7

24 valid cases, 7 missing case

Further analysis of the “problems here” theme was undertaken looking at respondents’ beliefs and ideas about why there are fewer fish to catch. Table 61 illustrates

how when it came to respondents offering suggestions as to the reason or reasons behind the fall-off in fishing productivity, the different communities had different ideas and that the different methods also were associated with different responses. It seems that the focus groups elicited many fewer reasons for fishing productivity and that these reasons were discussed by a majority of the groups from that community. On the other hand, individual interviews addressed wider ranges of reasons for fishing declines. For example, the absence of fishing regulations was not addressed as a possible reason for poor fishing in the focus groups of either community. Yet, regulations were discussed in almost half of the interviews in Chuburná and over two-thirds of the interviews in Chelém.

Table 61. Declining Fish Population Data Comparison

		Weather		Pollution		Trawlers		Too Many Fishers		DUMAC Project		No Reg's	
Chelém	A					67%	2	67%	2				
	B	25%	2	13%	1	13%	1	100%	8			63%	5
Chuburná	C	50%	1	50%	1								
	D	14%	1	14%	1	57%	4	57%	4	86%	6	43%	3
Aggregate		20%	4	15%	3	35%	7	70%	14	30%	6	40%	8

20 valid cases, 11 missing cases

Typical Comments

Now, you can't make a profit more than 2-3 months from fishing, that's why we do carpentry, mason work, etc.....The same problem is also happening in the estuary, it used to be that you could take all the crab, chivita you wanted. Now only the small ones are around. (ID# 18)

En Rio Lagartos [a distant coastal biosphere reserve] they have plenty of fish and lobsters, they don't even collect their chivita....Here is close and easy for people, not like there which is hidden....They have conservation, here everything can be taken....Unlike Rio Lagartos, there is much demand and competition here. (ID# 23)

We have problems with experts....the DUMAC project, they said, would maintain the flow of water and fish, but they closed the flow of water and fish off. Now there are no fish, no chivita, no wetland....we need to open the DUMAC dike so we can live, live from the wetland. We must undo what DUMAC has done. (ID#29)

DUMAC built a flood-gate (dike) and told the village that it would function well, but no, it doesn't work....Because of DUMAC, the wetland's water is too low, too hot, and the mud is too hot. All the chivita and crab are killed. (ID# 34)

Too many people are coming from other villages to live and survive here....Too many people go fishing and take even the small fish, and grouper during their breeding season, they kill females and sell the eggs instead of letting them reproduce....Now there are too many boats...there used to be 50-70 boats here, now there are times when there are 1000-1200. (ID# .36)

Overexploitation, too many people are catching fish at night and during the day, they exploit these animals at night, in the afternoon, and in the morning, the animal are beginning to pay the price, like the story says, all rivers run dry....People have closed of the only way water can pass into the wetland under the bridges. They put many nets there and the fish cannot pass in and out....The overexploitation, they take every fish! (ID# 39)

Wetland Value

It was clear from practically the first interview that the inhabitants of Chelém and Chuburná value the mangrove wetland. To examine the data for indications of differences that could be attributable to the locales or methodologies, the results of the \$CVIEW and \$CSERV variables were tabulated. Table 62 shows that with the exception of referring to the wetland's beautify, the focus groups and individual interviews addressed the same range of topics. Interestingly, the individual interviews in Chuburná, while identifying the wetland as an income source, differed from the focus groups there. It seems that all of the

groups in Chuburná addressed the beauty of the wetland while the individuals emphasized the threatened nature of the wetland and did not mention the ecosystem's natural beauty at all.

Table 62. Perception of Wetland Data Comparison

		Connect to sea		Ecosystem		Threatened		Beautiful		Source of living	
Chelém	A	71%	5	71%	5	14%	1	100%	7	86%	6
	B	33%	3	11%	1	44%	4	22%	2	89%	8
Chuburná	C	40%	2	40%	2	40%	2	100%	5	80%	4
	D	11%	1	33%	3	67%	6			67%	6
Aggregate		37%		37%		43%		47%		80%	

30 valid cases, 1 missing cases

The other wetland value variable examined with the data comparison table was the variable capturing responses referring to services provide by the wetland. It was apparent from previous analysis of this variable that respondents uniformly characterized the wetland as providing a social safety net for the villagers. Table 63 illustrates that regardless of data collection method or locale, the overwhelming view of the wetland is as a source of support and sustenance for local inhabitants. The dominance of the DUMAC project for the inhabitants of Chuburná was once again made apparent in Table 63.

Table 63. Wetland Services Data Comparison

		Safety Net		Storm Protection		None b/c DUMAC	
		%	#	%	#	%	#
Chelém	A	100%	6	33%	2		
	B	100%	4				
Chuburná	C	100%	9	11%	1		
	D	63%	5			50%	4
Aggregate		89%	24	11%	3	15	4

27 valid cases, 4 missing cases

Typical Comments:

While husbands try to work elsewhere, the women sustain their families with chivita from the wetland. (ID# 18)

The men go out to sea to fish sometimes for 15 days. And if they don't give or have money because they have many children, the women are obligated to go collect chivita to sell and survive until the men return and give them money. (ID# 10)

The fish are down, the chivita are way down. Because too many people are going in and the area is not getting any rest....The wetland is our resource, we must protect it our community and place for people to make a living. (ID# 32)

When there was bad weather, we would live from the wetland....Fish would enter when there was high tide but now there is no water, it is not sufficient....Before the DUMAC dike, we dedicated ourselves to collecting chivita, before there was free flow of water...the sea and the estuary were connected....when we did not have fish in the sea, we went to the river and fished....DUMAC's dike has affected us gravely. (ID# 34)

Chivita are the source of livelihood for the village, if they are taken away or disappear, how are people going to live. They are the only thing that sustains some people and families. (ID# 37)

Resource Management

The variables \$IMPROVE and \$RWHYNOT was examined using the data comparison tables to see if information learned from the participants concerning resource management revealed similarities and differences based on locale or data collection methods. Table 64 illustrates the substantial similarities between the results learned from the individual interviews and focus group interviews in Chelém. However, the range of information

Table 64. Wetland Improvement Data Comparison

		Aquaculture		Tourism		Expert help		Restrict Use		Nothing c/b done		Remove DUMAC	
		%	#	%	#	%	#	%	#	%	#	%	#
Chelém	A	60%	3			20%	1	20%	1	20%	1		
	B	43%	3			14%	1	57%	4	14%	1		
Chuburná	C	100%	5	20%	1	20%	1	20%	1	20%	1		
	D	20%	1							20%	1	80%	4
Aggregate		55%	12	5%	1	14%	3	27%	6	18%	4	18%	4

22 valid cases, 9 missing cases

uncovered in Chuburná about possible ways to improve the wetland was very different as between the focus groups and individual interviews. For example, aquaculture received more responses in focus groups both in Chelém and Chuburná. Yet individual interviews in Chuburná once again seemed to focus on the DUMAC issue and not mention alternatives to improving the wetland.

The examination of the data on why respondents did not think that use restrictions would work to protect and manage the mangrove ecosystem is illustrated below in Table 65. Regardless of method or locale, the overwhelming sentiment expressed by the participants from both Chelém and Chuburná was that restrictions would not and could not be put in place because the wetland provided a much needed way of life, a source of subsistence, and the key to their survival; despite the fact that 20 percent of the focus groups and over 50 percent of the individuals interviewed in Chelém discussed using restrictions as a way to improve the wetland. Another interesting point illustrated by

Table 65. Restriction Enforcement Efficacy Data Comparison

		Survival/ Subsistence/ Way of Life		No Enforcement of Rules	
		%	#	%	#
Chelém	A	75%	3	75%	3
	B	75%	6	25%	2
Chuburná	C	67%	2	67%	2
	D	83%	5	17%	1
Aggregate		76%	16	38%	8

21 valid cases, 10 missing cases

Table 65 is that focus groups more often articulated the sentiment that rules and regulations of the wetland would not and could not be enforced. This response rate

differed by almost a factor of three from the response rate of individual interviewees voicing doubt about the enforcement of such rules.

Typical Comments:

During the shrimp period, the navy tries to stop fishing for shrimp [prohibited in Lagoon and near shore]....When the word is out that there are shrimp everybody goes fishing for them, and sell a kilo or two that they get. (ID# 16)

We could use fish-ponds or nurseries....individuals could have their own shrimp/crab farms....But we couldn't agree, there is too much politics involved....people would support and encourage aquaculture, but we would need permission from many different government agencies, and we would need money. (ID# 17)

The community would not accept any restrictions....Maybe, if it was the law, people may be angry but they would obey, like octopus....but there is so much corruption like the shrimp regulation. Even though there is a law against it, we still fish for shrimp, we have to....Chivita could be regulated by closing a part of the wetland and guarding it....a season would only work if there were guards, and they are subject to corruption....The village doesn't have anything to eat, people search all day for 2 kg of chivita to make up to 20 pesos. If restricted one would have to find a way to eat meat, pork, every second day. Now, no one can do that. (ID#18)

I am 72 years old and I sleep little. My work is to think of why the coast is dying out....People are working hard, with hunger, with cold, and they collect 2 kg of chivita....If fishing in the river is prohibited, people will take to robbery. What will happen will be that the government will have to put us all under guard, the police and military would be the winners. (ID# 23)

Some people have already tried to undertake an aquaculture project. They closed off an area and placed live "shrimp larvae" in there only to have some other people take the shrimp. (ID# 27)

Problem, because so many depend on collecting chivita, there isn't a season. When there are bad times (weather, etc.) in the sea, everybody focuses on fishing in the river. (ID# 33)

Thinking about prohibitions on chivita, there are many people that are dedicated only to that one activity all year. If there is a prohibition on chivita, how are these people going to live, can you imagine how those people that depend entirely on chivita are going to live? (ID# 39)

Names for Wetland

Because word use and meaning are important to good survey research design and qualitative research, the name people in the Chelém Lagoon area use to refer to the mangrove ecosystem were examined. Table 66 lists the four categories of names used by respondents and their corresponding frequencies by locale and interview method. It is obvious that the vast majority of respondents used the term *ciénaga* (wetland) to refer to Chelém Lagoon and the mangrove ecosystem. The other three names reveal differences that may be a function of geographic differences. In Chelém, both individual interviews and focus groups produced similarly response rates for the four names. However, it does seem that in individual interviews the term *rio* was used slightly less frequently. Yet in Chuburná, the responses rates for the term *rio* and *ría* are opposite for focus groups and individual interviews. Both methods reveal the use of another term (*charcos*) but neither method nor locale seems to use that term with considerable frequency.

Table 66. Names for Wetland Data Comparison

		Ciénaga (wetland)		Rio (river)		Ría (estuary)		Charcos (ponds)	
		%	#	%	#	%	#	%	#
Chelém	A	71%	5	71%	5	71%	5	14%	1
	B	80%	8	50%	5	80%	8	10%	1
Chuburná	C	100%	5	40%	2	100%	5	40%	2
	D	100%	9	67%	6	22	2	11%	1
Aggregate		87%	22	68%	18	65%	20	16%	5

31 valid cases, 0 missing cases

Gender Differences

As discussed earlier, within the dissertation efforts are made to address possible gender differences. These efforts include conducting focus groups made-up of only women as well as making efforts to qualitatively interview women in both communities.

Table 67 and Table 68 depict the summary data for the \$CNAME and \$PROBLEM variables by gender and locale. Note the shading in these tables does not correspond with the interview type used to learn the underlying data. Responses made by women are shaded gray while those made by men are not. In this way, the comparison of data learned from men and women may be made more easily.

Table 67. Names by Gender Data Comparison

		Ciénaga (wetland)		Rio (river)		Rfa (estuary)		Charcos (ponds)	
		%	#	%	#	%	#	%	#
Chelém	♀	80%	4	100%	5	60%	3		
	♂	75%	9	42%	5	83%	10	17%	2
Chuburná	♀	100%	4	50%	2	75%	3	50%	2
	♂	100%	10	60%	6	40%	4	10%	1
Aggregate		87%	22	68%	18	65%	20	16%	5

31 valid cases, 0 missing cases

Table 67 reveals substantial similarities in the names that the men and women of the area use. It is worth mentioning that the women in the two communities seem to have

more similarities in name usage than do the men. For the men of Chelém, the second most recorded wetland name was *ría* while the men of Chuburná seemed to prefer the term *rio*.

