

Community Characteristics and Their Influence on Community Renewable Energy Projects:
A Case Study of Cang Dong Village, Hainan, China

by

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AUTHOR'S DECLARATION FOR ELECTRONIC SUBMISSION OF A THESIS

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners

I understand that my thesis may be made electronically available to the public.

Ben Greenhouse

Abstract

This thesis examines the characteristics of a community that positively influence the success of a community renewable energy project. As the first stage of a two-stage inductive research process, a review of relevant bodies of literature results in the development of 5 characteristics of a community that—based on the literature—have the potential to positively affect the success of a community renewable energy project. Those characteristics are: a large stock of social capital and a strong sense of community; effective leadership from local government and local organizations; past experience with cooperation and innovation, and access to technical resources; economic perceptions and realities; and biophysical resources appropriate to the technologies being used.

Following an examination of how these characteristics might manifest themselves in a Chinese context, the five characteristics were used as a heuristic to guide the second stage of the research process: a case study of a community biogas project in Cang Dong Village in China's Hainan province. This case study suggests that the success of Cang Dong's biogas project was directly influenced by four main factors: effective leadership from local government, access to technical resources, economic perceptions and realities, and biophysical resources appropriate to the technologies being used. The impact of the community's past experience with innovation & cooperation and their strong stock of social capital were more ambiguous; although the community had past experience with cooperative and innovative projects, along with a high stock of social capital, a direct link between these characteristics and the success of the biogas project could not be conclusively determined.

As a result of the case study, this thesis concludes with an outline of a general framework that could be used to evaluate the suitability of a community for a community renewable energy project. This outline is presented acknowledging the exploratory nature of this research and follows the need for more research on this topic.

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Dedication

For Jen.

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Chapter 1: Introduction

Small renewable energy projects dispersed [... across a large area ...] may offer the benefits of distributed generation, pump more [...] project development dollars through rural economies, increase public awareness and acceptance of renewable energy, and provide a stable domestic market for renewable energy technology that can spur regional manufacturing industries.

(Gipe, Doncaster, and MacLeod 2005:9)

Technology, like society, is heterogeneous. It mirrors the context in which it operates.

(Regmi 2003:193)

I think it's important to realize that technology defined as *practice* shows us the deep cultural link of technology, and it saves us from thinking that technology is the icing on the cake. Technology is part of the cake itself.

(Franklin 1990:17)

1.1 Introduction

Energy is a central part of every human being's daily life. Whether in the form of chemical energy (food), thermal energy (heat), or electricity, everything on this planet is part of a vast system of energy transfers, conversions and use. Energy, in all its forms, has the ability to transform the daily lives of humans across the world by easing workloads, boosting economies, and generally increasing the comfort of our lives. In rural or remote communities, the transformative power of energy is often amplified as access to convenient and "modern" forms of energy such as electricity, liquid fuels or modern biomass can create new economic opportunities, spur existing ones, and drastically improve the quality of life in that community. As 50% of the world's population lives in rural areas (United Nations 2004), provision of energy to these communities can have a major impact. In less-developed¹ countries, where some estimates suggest that 90% of the population lacks access to "sufficient and sustainable supplies of energy" (Barnes and Floor 1996:499), the percentage of the population in rural areas grows to almost 60% (United Nations 2004). In this context, the provision of "modern" energy sources to rural communities becomes an important component of development plans in both developed and developing countries.

In isolated areas, or in areas with relatively small populations (characteristics of many rural and remote communities), the use of renewable energy technologies for the provision of

¹ I use this term guardedly, and only because of its use in the United Nations report to which I am referring.

energy can often be a cost-effective alternative to traditional methods of energy provision, especially—in the case of electricity—central-grid electrification (Byrne, Shen, and Wallace 1998; Zhou and Byrne 2002; Weisser 2004). Renewable energy technologies also have the advantage of being more sustainable and benign methods of energy provision relative to non-renewable alternatives.

Given the importance of rural energy and the potential that renewable energy technologies hold with regards to filling that need, the question arises: why do some community renewable energy projects succeed where other, apparently similar, projects fail? The answer to this question is complex and multifaceted. As the quotes at the beginning of this chapter suggest, the interface between technology and the society in which it is found can be an important element in determining the success of any project involving technology, including community energy projects. Community energy projects rely on technology and innovation, but take place in a specific social context. All too often this social context is ignored as if it is unimportant, or given a lower priority than technological concerns (Regmi 2003; Kottak 1990). Ignoring the social context (and—by extension—the end-users) of a technology project in this way can often result in a lack of maintenance, inappropriate financing schemes to pay for the technology, inappropriate usage of that technology, and ultimately failure of the system (Short and Thompson 2003). Planning of community energy projects has historically focused on technological challenges and resources without much attention to other characteristics of a community that also affect the success of those projects.

1.2 Research Question

This thesis first asks what characteristics of a community are conducive to a successful community renewable energy project, and explores this question with a literature review. Armed with the results of this literature review as a heuristic for further research, I ask what these characteristics would look like in a Chinese context, followed by a case study of a community energy project in China.

The initial literature review draws together five characteristics of a community that can influence the success of a community renewable energy project. I then explore the sub-question of how these characteristics might be manifest in contemporary Chinese culture through a brief exploration of the literature on Chinese history and culture. The five characteristics and their manifestation in China are then investigated through a case study of a biogas plant generating electricity for a commercial farm enterprise and providing free cooking gas to the residents of Cang Dong, a small village in Hainan, the southernmost province of China.

1.3 Rationale

1.3.1 General Rationale

Why are community renewable energy projects important? Fully answering this question first requires addressing the importance of energy in rural communities and the role of renewable energy technologies in such communities. A reliable and reasonably priced source of energy (whether electricity, heat sources or another form of energy) can have a positive impact on the quality of life in a rural community. In the case of electricity, electrification has been shown to stimulate existing economic activities, create new ones and to improve the quality of life in rural and remote communities (Holland et al. 2001; El Bassam 2001; Smith 2000).

How do renewable energy projects fit into this larger picture of rural energy needs? Paradoxically, many common rural sources of energy such as firewood or coal have carried an environmental or social cost² that—while providing some benefits as outlined above—ultimately reduces the quality of life in the community. At the same time, these energy sources are often based on limited resources whose costs will eventually rise as their supply dwindles. Providing energy in a sustainable, environmentally and socially benign (or positive) way can avoid that concurrent reduction in quality of life and increase in price. Renewable energy technologies by their very nature provide a non-polluting, stable priced source of energy, and—as discussed—may already be cost-competitive with conventional energy sources (Byrne, Shen, and Wallace 1998; Zhou and Byrne 2002; Weisser 2004).

Given the role of renewable energy technologies in the provision of energy to rural communities (and the importance of that energy), why am I focusing on community energy projects in particular? Community energy projects are often small-scale and decentralized energy projects that provide a key opportunity for community involvement in the planning, management and operation of the energy source. Small-scale and decentralized energy projects can often provide energy at a lower cost than centralized energy provision (e.g. central-grid electrification), while community involvement in such a project can augment the stability and sustainability of such a project.

Most of the energy sources commonly used by humans are produced and delivered from a central location. Electricity, gas, and even sources like coal are often produced miles away from where they are consumed. Decentralized energy provision