Examining the data summaries associated with the cross-tabulation of \$PROBLEM by gender and locale did not reveal unexpected insights. Men and women, regardless of interview type (focus or individual) identified that indeed there were some differences between women's and men's responses. It seems that men mentioned more problems that were negatively affecting the ecosystem than those discussed by women.

Table 68. Problems by Gender Data Comparison

		Coastal Fishing Down		Unemploy't		No More Salt		Lagoon Fishing Down		People Coming to Area		DUMAC Project	
		%	#	%	#	%	#	%	#	%	#	%	#
Chelém	♀	75%	3	50%	2			50%	2	25%	1		
	♂	90%	9					60%	6	50%	5	10%	1
Chuburná	♀	100%	2					50%	1			50%	1
	♂	75%	6	25	2	25	2	100%	8	25%	2	63%	5
Aggregate		83%	20	17%	4	8%	2	71%	17	33%	8	29%	7

24 valid cases, 7 missing cases

TEST OF HYPOTHESES

In order to test the hypotheses that: (1) focus groups produce the same data as individual qualitative interviews, (2) that focus groups from two similar communities will produce similar data, and (3) that individual interviews will produce similar information from two

similar communities, the results of the data comparisons were summarized and tabulated by theme, variable, and hypothesis. Some decision-making rules were invoked in order to make this analysis possible. Because the qualitative research methods are supposed to help researchers learn about the realities of the observed rather than the observer, the decision was made to measure the substantial similarities and differences in the information learned using the two methods.

Table 69 was developed to reduce the data to a form that could be used to test the various hypotheses. As previously discussed, the basic unit of analysis was the category of responses for each particular variable under investigation. Each category of response captured and catalogued the characteristics of participants' contributions to the various discussions of the research foci. The absence of information was recorded as another way to measure the relative strength of the two methods to reveal or encourage respondents to reveal such information.

For example, if the focus group interviews revealed a category of information relating to a particular theme or variable its "magnitude" was noted. If the two methods' categories were of the same magnitude (i.e., both $\geq 50\%$ or $< 50\%$ but positive), then such a match was deemed to be a positive indication of the similarity of information learned by the use of both of the methods. That is, when $A_1 = B_1$, a "yes" was recorded. In cases when similar categories of responses were raised by both methods but they were of

different magnitudes (e.g., one was $> 50\%$ and the other $< 50\%$) or one method did not reveal any information for that particular category they were classified as negative indications of the two methods' similarity of information acquisition. That is, when $A_1 \neq B_1$, a "no" was recorded.

Table 69. Data for Hypothesis Tests

				Focus Groups = Ind. Int. ?		FG in CLM = FG in CBA?		Int in CLM = Int in CBA?				
				Yes	No	Yes	No	Yes	No			
				A _n =B _n	A _n ≠B _n	A _n =C _n	A _n ≠C _n	B _n =D _n	B _n ≠D _n			
				C _n =D _n	C _n ≠D _n							
Theme	Variable	n	Locale									
Life Here	How Live	4	Chelém	3	1	2	2	1	3			
			Chuburná	1	3							
	Where Fish	3	Chelém	3	0	2	1	2	1			
			Chuburná	2	0							
Problems Here	Problems	4	Chelém	2	2	4	0	3	1			
			Chuburná	2	2							
	Why Few Fish	6	Chelém	1	4	0	4	3	3			
			Chuburná	0	6							
Wetland Value	Wetland Value	5	Chelém	2	3	3	2	3	2			
			Chuburná	3	2							
	Wetland Service	3	Chelém	1	2	2	0	1	1			
			Chuburná	1	2							
Resource Mang't	Improve Ideas	6	Chelém	2	2	4	1	2	3			
			Chuburná	1	5							
	Restrict'n Work	2	Chelém	1	1	2	0	1	1			
			Chuburná	1	1							
Words & Meaning	Name	4	Chelém	4	0	2	2	3	0			
			Chuburná	2	2							
Totals by Variable per village		9		Y	N	T	Y	N	T	Y	N	T
			Chelém	3	3	3						
			Chuburná	2	4	3						
Overall Aggregate		9		2	3	4	6	1	2	4	2	3

When it came time to aggregate and evaluate the total number of positive and negative matches, some decision had to be made about the instances when there were equal numbers of positive and negative response category totals. These ties were separately recorded, so as to accurately measure the methods information acquisition power. However, such ties were not treated as evidence that the two methods revealed the same information. It would be more prudent to treat them as the opposite, examples of the two methods not necessarily revealing the same information. Therefore, the ties should be treated as not supporting the hypotheses that the two methods and their application in similar communities help to reveal the same information.

Focus Groups = Individual Interviews

One of the research hypotheses was that focus group interviews would yield the same or similar information about people's understanding, use, and beliefs about shared natural resources as qualitative individual interviews. Using the research framework for analysis developed for the dissertation, this hypothesis would be supported if the information learned about a theme was similar under the two methods. To determine that, Table 69 counted the coincidences of the frequencies of each particular response category for each variable. Doing so, allowed the testing of whether the information set learned with focus groups in a community (e.g., A_n and C_n) were the same as the information set learned using individual qualitative interviews (e.g., B_n and D_n).

As Table 70 illustrates, the information learned in each community using the focus groups could not be considered to be substantially the same as the information learned in that community using individual qualitative interviews. There were only two instances

that clearly supported the hypothesis, three rejections of the hypothesis, and 4 ties or ambiguous cases. Because the objective of undertaking qualitative research, or any research for that matter, is to learn information otherwise unknown to outsiders, ambiguous results (i.e., ties) should probably be viewed as not supportive of the hypothesis. In any event, the first research hypotheses, was not supported by the evidence.

Table 70. Hypothesis 1: $A_n = B_n$; $C_n = D_n$

THEME	VARIABLE	YES	NO	TIE
LIFE HERE	How live			1
	where Fish	1		
PROBLEMS HERE	problems			1
	few fish		1	
WETLAND VALUE	wetland value			1
	wetland service		1	
RESOURCE MANAGEMENT	improve		1	
	Restrict NG			1
WORDS	Name	1		
DOES A = B; C = D?		2	3	4

Focus Groups in Different Villages

The second research hypothesis was that the information learned about a shared natural resource from focus groups conducted with people in one community would be substantially similar to the information learned in focus groups with people from a similar community also sharing that particular resource. To place this in terms of the research

framework, focus group information sets from Chelém 1 (e.g., A_n) were theorized to be substantially similar to the information sets from Chuburná (e.g., B_n). To help determine whether or not the data learned in the focus groups conducted as part of the dissertation either supported or did not support this hypothesis, the data was summarized about in Table 69. This data is used below in Table 71 to test the second research hypothesis of the dissertation.

Table 71. Hypothesis 2: $A_n = C_n$

THEME	VARIABLE	YES	NO	TIE
LIFE	How live			1
HERE	where Fish	1		
PROBLEMS	problems	1		
HERE	few fish		1	
WETLAND	wetland value	1		
VALUE	wetland service	1		
RESOURCE	improve	1		
MANAGEMENT	Restrict NG	1		
WORDS	Name			1
DOES $A_n = C_n$?		6	1	2

The data seems to support the hypothesis that focus groups conducted in similarly situated communities can produce substantially similar information sets. There were six instances where the information sets learned in focus groups in Chelém were substantially similar to the information learned in focus groups in Chuburná. There was only one outright rejection of the hypothesis and two ambiguous ties. Regardless of whether or not

the ties were treated as rejections of the hypothesis, the data supports the dissertation's second research hypothesis. It seems that focus groups conducted in different communities that share a common resource and socioeconomic characteristics will produce substantially similar sets of information about the shared resource.

Individual Interviews in Different Villages

The third research hypothesis of the dissertation was that individual qualitative interviews produced substantially the same information when conducted in two communities that shared the same natural resource. That is, it was hypothesized that the information sets acquired from conducting individual qualitative interviews in Chelém would be substantially similar to the information learned from individual qualitative interviews in Chuburná.

Table 72. Hypothesis 3: $B_n = D_n$

THEME	VARIABLE	YES	NO	TIE
LIFE	How live		1	
HERE	where Fish	1		
PROBLEMS	problems	1		
HERE	few fish			1
WETLAND	wetland value	1		
VALUE	wetland service			1
RESOURCE	improve		1	
MANAGEMENT	Restrict NG			1
WORDS	Name	1		
DOES $B_n = D_n$?		4	2	3

Following the method already discussed above, Table 72 was developed to facilitate testing the third hypothesis. While the results of this test at first seem to support the hypothesis, a closer look reveals less positive interpretations. It is true that in four variables, the individual interviews in Chelém produced substantially similar information as the information learned with such interviews in Chuburná. However, a majority of the information that was revealed using individual qualitative interviews did not support the hypothesis; that is, there were two instances of outright rejections of the hypothesis and three instances in which the results have to be considered inconclusive, at best. In light of these findings, it would be imprudent to conclude that the hypothesis that individual qualitative interviews in one community yield substantially the same information as individual qualitative interviews in a similarly situated community.

E C O N O M I C D A T A

Throughout the field research component of the dissertation evidence of economically relevant sources of value associated with the mangrove ecosystem was readily apparent in speaking with the people of the Chelém Lagoon area. As the foregoing analysis of the qualitative data reveals, people of Chelém and Chuburná articulated some use and nonuse values they associate with the ecosystem. Equally clear were peoples' apprehension about the health of their fisheries and their economic circumstances. This was evidenced by the predominance of responses identifying the increasing difficulties in both coastal and lagoon fishing. Also, the many comments expressing the role of the wetland as a social safety net and a source of livelihood for the coastal inhabitants underscore the importance of the wetland in the local subsistence economy. In an attempt to develop some measure of what

the economic value of the mangrove wetland might be, a focused analysis of the transcript data was performed.

QUALITATIVE RESEARCH DATA

Vaughn, Schumm, and Sinagub (1996) have pointed to research studies that support the notion that focus groups and qualitative interviews can produce data that is consistent with survey research data. They assert that focus groups can be used to collect data that are as reliable and valid as data collected using traditional survey questionnaires.

One example of the comparability of data from qualitative research methods and quantitative research methods is the 1978 shopping study of Reynolds and Johnson. Reynolds and Johnson (1978) conducted an item by item analysis of food shopping and preparation in an effort to test and compare the accuracy and reliability of focus group data. They compared the findings of a quantitative survey of people about their grocery store purchases and food preparation with their findings from a series of focus groups on the same topics. They found that there was a 97% correspondence in findings of the surveys and the findings of the focus groups. Reynolds and Johnson did find one major difference between the two sets of findings, the responses on baking products. Interestingly, based on later sales figures, the purchases of baking items was more accurately revealed (predicted) by the focus group data than by the survey answers.

The candidate, in an effort to derive some, albeit partial, measure of the economic value of the wetland, coded the data so that responses and comments that might be useful in such an analysis could be recorded, retrieved, and used. After reviewing all of the transcripts and the coded data therein, it became apparent that the primary use of the

mangrove resource was the collection of chivita. Furthermore, it was also apparent from the data that many respondents had volunteered catch rates and prices associated with the collection of chivita. As a result, it was decided to collect, analysis, and use this data to develop a partial estimate of the economic value of the mangrove resource to the communities of Chelém and Chuburná.

VALUE OF CHIVITA

Chivita were the most mentioned and discussed product associated with the Chelém Lagoon. More than any other product, respondents from Chelém and Chuburná talked about the importance of chivita to them and their communities. When groups or individuals mentioned the collection of chivita, the focus group moderator and individual interviewers tried in a nondirective manner to encourage participants to discuss how they went about collecting the shellfish, how much they usually collected in a typical day (i.e., quantity), and how much they received for their catch (i.e., price). This data, as mentioned, was subsequently coded for later retrieval and use.

Table 73 illustrates a summary of some of the “economic” data revealed by respondents during focus groups and individual interviews. Fourteen sessions specifically discussed the current state of chivita fishing and expected catch rates. Many of these discussions were framed in terms of comparisons of the current difficulties to the much better catches in recent history. However, only those estimates that reflected current chivita collection experience were used.

Table 73. Chivita Data

Variable	n	low	high	mean
Chivita (KG/day)	14	.5	4	1.8
Price (Pesos/KG)	8	5	10	7.9

As Table 73 illustrates, the range reported of chivita collected per working day ranged from a few 0.5 kilograms to as many as 4 kilograms. Many respondents spoke about being able to easily collect more than 10 kilograms during good times. While discussions of the current market price for chivita revealed a seasonality to chivita prices, many respondents gave a range of chivita prices that reflected the then relatively average price being paid for chivita.

It should be remembered that the potentially lucrative octopus season runs from mid-August through late-November. That is approximately 4 months. While chivita and other lagoon species are continued to be collected during Octopus season, most men focus on octopus fishing, if they can. This is not true for the women of the area who report collecting chivita to sustain their families while their husbands, if they are married, go to fish in the sea. In any event, it is fair to assume that the lagoon is heavily relied upon for about 8 months of the year. While chivita are not they only species harvested from the lagoon, it may be assumed that they represent a significant portion of the lagoon's direct consumptive use value. Chivita were not only were mentioned more than other species, but their collection does not require any special skills or equipment. Additionally, parents can bring their children along with them to help with the chivita collection.

Of course, the productivity of chivita collection has cycles. However, no one, including the scientists at CINVESTAV studying chivita has a good idea of chivita breeding activity, productive zones, or other life cycle data. Therefore, for now, it will be assumed that the current levels of chivita collection will remain at their current rates. This assumption may lead to an estimate of value that will have to be adjusted as fishing productivity data changes. For now, it will be assumed that people in the region may continue to collect the same amount of chivita per day for the near-future.

CHIVITA COLLECTION SEASON (no chivita collected during octopus season)	
8 month chivita season	
x 24 working days/month	
192 collecting days	
x 1.8 kg chivita/day	
346 kg/season	
x 7.9 pesos/kg	
2,733 pesos/household per chivita season	
or	
± \$ 390* per household per chivita season	
CHIVITA COLLECTION YEAR-ROUND	
[12 months @ 24 collection days]	
4,095 pesos/household per year	
or	
± \$ 585* per household per year	
AGGREGATE ANNUAL VALUE TO CHELÉM & CHUBURNÁ	
[±600 households]	
Excluding Octopus Season	Year-Round Collection
1,639,800 pesos per year	2,457,000 pesos per year
or	or
± \$ 234,257* per year	± \$ 351,000* per year
* Exchange rate of 7 pesos per dollar	

Figure 12. Wetland Use Value Estimate

With the data learned with the qualitative research methods , illustrated in Table 73, and the foregoing assumptions, a rough estimate of the value of a major use value of Chelém Lagoon was estimated. The average daily chivita catch reported in focus groups and individual interviews was 1.8 kilograms and the average price paid per kilogram was 7.9 pesos. The qualitative data supports the assumption that family members work on average 6 days collecting chivita. Therefore, as Figure 12 illustrates, this data can be used to estimate an aggregate and household mangrove use value.

According to the rough estimate, the communities of Chelém and Chuburná derive benefits use benefits from the Chelém Lagoon of approximately \$230,000 to \$350,000 dollars annually. It may be more instructive to look at the per household estimates. It is estimated that a family, relying on the lagoon for chivita collection year-round, can earn more than \$580 dollars per year and that a family can earn \$390 dollars per year from chivita if they devote 4 months to octopus fishing.

The findings are significant, especially when compared to the Mexican minimum wage of \$2 dollars (14 pesos) per day paid at factories in Progreso and Mérida. Working 6 day a week, every week of the year, a factory worker would earn about \$576. People in the area report being able to earn, on average, much more than that collecting chivita. Some reasons cited for this: (1) to take a job in a factory, one must deal with an unreliable, time-consuming, and costly system of public transportation; (2) employees can not work as much as they want or as much as the factories demand of them; (3) factory workers have to pay for meals and other necessities associated with going to work in the factories. As it was stated during one focus group interview,

Between collection chivita and factory work, chivita is harder. The benefit of chivita work is that much of it can be done at home. You don't have to pay for transportation and the food you eat. (ID #16)

Therefore, the use of qualitative research methods can do more than help outsiders learn important data about how and why local research beneficiaries use, understand, refer to, and value environmental and natural resources. Focus groups and individual qualitative interviews can reveal some baseline economic data that can be used by itself or in conjunction with other policy making and economic valuation efforts.

CHAPTER 5

CONCLUSION

The dissertation examined some of the advantages and disadvantages of using focus group and individual qualitative interviews for designing economic valuation studies. Economic valuation studies, including contingent valuation studies, are increasingly being used in developing countries to assist decision makers with policies that impact environmental and natural resources. Contingent valuation survey questionnaires, like other survey research instruments, require well-crafted and well-implemented questionnaires to generate reliable and valid data. The dissertation evaluated two qualitative research methods—focus groups and individual interviews—that are increasingly used by sociologists and other survey practitioners for designing and testing survey-based research.

S U M M A R Y

To evaluate the relative efficacy of two different qualitative methods for helping outsiders learn how local resource beneficiaries use, think about, value, and refer to their environmental and natural resources, a modified 2 x 2 research design was developed. Separate focus groups and individual interviews were conducted with members from the villages of Chelém and Chuburná. Both of these communities are located along the same 24 kilometer stretch of coast of the littoral basin called Chelém Lagoon. Chelém Lagoon is a mangrove wetland that, among other things, supports both coastal and lagoon fishing.

The data collected in the focus groups and individual interviews was then systematically analyzed. Using transcripts of the focus groups and individual interviews, a coding procedure following the ground theory approach of Strauss and Corbin (1990) was applied to the data. Successive iterations of open, axial, and selective coding efforts using qualitative software programs HyperRESEARCH and QSR NUD•IST produced a database of the transcripts, thematic variables, and response categories. The frequencies of the variables and response categories as well as their cross-tabulations were then examined by defining and subsequently analyzing multiple response variables for selective codes in SPSS for Windows®.

The results of the systematic analysis of the focus group and individual interview data supported the supposition that separate focus groups with members from distinct communities that rely upon a common environmental and natural resource produce substantially similar sets of information. However, the data failed to support the supposition that information learned using individual qualitative interviews in a community is substantially similar to the information learned in the same community using individual qualitative interviews. Furthermore, the evidence collected did not support the supposition that the information learned used separate series of individual interviews in two similar communities produce substantially similar sets of information.

DISCUSSION

The theoretical and practical foundations of the dissertation touch on the literature of international development; coastal zone management and the importance of mangrove

wetlands; nonmarket economic valuation; and qualitative research methods. The results of the dissertation are discussed in light of each of these areas.

INTERNATIONAL DEVELOPMENT

Despite the growing literature on the importance of taking a bottom-up approach to development and international assistance, the assumption that U.S. and other industrialized nations' "know-how" can transform "underdeveloped" nations persists in governmental agencies and multilateral donors (G. Axinn 1988). Unfortunately, the DUMAC project near Chuburná, its failure to achieve its stated goal of restoring duck habitat, and its destruction of the wetland ecosystem demonstrate some harmful consequences of using a "top-down" approach to development.

As the respondents put it,

We have problems with experts coming in here....the DUMAC project, they said, would maintain the flow of water and fish, but they closed the flow of water and fish off. Now there are no fish, no chivita, no wetland....we need to open the DUMAC dike so we can live, live from the wetland. We must undo what DUMAC has done. (ID# 29)

[DUMAC] got money from the United States....The biologists in Mérida came here and....DUMAC built a flood-gate (dike) and told the village that it would function well, but no, it doesn't work....Because of DUMAC, the wetland's water is too low, too hot, and the mud is too hot. All the chivita and crab are killed. (ID# 34)

The data collected by the dissertation research demonstrated several important points about including local beneficiaries in development planning, decision making, and evaluation. While the two villages appeared to have the same socioeconomic composition and relationship vis-à-vis reliance on the wetland, Chuburná's proximity to the DUMAC

project seems to account for its more profound tendency to raise the DUMAC issue with the candidate and his researcher assistants.

This is supported by the evidence that not one of the focus groups and only one individual interview from Chelém mentioned the DUMAC project (See Table 60). People in Chuburná seemed careful to avoid criticizing the DUMAC project during focus groups with fellow villagers. In fact, the only mention of the DUMAC project during a focus group in Chuburná was to point out that only a few community members would benefit from increased duck hunting. However, also in Chuburná, 75 percent of the individual interviews mentioned the DUMAC project as a significant problem facing the community; 86 percent of the individual interviews identified the DUMAC project as the reason for the declining fish population; and 80 percent of the individuals interviewed suggested removing the DUMAC project as the way to improve the wetland (See Table 60, Table 61, and Table 64).

The villagers of Chuburná also expressed their frustration with the bureaucracies of the local, regional, and national governments and their failure to address and rectify the communities' problems, especially the DUMAC dike. Regional officials expressed their frustration to the candidate. According to them, DUMAC presented a project that made sense but built a project that either was never completed properly or that simply did not work. A Mexican researcher who provided some hydrological help for designing the DUMAC project spoke of the role such a dike could play in ensuring the future viability of the lagoon both as a fishery and duck habitat. He went on to express his extreme frustration at DUMAC's failure to complete the project and their refusal to even return his telephone calls.

Unfortunately for the people of the Chelém Lagoon area , it seems that the failure of DUMAC to use a bottom-up participatory approach to design, implement, and maintain their project has contributed to the destruction of parts of a much valued wetland resource. Future development assistance efforts in the Chelém Lagoon may find a populace that has learned to be suspicious and distrustful. As one respondent put it,

The government is always asking, talking, and never doing anything....We have problems with biologists, the Dumac project. They said they would maintain flow of water and fish, but they closed it off. Now there are no fish....Well the truth is that we will believe nobody, neither the government, nor anybody, now the people are uncontrollable, they do not have the capacity to believe because everyone says things and does not do them. (ID# 29)

While the local beneficiaries recognize the need to take steps to protect their environmental and natural resources, their recent experiences seem to have decreased their ability to believe that they or anybody can affect positive social change.

The qualitative research helped to reveal the history of development projects and the communities' frustration with and reaction to such projects. For example, the communities reported successive government sponsored projects that failed, in the eyes of community members, to adequately account for impacts on the villages. The construction of the *puerto de abrigo* near Chelém, the increase in government-sanctioned trawler activity off-shore, and the promotion of coastal migration as a response to the collapse of Mexico's henequen industry are viewed as examples of the lack of power and consideration of local beneficiaries.

The use of qualitative research methods by outsiders to focus on understanding the problems of this region before the next project or undertaking may help prevent the cultural and political biases from further interference with the area's sustainable and

appropriate development. Taking such steps would go a long way towards making explicit the suggestion of George (1984) for governments and international organizations to become more effective in their development efforts by receiving and using the input and participation from the affected citizens and stakeholders.

ECONOMIC VALUE

Hamilton, Dixon, and Owen Miller (1989) report the importance of mangrove ecosystems to the subsistence livelihoods of tropical coastal communities. Barbier (1994) and Turner (1991) report that recent studies of healthy tropical wetland systems report that they may play a crucial role in regional economic development. Furthermore, such wetland systems may be more valuable when retained in their natural or semi-natural state than converted or degraded.

Barbier (1994) and others have developed hierarchies that describe the theoretically possible sources of economic value associated with healthy mangrove ecosystems (See Figure 3). These values, they claim, include use and nonuse values. The data and findings of this dissertation appear to support such claims. Using focus groups and individual qualitative interviews, the candidate learned about some of the use and nonuse values that local beneficiaries derive from Chelém Lagoon.

Almost 80 percent of the focus groups and individual interviews referred to local reliance on the mangrove wetland for fishing (See Table 59). Furthermore, 80 percent of the cases reported the wetland to be a source of living for the communities (See Table 62). The species of “fish” most often mentioned in the cases was chivita, a lagoon species of shellfish. More than 70 percent of the cases mentioned collecting or fishing for chivita

(See Table 14). Therefore, it is fair to say that the collection of chivita represents a significant consumptive use value associated with Chelém Lagoon.

According to estimates based on data collected during the focus groups and individual interviews, each household in these communities is able to earn between \$400 and \$600 per year by collecting chivita. Therefore, this one use value associated with the mangrove wetland is quite significant, especially when viewed in light of the \$2 per day minimum wage in Mexico. Also, the collection of chivita does not preclude households in the Chelém Lagoon area from taking advantage of other economic opportunities in the area (e.g., coastal fishing for octopus and grouper and seasonal employment during tourist season).

As one respondent stated:

The benefit of chivita work is that much of it can be done at home. You don't have to pay for transportation and the food you eat. (ID #16)

There was some evidence of other types of direct use values associated with the wetlands by local beneficiaries. Some of these things include trapping crab for use as bait during octopus season and fishing for lagoon dwelling fish such as shrimp, mullet, and mojarra. Likewise, some respondents mentioned collecting firewood. However, data and information on fishing effort, catch rates, and market prices for other lagoon species was not readily apparent from the focus groups and interviews. It would be fair to say that, but for crab, respondents viewed these other species as secondary to chivita for providing food and a living.

One source of indirect use value was raised in three focus groups (See Table 63). Two of these groups were in Chelém. It seems that the wetland was viewed as able to

provide storm protection for the fishing boats during severe weather. This benefit seems however to only applicable to the members of Chelém. As one respondent put it,

Unlike in Chuburná, here the wetland is deep enough to allow for boats. During storms we can bring out boats into the lagoon for protection. (ID# 32)

Although theoretically possible to attribute coastal fishery support (e.g., nutrients, breeding grounds, etc.) to wetland biological functions, no respondents mentioned such a connection. However, virtually every case mentioned that the wetland provided a function as a social safety net. Such a role may be thought of as a direct use value but it may also be viewed as an option value. That is, people in these communities may value the continued availability of the mangrove wetland for possible use at some needed time in the future (See Table 63).

While it is widely recognized by resource economists and others that environmental and natural resources may have significant nonuse value for people and societies, such values can be difficult to discuss and quantify. Typically, nonuse values may be thought of as existence values and bequest values. That is, the value to people of simply knowing that the environmental and natural resource exists and the value to people to know that future generations will have the resource. While economists and others recognize a wide range of possible nonuse values associated with mangrove wetlands, the qualitative research did not reveal much evidence of such values. This does not mean that such values do not exist. However, it does raise substantial questions as to how to reveal such values, how to measure them, and how to best determine the economic value of the mangrove resource.

One general class of nonuse value that was apparent from the qualitative research was an appreciation for the scenic beauty of the mangroves by respondents. Respondents did comment on how much they liked the wetland, how beautiful they thought the wetland ways, and how they liked having nonmarket species (e.g., flamingoes, heron, crocodiles, etc.) living in the mangrove ecosystem. Flamingoes were mentioned in 71 percent of the cases; herons and other seabirds mentioned in a third of the cases; and the overall beauty of the wetland was discussed in all of the focus groups (See Table 30 and Table 62).

As some of the cases put it:

The wetland is pretty....We sometimes picnic there but it is not that common anymore....When we have a visitor we take them for a boat ride to see it. (ID# 9)

The flamingoes always come and go....They are very pretty and the people here like to see them during the month or two they are here. (ID# 11)

For the Virgin, we go there for a trip around wetland bringing the Virgin Mary's statue in a boat for her holiday. The fiesta is a tradition, many people participate...people enjoy the procession for the virgin in the wetland. (ID# 16)

Such comments seem to evidence that some of the villagers of Chelém and Chuburná associate and are able to articulate some nonuse and nonmarket values with the mangrove ecosystem. That however does not necessarily mean that one can accurately measure such nonmarket and nonuse values. Furthermore, the inability or failure of respondents to volunteer and discuss sources of nonuse value associated with mangrove wetlands may help researchers identify the appropriate valuation method(s) and signal them to take additional care in developing such instruments.

NONMARKET VALUATION

Nonmarket economic valuation methods are used to estimate the economic value associated with goods and services that are not traded in well-functioning markets. The failure to incorporate the total value of many environmental and natural resources into decision making too often leads to the socially undesired loss or degradation of valuable resources. The use of nonmarket valuation techniques, especially in developing countries, may help policymakers choose better resource management and development programs. However, nonmarket valuation methods are not necessarily easy to apply and each method has particular strengths and weaknesses. Some, like hedonics, require the use of market data for shadow goods and services to derive economic estimates. Other methods like the travel cost method and contingent valuation require the use of specially designed survey questionnaires. And only one technique—contingent valuation—can be used to determine nonuse and therefore total economic values.

Evidence of Value

The evidence collected by this dissertation supports the idea that local beneficiaries of a complex ecosystem (i.e., mangrove ecosystem) implicitly and explicitly recognize some their use and nonuse values attributable to the ecosystem. People refer to the mangrove wetland as:

a place with moral and spiritual value (ID# 3);

providing for the village...a way of life....The life we all do (ID# 18); and,

a place for people to make a living....A way for people to feed themselves although the fish are down, the chivita are way down because so many people depend on collecting chivita (ID# 33).

Respondents also spoke about the extractive resources from the *ciénaga* (e.g., *chivita*) in terms of fishing effort, productivity, and market price for their catch. Other use values, such as recreation and storm protection were mentioned in some cases.

The data shows that more than three-quarters of the respondents discussing where they fished identified the mangrove wetland (See Table 59); 80 percent of the cases viewed the wetland as a source of living (See Table 62); 90 percent of comments on wetland services characterized the wetland as providing a social safety net (See Table 63); and all of the focus groups discussed the beauty of the mangrove ecosystem (See Table 62).

However, it is clear that the difficult economic times in Mexico and the difficulties being faced by the people of these two villages seem to dominate the respondents' thoughts and comments. The use values of the wetland, specifically the collection of *chivita*, seems to be the predominant concern and association with the wetland of the local beneficiaries. While there may be evidence of the existence of nonuse values associated with the mangrove wetland, local resource beneficiaries seem understandably preoccupied with extracting a living from the mangrove ecosystem.

Selecting Valuation Method

The use of qualitative methods may help researchers select the valuation method that can best reveal economic values associated with environmental and natural resources.

Furthermore, qualitative research methods may also be used to better understand the range and character of the services provided by environmental and natural resources to local beneficiaries. In the instant case, it seems apparent that the inhabitants of Chelém and

Chuburná while speaking of fishing as their main economic activity rely to a great extent on the collection of chivita from the wetland for subsistence. This "one" discovery, in context to the entirety of the qualitative data, not only helps identify the appropriateness of valuation methods but also provides valuable insights on how to best proceed in undertaking the valuation study.

While the literature refers to a panoply of resource values attributable to mangrove wetlands, respondents in the two communities overwhelmingly emphasized their reliance on chivita collection. Individuals who fished in the Gulf of Mexico individually or as part of a crew on a commercial fishing vessel, individuals who fished exclusively in the lagoon, and individuals who did not fish for a living all characterized themselves as fishers. Even for individuals who subsequently reported earning their livelihood as factory workers, masons, and restaurant employees, when asked about what they do, the people of these villages reported fishing. The qualitative research, in this case, would caution researchers to clearly address questions of economic activities and clearly describe the particular services to be valued. In other words, researchers would know to disaggregate types of fishing activities as well as specifically describe the resource service(s) under investigation.

Likewise, such qualitative data might also help researchers decide upon the most appropriate valuation method to use. This may result from an understanding of respondents' circumstances, the difficulties of obtaining certain types of data, or the environmental and natural resource services valued. If respondents did not seem concerned with nonuse values, and only use values associated with the environmental and natural resource under investigation seemed important, researchers could reasonably a valuation method without regard to its ability to reveal nonuse values. Furthermore, if

there little evidence that respondents associated substantial nonuse values with a particular resource, it would be reasonable to assume that the economic values revealed by a CV study of that resource's economic value should approximate the use values associated with that resource.

CV Method

The absence of well-operating markets for many of the goods and services provided by the mangrove ecosystem combined with the expert and local recognition of significant nonuse values associated with the wetland point towards the usefulness of CV to estimate the total economic of the wetland for decision making. However, in order to produce reliable and valid estimates CV survey instruments must use: (1) resource scenarios that are understood and acceptable by respondents, (2) policy change scenarios that are believable to respondents, and (3) value elicitation questions that have respondents realistically consider their budget constraints when answering. Unfortunately, the data collected in the Chelém Lagoon area does not support the probability that such a CV instrument could be drafted and used with these respondents.

For simplicity sake, the three elements needed for a good CV instrument can be treated together. While they all require different design elements, the survey instrument must present scientifically accurate representations of present and future scenarios. Additionally, all of the CV design elements require respondents to understand, believe, and accept them. The focus groups and individual interviews conducted for the dissertation revealed a high level of distrust of the local, regional, and national government, a high level of frustration with the multinational donor DUMAC, and a

dominance of a subsistence state of mind. It seems unlikely that respondents would believe and accept a CV instruments' description of present and proposed policy changes.

Furthermore, respondents do not see themselves as capable of earning enough money to feed their families. Traditionally, CV researchers use some sort of use restrictions as part of the proposed policy change scenario and the payment vehicle. The people of Chelém and Chuburná expressed substantial resistance to the plausibility of and acceptance of such use restrictions (See Table 65). This substantially diminishes the already difficult task of designing CV payment scenarios that would be understandable, acceptable, and used by respondents.

Some of the comments from the focus groups and individual interviews illustrate the difficulty of designing a CV instrument to address the total economic value of the Chelém Lagoon:

The government is more concerned with the wharf [Progreso] than anything else....Every time there is a change in government, everything changes....If the government comes in and gets involved we'll lose everything. (ID# 15)

I don't believe the government because they never do anything....The government is always asking, talking, and never doing anything....politicians promise you and when they win they forget. (ID# 16)

The community would not accept any restrictions....Maybe, if it was the law, people may be angry but they would obey, like octopus....but there is so much corruption like the shrimp regulation. Even though there is a law against it, we still fish for shrimp, we have to....Chivita could be regulated by closing a part of the wetland and guarding it....a season would only work if there were guards, and they are subject to corruption....The village doesn't have anything to eat, people search all day for 2 kg of chivita to make up to 20 pesos. If restricted one would have to find a way to eat meat, pork, every second day. Now, no one can do that. (ID#18)

I am 72 years old and I sleep little. My work is to think of why the coast is dying out....People are working hard, with hunger, with cold, and they collect 2 kg of chivita....If fishing in the river is prohibited, people will take to robbery. What will happen will be that the government will have to put us all under guard, the police and military would be the winners. (ID# 23)

I don't think the people would have any trust or confidence in a private company like PEMEX [Mexican petroleum company]....Both the government and the private enterprises are doubtful at best....Thinking about prohibitions on chivita, there are many people that are dedicated only to that one activity all year. If there is a prohibition on chivita, how are these people going to live, can you imagine how those people that depend entirely on chivita are going to live? (ID# 39)

Other Economic Estimates

The difficulty of constructing a plausible, acceptable, and well-understood CV valuation scenarios may, in this case, dictate the use of some other mechanisms for determining some of the economic values of the mangrove wetland. Such estimates of value must however be considered as minimum, partial, and floor estimates of the economic value of the mangrove ecosystem. As discussed in Chapter 4, the data revealed by the focus groups and individual interviews support the existence of and perhaps significance of a variety of nonmarket and nonuse values. Yet, the relative importance to local beneficiaries may be overshadowed by the difficulties they face in meeting their subsistence needs.

The data collected using the focus groups and individual interviews also allowed for the estimation of one substantial use value of Chelém Lagoon. As previously illustrated in Figure 12, a conservation estimate of the annual use value of chivita collection for a family who collects chivita is \$585. This is more than a factory worker earns in a year working six days a week for 52 weeks in Mérida. While other use values may ultimately be estimated using data collected directly from resource beneficiaries, the

sum of all such estimates, while maybe the best available data, must still be considered a floor estimate of some of the use values (necessarily less than the total value) of the ecosystem to the villages of Chelém and Chuburná.

QUALITATIVE METHODS

The idea behind using qualitative research for survey research design is that before a survey questionnaire is implemented, testing should be done to find out if people can understand the questions and if they can perform the tasks the questions require. In survey research that focuses on complex subject matter such as ecosystems, and that asks respondents to consider their budget constraints and make choices (e.g., CV studies), preliminary qualitative has proven to be valuable. In the cross-cultural application of such complex instruments, additional efforts must be made to appreciate respondents' cognitive process and way of understanding questions (Sudman, Bradburn, and Schwarz 1996).

Qualitative research methods, with their "commitment to viewing events, actions, norms, values, etc. from the perspective of the people who are being studied" (Bryman 1988, 61), can provide researchers with a useful means for designing better survey research studies.

As Fowler (1994) asserts,

The level of investment is so small, compared to the effort involved in most surveys, and the payoff so big, it is hard to explain why every survey does not begin with some focus group discussions. (110)

Yet, even though focus groups and individual qualitative interviews can be especially valuable "when a target population is likely to have special perceptions, problems, and idioms that may be relatively foreign to the investigator....Most of us are too likely to neglect this preliminary phase of exploration" (Converse and Presser 1986).

Focus Groups

Focus groups are supposed to be efficient ways to obtain a great deal of information relevant to the design of surveys (Morgan 1997). Furthermore, they are supposed to be helpful in identifying “respondents’ level of knowledge, attitudes, and opinions” (Hutchinson, Chilton, and Davis 1995, 100). The key to focus groups are their use of “group interaction to produce data and insights that would be less accessible without the interaction found in a group” (Morgan 1997, 2).

Individual Interviews

The purpose of individual qualitative interviews is to “develop ideas and research hypotheses rather facts and statistics” (Oppenheim 1992, 67). Weiss (1994) points out that qualitative interviews can teach outsiders about settings otherwise closed to them. The advantages that individual interviews offer, according to Morgan (1997), stem from the close relationship such interviews establish between interviewer and informant.

Caveats and Comments

The focus groups and individual interviews were conducted with members of two relatively small populations. Unlike focus group research with participants drawn from a large population, the focus group participants in the instant case knew each other. The impact of this fact on the information revealed during the focus groups is not clear. While the lack of anonymity and the possible presence of social pressure may have hindered the free flow of ideas and concerns, the interpersonal comfort and familiarity of group members may have promoted the free flow of ideas and concerns.

Similarly, while the focus groups were made up of all men or all women, the professional moderator was male and the individual interviewers were female. The possible bias of using a male moderator with female focus groups and female interviewers with male individual interviewees is not addressed. It was assumed that the non-sensitive nature of the subject matter as well as the consistent use of the moderator and interviewers would not result in unacceptable and biased information.

Finally, the absence of socio-economic data on the individuals that participated in the focus groups and individual interviews is a limitation on the depth and breadth of possible analysis of the data collected. As discussed earlier in the dissertation, it was difficult to get people from the communities to participate and the use of an introductory or exit demographic survey appeared to deter people from participating. A strategic choice was made to maximize the number and quality of focus group sessions and individual interviews given the budgetary and time constraints of the candidate. In any event, it does not appear that the goals of the dissertation were not adversely effected by the absence of this demographic data.

Group vis-à-vis Individual Interviews

Focus groups rely on group interactions to reveal participants similarities and differences of opinion. Individual interviews collect more in-depth information and requires the analyst to make comparison with other interviews to determine similarities and differences. There have few studies examining whether the two methods produce similar data, this question “has been more the subject of speculation than systematic research” (Morgan 1997, 13). Kitzinger (1994a, 1994b) asserts that differences detected between the two

methods is not necessarily evidence of the absence of validity of one or both results. Kitzinger believes that differences may be attributed to context, that people act and response differently in a group than individually.

The results of the focus groups conducted in Chelém and Chuburná were often broader than the information in the individual interviews. Respondents seemed to offer more information about the ways they live (See Table 58); suggest more services provided by the wetland (See Table 63); and discuss more ways to improve the wetland (See Table 64) than the individual respondents seemed to raise in the individual qualitative interviews. On the other hand, the individual qualitative interviews appeared to have raised details and concerns that were avoided in the focus group interviews. That is, individuals seemed to be more comfortable discussing a wider range of reasons for the decline in the fishing populations (See Table 61); identifying the range of problems in the area (See Table 60); and being critical of the government and multilateral projects (e.g., DUMAC) (See Table 60, Table 61, Table 63, and Table 64) than they did in the focus groups.

To examine the data obtained, in yet another way for methodological strengths and weakness, the results from Table 58 to Table 66 were reanalyzed. The goal was to detect patterns, if any, in the type of information revealed by the two qualitative methods. The literature posits that focus group data is broader relative to individual qualitative interview data and that individual qualitative interviews reveal more detailed information. These suppositions lead to the construction of the following assumptions: (1) if focus groups yield broader information than individual interviews, then we should see more response categories offered in focus group data sets than individual data sets; and (2) if individual interviews yield more detailed information than focus groups, then individual interview

data sets should contain response categories not addressed by focus groups. Table 74 presents the results of this admittedly rough analysis.

Table 74. Focus Group v. Individual Interviews

Variable	Locale	Focus Groups More Info. Than Ind. Interviews		Ind. Interviews More Details Than Focus Groups		Possible Reason
		Yes	No	Yes	No	
How Live	Chelém		X	X		Fact Based more jobs in Chelém
	Chuburná	X			X	
Perceptions	Chelém		X		X	Vague Topic Indv. d/t process
	Chuburná	X			X	
Services	Chelém	X			X	
	Chuburná	X		X		
Improvement	Chelém		X		X	Single issue (DUMAC) Indv. focused on this
	Chuburná	X		X		
Problems	Chelém		X	X		Causes of Problems Indv. offer more ideas/reasons
	Chuburná		X	X		
Few Fish	Chelém		X	X		
	Chuburná		X	X		
Where Fish	Chelém		X		X	Factual Info not controversial
	Chuburná		X		X	
Restrictions	Chelém		X		X	
	Chuburná		X		X	
Name	Chelém		X		X	
	Chuburná		X		X	

The results of this analysis while certainly not unanimous do give rise to some interesting possible explanations of the differences in using the two qualitative research methods. It seems that focus group data sets were, in general, not much larger than individual interview data sets when the subjects discussed were uncontroversial and factual in nature. Nor does it seem that individual data sets reflect information outside the scope of focus group in those instances when the discussions centered on relatively

uncontroversial matters of fact applicable to the region as a whole. Table 74 categorizes these variables (i.e., Where Fish, Restrictions, and Name) as Factual Info.

In some cases, focus groups did raise for discussion more information than did individual interviews. However, some individual interviews did indeed raise topics and ideas that were not discussed in the focus groups. Such instances where individual interviews were as broad as focus groups and the individual interviews raise topics that were not mentioned in the focus groups, are group with the label Causes of Problems in Table 74. It seems that the individuals were able to offer more possible reasons and ideas behind the areas' problems, in general and specifically as they related to the decline in fishing productivity during the individual interviews.

The variable improvement for the village of Chelém resembles the factual information type variables. That is, the groups and individual interviews yielded substantially similar data. However, as Table 74 summarizes the data from Chuburná for the improvement variable, it does not resemble the factual information variables. That is, focus groups are broader sources of information and individual interview raise points not mentioned in focus groups. This can be attributed to the on going controversy of the DUMAC project. The negative impact of this project are being felt most immediately by Chuburná. People feel uncomfortable complaining about their neighbors or the few (and perhaps powerful) community members who may profit from the project. However, in a one-on-one qualitative interview, individuals focus a great deal on the controversy.

For this variable, the focus groups did present a wider range of information than did individual interviews. Likewise, the individual interviews in Chuburná discussed things that were either avoided, missed, or otherwise absent from the focus group discussions in

Chuburná. A review of the transcripts confirms that this is not necessarily a result of focus groups promoting broader topics of discussion. Rather, it seems to be a function of individuals being willing and even consumed in some cases with making the point that they were unhappy with the project and blamed it for many of their problems. It seems that social norms may be responsible for people's repression being publicly critical of a project that some community members supported. However, in individual interviews, community members seemed to focus more on that particular project than other things.

The results of the analysis of Table 74 of the How Live show marked differences between the relationship of focus group and individual interview information sets between the two communities. This is probably more a function of an underlying factual basis than anything else. Chelém is much closer to Progreso and Mérida than Chuburná. Therefore, the residents of Chelém have relatively fewer obstacles to work outside of the community. Furthermore, the number of seasonal residences is much higher in and around Chelém than those near Chuburná. As a result, there are more opportunities for seasonal employment, too. These differences probably explain the difference in the data.

The final category of variables with regard to the results of the focus group and individual interviews, in general support the idea that focus groups reveal broader sets of information than individual interviews. However, these variables do not seem to support the notion that individual interviews offer up more detailed sets of information. These results may be explained by the vague nature of the topics represented by the variables. Perhaps, groups of people, like Morgan (1997) suggests can process using group interaction to reveal a broader range of ideas when discussing such vague concepts as the perceptions and the services of the mangrove wetland. Maybe the absence of detailed

information on these topics in the individual interviews can be seen as supportive of the notion that focus groups and the interaction between participants can be useful for participants to grapple with, understand, and offer input on vague or difficult to grasp topics.

CONCLUSIONS

It seems that the research hypotheses supported and those not supported by the data indicate, in general, that focus groups and individual interviews conducted in a developing country yield important but different data. In general, the data supports the conclusion that focus groups in separate but similar communities help researchers to learn substantially similar information sets (e.g., $A=C$). However, the evidence does not support the notion that the two qualitative research methods, focus groups and individual interviews, reveal substantially similar data sets (e.g., $A \neq B$). Further investigation of this apparent inequality, in light of the literature, seems to be explained by some the contexts of the methods. The different effects of group dynamics, the sensitivity of the subject matter, and the social realities faced by the individuals impact the breadth and the depth of information revealed by focus groups and individual interviews (See Table 74).

IMPLICATIONS

Based on the findings and analysis of the data in this study, several implications for practice seem reasonable. Since both focus groups and individual qualitative interviews enabled outsiders to learn and better understand the realities, perceptions, and problems of local beneficiaries of a complex environmental and natural resource, some use of

qualitative research in designing and implementing natural resource valuation studies seems warranted. In doing so, researchers can develop studies and instruments that can more effectively reflect the current of the environmental and natural resource under investigation; choose the most appropriate valuation methods given the nature of the problem and the respondents; and design and present policy change scenarios that are more likely to be understood and accepted by respondents.

It seems that, based on the data in this dissertation, focus groups do offer an efficient way to obtain a great deal of information relevant to the design of survey questions and policymaking (See Morgan 1997). This was reflected in both the results tabulated in both Table 69 and Table 74. Furthermore, the substantial similarity between the information revealed in the Chelém focus groups with that revealed in the Chuburná focus groups supports the idea that the information revealed in focus groups about environmental and natural resources may be substantially similar across similarly situated communities (See Table 71). Likewise, it has been shown with the Chelém and Chuburná data that individual interviews in general reveal different information from focus groups (See Table 69) and more details and information on problems and their causes than focus groups (See Table 74).

Therefore, a preliminary qualitative research study of local resource beneficiaries that relies primarily on several focus groups from similarly situated communities and that uses targeted individual qualitative interviews to examine for further details and socially sensitive issues seems an appropriate strategy for efficiently obtaining a great deal of data for use in designing better studies of the economic value of environmental and natural resources.

POSSIBLE APPLICATIONS

There are several possible applications of the dissertation methods and findings. The results can be used to help researchers identify which sorts of questions are best suited for their preliminary work using focus groups or individual interviews. That is, researchers interested in particular phenomena can use information such as that contained in Table 74 on the methods' relative strengths and weaknesses to guide them towards the use of either or both methods in their preliminary investigations. Furthermore, such information can help researchers decide upon what types of questions to ask in focus groups and in individual interviews.

Another application of the dissertation results and methods can be as a valuation method selection tool. That is, undertaking preliminary qualitative research, such as that performed in the dissertation, can identify the range of services relevant for the economic valuation exercise. This information can then be used to determine the most appropriate method for undertaking the subsequent valuation exercise. If for example, the preliminary research reveals high levels of recreational use of the resource and few other values are revealed by the qualitative research, perhaps an application of the travel cost valuation method would be most appropriate. Likewise, if the target population evidences nonuse values or difficult to measure nonmarket values regarding the subject resource, then perhaps use of the contingent valuation method would be desirable.

Finally, the dissertation and its findings support the use of qualitative methods with ethnographic type questions to reveal the range and importance of services of an environmental and natural resource to resource beneficiaries. Such information is critical in drafting valuation studies that clearly identify and describe the "goods" (resource

services) to be valued by respondents. This ability of qualitative research to help researchers identify, understand, and ultimately address the actual resource services valued by respondents can help researchers design better economic valuation studies.

R E C O M M E N D A T I O N S

This study of the relative strengths and weaknesses of using focus groups and individual interviews to help design economic valuation studies in a developing country was one attempt to measure, systematically and objectively, the efficacy of the two methods. As result of these efforts, several suggestions for improving future such studies have become apparent. One such recommendation would be the use of specially trained “coders” to read (listen to) the transcripts , develop a coding scheme that could be tested for reliability, and apply the codes to the transcripts in a uniform and verifiable manner. The use of such a rigorous and “objective” coding scheme would allow for more detailed analysis of the frequencies and relationships of codes within and between transcripts. Such coding procedures are increasingly being used in cognitive survey research. However, its costs both in time and money were prohibitive for the dissertation.

Another recommendation for future evaluation of the efficacy of qualitative research methods for designing and implementing environmental and natural resource survey questionnaires would be a follow-up study that designed and implemented a questionnaire using the qualitative data learned from the various methods. Perhaps different instruments could be developed based on the information learned using one method or the other to test for any significant differences. Perhaps efforts could be made during the qualitative research to collect quantitative data that could be used to confirm

the results of the survey questionnaire (e.g., a collection and use of data similar to the chivita data in the dissertation).

Finally, future analyses of the use of qualitative research methods for the design of environmental and natural resource surveys in a developing country would benefit from the iterative use of the various methods with adequate time for the detailed analysis of the data between phases of the methods application. Such a process would allow researchers to better learn and understand the information being shared. Furthermore, researchers could use this information to refine the focus groups and individual interviews as well as track and monitor the qualitative research method's learning process.



APPENDICES

APPENDIX A

LIST OF INTERVIEWS

Table 75. Interview List

ID#	Location	Date	Type	Gender
1	Progreso	02/07/96	group	Women
2	Progreso	02/07/96	group	Women
3	Progreso	02/07/96	group	Men
4	Progreso	02/08/96	group	Men
5	Progreso	02/08/96	group	Men
6	Chelém	02/09/96	group	Men
7	Chelém	02/09/96	group	Women
8	Chelém	02/09/96	group	Men
9	Chelém	02/09/96	group	Women
10	Chuburná	02/10/96	group	Women
11	Chuburná	02/10/96	group	Women
12	Chelém	02/10/96	group	Men
13	Chuburná	02/10/96	group	Men
14	Chuburná	02/10/96	group	Men
15	Progreso	02/11/96	group	Men
16	Chelém	07/05/96	group	Women
17	Chuburná	07/06/96	group	Men
18	Chelém	07/07/96	group	Men
19	Seasonal	07/07/96	individual	Women
20	Chelém	07/08/96	individual	Men
21	Chelém	07/08/96	individual	Men
22	Seasonal	07/08/96	individual	Women
23	Chelém	07/08/96	individual	Men
24	Chelém	07/08/96	individual	Women
25	Chuburná	07/08/96	individual	Men
26	Chuburná	07/08/96	individual	Women
27	Chuburná	07/09/96	individual	Men
28	Chuburná	07/09/96	individual	Men
29	Chuburná	07/09/96	individual	Men
30	Chuburná	07/09/96	individual	Men
31	Chuburná	07/09/96	individual	Men
32	Chelém	07/09/96	individual	Men
33	Chelém	07/09/96	individual	Men
34	Chuburná	07/09/96	individual	Men
35	Chuburná	07/10/96	individual	Women
36	Chelém	07/11/96	individual	Men
37	Chelém	07/11/96	individual	Women
38	Chelém	07/11/96	individual	Men
39	Chelém	07/11/96	individual	Men
40	Seasonal	07/08/96	individual	Women
41	Seasonal	07/08/96	individual	Women

1

1

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APPENDIX B

PROBLEM1 Problems Here 1

Value Label

- 21 Coastal fishing down
- 22 Unemployment
- 23 No more salt
- 24 Ciénaga fishing down
- 25 people come here to live
- 26 DUMAC

PROBLEM2 Problems Here 2

Value Label

- 21 Coastal fishing down
- 22 Unemployment
- 23 No more salt
- 24 Ciénaga fishing down
- 25 people come here to live
- 26 DUMAC

PROBLEM3 Problems Here 3

Value Label

- 21 Coastal fishing down
- 22 Unemployment
- 23 No more salt
- 24 Ciénaga fishing down
- 25 people come here to live
- 26 DUMAC

PROBLEM4 Problems Here 4

Value Label

- 21 Coastal fishing down
- 22 Unemployment
- 23 No more salt
- 24 Ciénaga fishing down
- 25 people come here to live
- 26 DUMAC

PUERTO Puerto

Value Label

- 1 Beneficial
- 2 Harmful
- 3 Both Beneficial & Harmful

PUERTO B puerto benefits

Value Label

- 1 protects boats

- 2 water circul.
- 3 increase c's fish

PUERTO B2 puerto benefits 2

Value Label

- 1 protects boats
- 2 water circul.
- 3 increase c's fish

PUERTO H puerto harms

Value Label

- 1 lost salt biz
- 2 lost ducks
- 3 pollution

PUERTO H2 puerto harms

Value Label

- 1 lost salt biz
- 2 lost ducks
- 3 pollution

DUMAC DUMAC Project

Value Label

- 0 good
- 1 bad

DUISSUE1 DUMAC issue 1

Value Label

- 0 drying up wetland
- 1 killing fish in ciénaga
- 2 ducks not back
- 3 failed to keep promise
- 4 only few guides gain

DUISSUE2 DUMAC issue 2

Value Label

- 0 drying up wetland
- 1 killing fish in ciénaga
- 2 ducks not back
- 3 failed to keep promise
- 4 only few guides gain

APPENDIX B

FEWFISH1 Reason for few fish 1

Value Label

- 1 weather
- 2 pollution
- 3 trawling fleets
- 4 too many fishers
- 5 DUMAC project
- 6 no regulations
- 9 DNK

FEWFISH2 Reason for few fish 2

Value Label

- 1 weather
- 2 pollution
- 3 trawling fleets
- 4 too many fishers
- 5 DUMAC project
- 6 no regulations
- 9 DNK

FEWFISH3 Reason for few fish 3

Value Label

- 1 weather
- 2 pollution
- 3 trawling fleets
- 4 too many fishers
- 5 DUMAC project
- 6 no regulations
- 9 DNK

FISH1 Fish Type 1

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

FISH2 Fish Type 2

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

FISH3 Fish Type 3

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

FISH4 Fish Type 4

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

APPENDIX B

FISH5 Fish Type 5

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

FISH6 Fish Type 6

Value Label

- 41 Chivita
- 42 Crab
- 43 Octopus
- 44 Grouper
- 45 Shrimp
- 46 Squid
- 47 Conch
- 48 Lobster
- 49 Mullet
- 50 Sea Bass
- 51 Corvina
- 52 Parguitos
- 53 Rubia
- 54 Mojarra
- 55 Shark

CCLASS Ciénaga use by whom

Value Label

- 1 the poor
- 2 women
- 3 everyone

CTRAITS1 Ciénaga Physical Aspects 1

Value Label

- 1 large
- 2 shallow
- 3 connected to sea
- 4 muddy

- 5 fresh water springs
- 6 very salty
- 7 flora & fauna

CTRAITS2 Ciénaga Physical Aspects 2

Value Label

- 1 large
- 2 shallow
- 3 connected to sea
- 4 muddy
- 5 fresh water springs
- 6 very salty
- 7 flora & fauna

CTRAITS3 Ciénaga Physical Aspects 3

Value Label

- 1 large
- 2 shallow
- 3 connected to sea
- 4 muddy
- 5 fresh water springs
- 6 very salty
- 7 flora & fauna

CTRAITS4 Ciénaga Physical Aspects 4

Value Label

- 1 large
- 2 shallow
- 3 connected to sea
- 4 muddy
- 5 fresh water springs
- 6 very salty
- 7 flora & fauna

CPERCEP1 ciénaga perceptions 1

Value Label

- 1 polluted
- 2 swampy
- 3 threatened
- 5 beautiful
- 6 income source
- 7 way of life
- 8 place to build
- 9 no interest/value
- 10 existence value

APPENDIX B

CPERCEP2 Ciénaga perceptions 2

Value Label

- 1 polluted
- 2 swampy
- 3 threatened
- 5 beautiful
- 6 income source
- 7 way of life
- 8 place to build
- 9 no interest
- 10 existence

CPERCEP3 Ciénaga perceptions 3

Value Label

- 1 polluted
- 2 swampy
- 3 threatened
- 5 beautiful
- 6 income source
- 7 way of life
- 8 place to build
- 9 no interest
- 10 existence

CNAME1 Ciénaga Names

Value Label

- 1 ciénaga (wetland)
- 2 rio (river)
- 3 ría (estuary)
- 4 charcos (ponds), etc.

CNAME2 Ciénaga Names 2

Value Label

- 1 ciénaga (wetland)
- 2 rio (river)
- 3 ría (estuary)
- 4 charcos (ponds), etc.

CNAME3 Ciénaga Names 3

Value Label

- 1 ciénaga (wetland)
- 2 rio (river)
- 3 ría (estuary)
- 4 charcos (ponds), etc.

CNAME4 Ciénaga Names 4

Value Label

- 1 ciénaga (wetland)
- 2 rio (river)
- 3 ría (estuary)
- 4 charcos (ponds), etc.

IMPROVE1 Improve Ciénaga 1

Value Label

- 1 aquaculture
 (shrimp/crab/fish ponds)
- 2 tourism
- 3 expert help/instruction
- 4 use restrictions
- 5 Remove DUMAC
- 6 nothing will help

IMPROVE2 Improve Ciénaga 1

Value Label

- 1 aquaculture
 (shrimp/crab/fish ponds)
- 2 tourism
- 3 expert help/instruction
- 4 use restrictions
- 5 Remove DUMAC
- 6 nothing will help

IMPROVE3 Improve Ciénaga 1

Value Label

- 1 aquaculture
 (shrimp/crab/fish ponds)
- 2 tourism
- 3 expert help/instruction
- 4 use restrictions
- 5 Remove DUMAC
- 6 nothing will help

APPENDIX B

CPROD1 Ciénaga Products 1

Value Label

- 1 Shrimp
- 2 salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 ducks
- 12 flamingoes
- 13 wood

CPROD2 Ciénaga Products 2

Value Label

- 1 Shrimp
- 2 Salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 ducks
- 12 Flamingoes
- 13 wood

PROD3 Ciénaga Products 3

Value Label

- 1 Shrimp
- 2 Salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 ducks
- 12 flamingoes
- 13 wood

CPROD4 Ciénaga Products 4

Value Label

- 1 Shrimp
- 2 Salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 Ducks
- 12 Flamingoes
- 13 wood

CPROD5 Ciénaga Products 5

Value Label

- 1 Shrimp
- 2 Salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 ducks
- 12 Flamingoes
- 13 wood

CPROD6 Ciénaga Products 6

Value Label

- 1 Shrimp
- 2 Salt no more
- 3 Chivita
- 4 Mojarra
- 5 Mullet
- 6 Sea Bass
- 7 Corvina
- 8 crawfish
- 9 Crab
- 10 nothing
- 11 Ducks
- 12 Flamingoes
- 13 wood

APPENDIX B

CSERV1 Ciénaga Opportunities 1

Value Label

- 1 flamingoes
- 2 construction sites
- 3 subsistence food
- 4 storm protection (boats)
- 5 nothing bc DUMAC
- 9 nothing

CSERV2 Ciénaga Opportunities 2

Value Label

- 1 flamingoes
- 2 construction sites
- 3 subsistence food
- 4 storm protection (boats)
- 9 nothing

CNONMKT1 nonmarket species 1

Value Label

- 1 Flamingoes
- 2 Ducks
- 3 Parrots & others
- 4 Herons, gulls, & others
- 5 Turtles
- 6 Lizards
- 7 Crocodiles

NONMKT2 nonmarket species 2

Value Label

- 1 Flamingoes
- 2 Ducks
- 3 Parrots & others
- 4 Herons, gulls, & others
- 5 Turtles
- 6 Lizards
- 7 Crocodiles

NONMKT3 nonmarket species 3

Value Label

- 1 Flamingoes
- 2 Ducks✓
- 3 Parrots & others
- 4 Herons, gulls, & others
- 5 Turtles
- 6 Lizards
- 7 Crocodiles

FLAM Flamingos here

Value Label

- 1 Never
- 2 Sometimes
- 3 Always

TOURSM tourism now

Value Label

- 0 no
- 1 sometimes

HELPTOUR What help tourism

Value Label

- 0 nothing
- 1 flamingoes
- 2 capital investment
- 3 other

SAFENET Ciénaga as safteynet

Value Label

- 1 Yes

RECREATE recreate (incl. Virgin's Day)

Value Label

- 0 no
- 1 yes

CHIVITA Chivita as resource

Value Label

- 1 Yes

CHWORK chivita work hard

Value Label

- 1 yes

RESTRIC Are there use restrictions?

Value Label

- 0 no
- 1 yes

APPENDIX B

RWHAT What is restricted?

Value Label

- 1 octopus
- 2 conch
- 3 shrimp
- 4 fishing in ciénaga @ bridge
- 5 turtles
- 6 flamingoes
- 7 fishing in sea

RWHAT2 What is restricted?

Value Label

- 1 octopus
- 2 conch
- 3 shrimp
- 4 fishing in ciénaga @ bridge
- 5 turtles
- 6 flamingoes
- 7 fishing in sea

RWHAT3 What is restricted?

Value Label

- 1 octopus
- 2 conch
- 3 shrimp
- 4 fishing in ciénaga @ bridge
- 5 turtles
- 6 flamingoes
- 7 fishing in sea

RESTWORK Do/Would restrictions (non octopus) work?

Value Label

- 0 no
- 1 yes
- 2 maybe

RWHYNOT Why restrictions not work

Value Label

- 1 subsistence/survival necessitates
- 2 lack alternatives
- 3 lack of enforcement

RWHYNOT2 Why don't restrictions work

Value Label

- 1 subsistence/survival necessitates
- 2 lack alternatives
- 3 lack of enforcement

RWHYNOT3 Why don't restrictions work

Value Label

- 1 subsistence/survival necessitates
- 2 lack alternatives
- 3 lack of enforcement

RESTOCT Why octopus restrictions work?

Value Label

- 1 enforcement
- 2 stiff penalties
- 3 makes sense (ecology)

RESTOCT2 Why octopus restrictions work?

Value Label

- 1 enforcement
- 2 stiff penalties
- 3 makes sense (ecology)

APPENDIX C

SPSS DATA SET

Table 76. Chelém and Chuburná Data Set

	id	locale	type2	partic	length	gender	howlive1	howlive2	howlive3	howlive4
1	6	Chelem	group	4	358	male	Fishing	.	.	.
2	7	Chelem	group	3	507	female	Fishing	Masonry/Pa	.	.
3	8	Chelem	group	4	586	male	Fishing	Masonry/Pa	.	.
4	9	Chelem	group	4	806	female	Fishing	Masonry/Pa	Seasonal W	.
5	12	Chelem	group	4	319	male	Fishing	.	.	.
6	16	Chelem	group	6	1416	female	Fishing	Masonry/Pa	.	Go to Merid
7	18	Chelem	group	6	1229	male	Fishing	Masonry/Pa	Seasonal W	Go to Merid
8	10	Chuburna	group	3	394	female	Fishing	.	.	.
9	11	Chuburna	group	3	509	female	Fishing	.	.	.
10	13	Chuburna	group	3	244	male	Fishing	.	.	.
11	14	Chuburna	group	4	705	male	Fishing	Masonry/Pa	.	Go to Merid
12	17	Chuburna	group	5	769	male	Fishing	Masonry/Pa	.	Go to Merid
13	20	Chelem	individual	1	175	male	Fishing	Masonry/Pa	Seasonal W	.
14	21	Chelem	individual	1	161	male	Fishing	Masonry/Pa	Seasonal W	.
15	23	Chelem	individual	1	213	male	Fishing	Masonry/Pa	Seasonal W	.
16	24	Chelem	individual	1	201	female	Fishing	Masonry/Pa	Seasonal W	.
17	32	Chelem	individual	1	465	male	Fishing	Masonry/Pa	.	.
18	33	Chelem	individual	1	345	male	Fishing	Masonry/Pa	Seasonal W	.
19	36	Chelem	individual	1	516	male	Fishing	.	Seasonal W	Go to Merid
20	37	Chelem	individual	1	194	female	Fishing	.	.	.
21	38	Chelem	individual	1	371	male	Fishing	.	.	Go to Merid
22	39	Chelem	individual	2	507	male	Fishing	Masonry/Pa	Seasonal W	.
23	25	Chuburna	individual	2	542	male	Fishing	.	Seasonal W	.
24	26	Chuburna	individual	1	573	female	Fishing	.	Seasonal W	.
25	27	Chuburna	individual	1	398	male	Fishing	.	.	.
26	28	Chuburna	individual	1	585	male	Fishing	.	.	.
27	29	Chuburna	individual	1	634	male	Fishing	.	.	.
28	30	Chuburna	individual	1	141	male	Fishing	.	.	.
29	31	Chuburna	individual	1	413	male	Fishing	.	.	.
30	34	Chuburna	individual	1	335	male	Fishing	.	.	.
31	35	Chuburna	individual	1	164	female	Fishing	.	Seasonal W	.

APPENDIX C

Table 76—Continued

	fishloc1	fishloc2	fishloc3	problem1	problem2	problem3	problem4	puerto	puertob
1	coastal fish	.	.	.	.	.	.	Beneficial	water circul.
2	.	cienaga	deep-sea fis	.	.	.	Unemploy	Beneficial	water circul.
3	coastal fish	cienaga	.	.	.	.	.	Beneficial	water circul.
4	.	.	.	.	.	.	.	.	.
5	coastal fish	cienaga	.	Cienaga fis	.	people com	.	Both Benefi	.
6	coastal fish	cienaga	.	Cienaga fis	Coastal fish	people com	Unemploy	Harmful	.
7	coastal fish	cienaga	.	Cienaga fis	Coastal fish	.	.	Both Benefi	.
8	coastal fish	cienaga	.	.	.	.	.	Both Benefi	water circul.
9	coastal fish	cienaga	.	.	.	.	.	Beneficial	.
10	.	cienaga	.	.	.	.	.	Beneficial	.
11	coastal fish	.	.	Cienaga fis	.	people com	Unemploy	Both Benefi	protects boa
12	coastal fish	cienaga	.	Cienaga fis	Coastal fish	No more sal	Unemploy	Both Benefi	.
13	.	cienaga	.	.	Coastal fish	.	.	.	.
14	coastal fish	cienaga	deep-sea fis	.	Coastal fish	people com	.	.	.
15	.	cienaga	.	.	Coastal fish	people com	.	Both Benefi	.
16	coastal fish	cienaga	.	Cienaga fis	Coastal fish	.	.	Beneficial	water circul.
17	.	.	.	Cienaga fis	Coastal fish	.	.	.	.
18	coastal fish	.	.	Cienaga fis	Coastal fish	.	.	Both Benefi	.
19	.	.	.	.	Coastal fish	people com	.	Beneficial	.
20	coastal fish	cienaga	deep-sea fis	.	Coastal fish	.	.	.	.
21	.	.	.	Cienaga fis	Coastal fish	people com	.	.	.
22	coastal fish	cienaga	.	Cienaga fis	Coastal fish	.	.	Harmful	.
23	coastal fish	.	.	Cienaga fis	Coastal fish	.	DUMAC	Both Benefi	water circul.
24	.	.	.	Cienaga fis	Coastal fish	.	.	Harmful	.
25	coastal fish	.	.	Cienaga fis	Coastal fish	people com	DUMAC	Harmful	.
26	coastal fish	.	.	.	.	.	.	Both Benefi	.
27	.	.	.	Cienaga fis	.	.	DUMAC	Beneficial	water circul.
28	coastal fish	cienaga	.	Cienaga fis	Coastal fish	.	.	Both Benefi	.
29	.	cienaga	.	Cienaga fis	Coastal fish	.	No more sal	Both Benefi	.
30	coastal fish	cienaga	.	Cienaga fis	Coastal fish	.	DUMAC	.	.
31	coastal fish	cienaga	.	.	Coastal fish	.	.	.	.

APPENDIX C

Table 76—Continued

	puertob2	puertoh	puertoh2	dumac	duissue1	duissue2	fewfish1	fewfish2	fewfish3
1	.	.	.	.	.	.	.	.	.
2	protects boa	.	.	.	.	.	.	.	.
3	protects boa	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.
5	increase c's	lost salt biz	.	.	.	.	.	too many fis	.
6	.	lost salt biz	.	.	.	.	trawling fle	too many fis	.
7	increase c's	lost salt biz	.	.	.	.	trawling fle	.	.
8	increase c's	lost salt biz	.	.	.	.	.	.	.
9	increase c's	.	.	.	.	.	.	.	.
10	protects boa	lost salt biz	.	bad	.	only few gul	.	.	.
11	increase c's	lost salt biz	.	.	.	.	.	.	weather
12	increase c's	lost salt biz	.	.	.	.	.	.	pollution
13	.	.	.	.	.	.	.	too many fis	.
14	.	.	.	.	.	.	.	too many fis	weather
15	increase c's	.	lost ducks	.	.	.	no regulatio	too many fis	weather
16	increase c's	.	.	.	.	.	no regulatio	too many fis	.
17	.	.	.	.	.	.	.	.	.
18	protects boa	lost salt biz	lost ducks	.	.	.	no regulatio	too many fis	.
19	protects boa	.	.	.	.	.	trawling fle	too many fis	no regulatio
20	.	.	.	.	.	.	.	.	.
21	.	.	.	.	.	.	.	too many fis	.
22	.	.	pollution	bad	drying up w	.	pollution	too many fis	no regulatio
23	increase c's	lost salt biz	.	bad	drying up w	killing fish in	DUMAC pro	weather	no regulatio
24	.	lost salt biz	.	.	.	.	.	.	.
25	.	lost salt biz	.	bad	drying up w	killing fish in	DUMAC pro	too many fis	.
26	.	lost salt biz	.	.	.	.	.	.	.
27	.	.	.	bad	drying up w	killing fish in	DUMAC pro	pollution	no regulatio
28	increase c's	lost salt biz	.	.	.	.	trawling fle	too many fis	.
29	increase c's	lost salt biz	lost ducks	bad	drying up w	killing fish in	trawling fle	too many fis	.
30	.	.	.	bad	drying up w	killing fish in	DUMAC pro	trawling fle	no regulatio
31	.	.	.	bad	.	killing fish in	DUMAC pro	too many fis	trawling fle

APPENDIX C

Table 76—Continued

	fish1	fish2	fish3	fish4	fish5	fish6	oclass	ctrails1	ctrails2
1	.	.	.	.	.	.	.	connected t	flora & faun
2	Crab	Mullet	Shrimp	Chivita	Octopus	.	.	muddy	shallow
3	Chivita	Octopus	Grouper	Sea Bass	.	.	.	flora & faun	.
4	Chivita	Conch	Shrimp	.	.	.	women	flora & faun	muddy
5	Chivita	Shrimp	.	.	.	.	.	flora & faun	connected t
6	Chivita	Shrimp	Crab	Octopus	Grouper	.	women	connected t	very salty
7	Grouper	Rubia	Mojarra	Shrimp	Crab	.	women	connected t	.
8	Chivita	Shrimp	Crab	Mullet	Corvina	Octopus	women	muddy	.
9	Chivita	Crab	Octopus	Shrimp	.	.	women	flora & faun	fresh water
10	.	.	.	.	.	.	women	connected t	.
11	Octopus	Grouper	Rubia	Mojarra	.	.	women	connected t	muddy
12	Chivita	Mullet	Mojarra	Shrimp	.	.	.	flora & faun	fresh water
13	Chivita	Octopus	Crab	.	.	.	.	connected t	flora & faun
14	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	women	.	.
16	Chivita	Crab	Mojarra	Mullet	Sea Bass	Octopus	the poor	.	.
17	Grouper	Conch	Lobster	.	.	.	.	shallow	mudd,
18	Grouper	Mojarra	Rubia	Parguitos	Octopus	.	.	.	.
19	Octopus	Grouper	Lobster	Chivita	Conch	.	women	.	.
20	Grouper	Chivita	Shrimp	Crab	.	.	women	.	.
21	Octopus	Grouper	Lobster	Chivita	Crab	.	.	large	shallow
22	Grouper	Corvina	Mullet	Sea Bass	.	.	.	connected t	.
23	.	.	.	.	.	.	.	muddy	.
24	.	.	.	.	.	.	.	.	.
25	Grouper	Rubia	Crab	.	.	.	.	.	.
26	Octopus	Grouper	Mullet	Chivita	.	.	women	muddy	flora & faun
27	Grouper	Squid	.	.	.	.	.	.	.
28	Grouper	Octopus	Chivita	Crab	.	.	.	.	.
29	.	.	.	.	.	.	.	.	.
30	Chivita	Octopus	Corvina	Sea Bass	.	.	.	shallow	flora & faun
31	Mojarra	Chivita	Conch	.	.	.	.	shallow	muddy

APPENDIX C

Table 76—Continued

	ctrails3	ctrails4	cpercep1	cpercep2	cpercep3	cname1	cname2	cname3	cname4
1	.	.	beautiful	.	.	.	ria (estuary)	rio (river)	charcos (po
2	connected t	.	income sour	beautiful	.	cienaga (we	.	rio (river)	.
3	.	.	income sour	beautiful	.	cienaga (we	.	.	.
4	.	.	income sour	beautiful	.	cienaga (we	ria (estuary)	rio (river)	.
5	.	.	beautiful	.	.	.	ria (estuary)	.	.
6	flora & faun	.	threatened	beautiful	.	cienaga (we	ria (estuary)	rio (river)	.
7	.	.	income sour	beautiful	existence	cienaga (we	ria (estuary)	rio (river)	.
8	.	.	income sour	place to buil	beautiful	cienaga (we	ria (estuary)	rio (river)	.
9	.	.	income sour	beautiful	.	cienaga (we	ria (estuary)	rio (river)	charcos (po
10	.	.	beautiful	.	.	cienaga (we	ria (estuary)	.	charcos (po
11	very salty	.	beautiful	threatened	polluted	cienaga (we	ria (estuary)	.	.
12	shallow	.	beautiful	threatened	.	cienaga (we	ria (estuary)	.	.
13	.	.	beautiful	.	.	cienaga (we	ria (estuary)	.	.
14	.	.	income sour	threatened	beautiful	cienaga (we	ria (estuary)	rio (river)	.
15	.	.	.	.	.	cienaga (we	ria (estuary)	.	.
16	.	.	.	.	.	.	.	rio (river)	.
17	.	.	threatened	income sour	.	cienaga (we	.	.	.
18	.	.	threatened	.	.	cienaga (we	ria (estuary)	rio (river)	.
19	.	.	.	.	.	.	ria (estuary)	.	.
20	.	.	.	.	.	cienaga (we	ria (estuary)	rio (river)	.
21	connected t	very salty	.	.	.	cienaga (we	ria (estuary)	.	charcos (po
22	.	.	polluted	.	.	cienaga (we	ria (estuary)	rio (river)	.
23	.	.	.	.	.	cienaga (we	.	rio (river)	.
24	.	.	.	.	.	cienaga (we	.	.	.
25	.	.	.	.	.	cienaga (we	.	rio (river)	.
26	.	.	.	.	.	cienaga (we	.	rio (river)	.
27	.	.	.	.	.	cienaga (we	.	.	.
28	.	.	.	.	.	cienaga (we	.	rio (river)	.
29	.	.	.	.	.	cienaga (we	.	rio (river)	.
30	large	connected t	income sour	threatened	.	cienaga (we	ria (estuary)	rio (river)	.
31	flora & faun	.	threatened	.	.	cienaga (we	ria (estuary)	.	charcos (po

APPENDIX C

Table 76—Continued

	improve1	improve2	improve3	cprod1	cprod2	cprod3	cprod4	cprod5	cprod6
1	aquaculture	.	.	Mullet	Sea Bass	Chivita	Salt no mor	Crab	wood.
2	aquaculture	.	.	Shrimp	Chivita	Crab	.	.	.
3	aquaculture	.	.	Chivita	Crab	Mullet	Salt no mor	.	.
4	.	.	.	Crab	Chivita	Shrimp	Salt no mor	Mojarra	.
5	.	.	.	Chivita	crawfish	Crab	Shrimp	.	.
6	.	.	nothing will	Chivita	Crab	flamingoes	.	.	.
7	.	use restricti	expert help/	Chivita	Shrimp	Mojarra	Ducks	.	.
8	aquaculture	.	.	Chivita	Shrimp	Crab.	crawfish	Mullet	Ducks
9	aquaculture	tourism	nothing will	Chivita	Crab	Sea Bass	Salt no mor	.	.
10	aquaculture	.	.	salt no more	Chivita	Mojarra	.	.	.
11	aquaculture	.	.	Shrimp	Chivita	Crab	Mullet	Sea Bass	wood
12	aquaculture	use restricti	expert help/	Chivita	Crab	Mullet	.	.	.
13	.	use restricti	expert help/	Shrimp	Crab	Chivita	.	.	.
14	aquaculture	.	.	Shrimp	Chivita	Crab	.	.	.
15	.	.	.	Chivita	Sea Bass	Corvina	.	.	.
16	aquaculture	use restricti	.	Chivita	Flamingoes	.	.	.	.
17	.	.	.	Corvina	Sea Bass	Mullet	Chivita	.	.
18	.	.	nothing will	Chivita	wood	.	.	.	.
19	aquaculture	.	.	Chivita	Mullet	Crab	.	.	Flamingoes
20	.	.	.	.	.	.	.	.	.
21	.	use restricti	.	Chivita	Crab	.	.	.	.
22	.	use restricti	.	.	.	.	.	.	.
23	.	.	Remove DU	Chivita	Mullet	.	.	.	.
24	.	.	nothing will	Chivita	Crab	Shrimp	Flamingoes	.	.
25	.	.	Remove DU	nothing	.	.	.	.	.
26	.	.	.	Chivita	Flamingoes	.	.	.	.
27	.	.	Remove DU	nothing	Chivita	.	.	.	.
28	.	.	.	.	.	.	.	.	.
29	.	.	.	salt no more	Chivita	Mullet	Sea Bass	.	.
30	aquaculture	.	Remove DU	Mullet	Sea Bass	Corvina	.	.	.
31	.	.	.	Chivita	.	.	.	.	.

APPENDIX C

Table 76—Continued

	cserv1	cserv2	cnonmk1	nonmk2	nonmk3	flam	tourism	helptour	safenet
1	storm prote	.	Lizards	Hérons, gull	Turtles	.	no	capital inves	Yes
2	subsistence	.	.	.	.	.	sometimes	capital inves	Yes
3	.	.	Hérons, gull	Ducks	.	Sometimes	sometimes	flamingoes	Yes
4	.	.	.	.	.	Always	sometimes	nothing	Yes
5	.	.	Hérons, gull	.	.	Sometimes	sometimes	flamingoes	.
6	subsistence	storm prote	Turtles	.	.	.	sometimes	flamingoes	Yes
7	subsistence	.	.	.	.	.	no	.	Yes
8	subsistence	.	Hérons, gull	.	.	.	no	nothing	Yes
9	.	.	.	.	.	Sometimes	sometimes	flamingoes	Yes
10	.	.	Hérons, gull	Lizards	Parrots & ot	Always	no	flamingoes	.
11	subsistence	.	.	.	.	.	sometimes	nothing	Yes
12	subsistence	.	Ducks	.	.	.	no	capital inves	Yes
13	subsistence	.	Ducks	.	.	.	no	.	.
14	.	.	.	.	.	.	sometimes	nothing	Yes
15	subsistence	.	.	.	.	.	.	.	.
16	.	.	Hérons, gull	Ducks	.	Sometimes	sometimes	flamingoes	Yes
17	.	.	Flamingoes	Ducks	.	.	.	.	Yes
18	.	.	.	.	.	Sometimes	.	.	Yes
19	.	.	.	.	.	.	sometimes	nothing	Yes
20	subsistence	.	Flamingoes	.	.	.	.	.	Yes
21	storm prote	subsistence	.	.	.	.	.	.	Yes
22	.	.	Flamingoes	.	.	.	.	.	.
23	.	.	.	.	.	.	.	flamingoes	Yes
24	subsistence	.	Hérons, gull	.	.	.	no	nothing	Yes
25	nothing bc	.	.	.	.	.	.	.	Yes
26	.	.	Ducks	.	.	.	.	.	.
27	nothing bc	.	Parrots & ot	.	.	Never	.	.	.
28	.	.	.	.	.	.	.	.	Yes
29	.	.	.	.	.	Never	sometimes	nothing	Yes
30	nothing bc	subsistence	Ducks	Flamingoes	.	.	.	.	Yes
31	nothing bc	.	Turtles	.	.	.	.	.	.

APPENDIX C

Table 76—Continued

	recreate	chivita	chwork	restic	rwhat	rwhat2	rwhat3	restwork	rwhynot
1	.	Yes	yes	yes	octopus	.	.	.	.
2	yes	Yes	.	yes	.	.	.	maybe	subsistence
3	.	.	.	yes	octopus	.	.	.	.
4	yes	.	.	yes	fishing in ci	turtles	octopus	no	lack of enfor
5	yes	Yes	.	.	.	.	.	.	.
6	yes	Yes	yes	yes	shrimp	octopus	.	no	subsistence
7	.	Yes	.	yes	shrimp	.	.	no	lack of enfor
8	.	Yes	yes	yes	fishing in se	.	.	no	lack of enfor
9	yes	Yes	.	yes	fishing in se	shrimp	octopus	no	subsistence
10	.	Yes	.	.	.	.	.	.	.
11	.	Yes	.	yes	octopus	.	.	.	.
12	.	Yes	yes	yes	octopus	.	.	maybe	lack alternat
13	.	.	.	yes	octopus	.	.	maybe	.
14	yes	Yes	yes	yes	octopus	.	.	.	.
15	.	Yes	.	yes	octopus	.	.	.	.
16	yes	.	.	.	.	.	.	.	.
17	.	Yes	.	yes	conch	.	.	no	subsistence
18	yes	.	.	.	.	.	.	no	subsistence
19	yes	Yes	.	yes	conch	.	.	no	subsistence
20	yes	Yes	yes	yes	shrimp	.	.	no	subsistence
21	.	.	.	yes	conch	.	.	no	subsistence
22	yes	.	.	yes	conch	.	.	no	subsistence
23	.	Yes	.	.	.	.	.	maybe	subsistence
24	.	Yes	.	yes	shrimp	octopus	conch	maybe	.
25	.	Yes	.	.	.	.	.	.	.
26	.	Yes	.	.	.	.	.	maybe	subsistence
27	.	Yes	yes	.	.	.	.	no	subsistence
28	.	.	.	.	.	.	.	.	.
29	.	Yes	.	yes	octopus	.	.	no	subsistence
30	.	.	.	yes	conch	turtles	.	no	subsistence
31	.	.	.	yes	conch	.	.	no	.

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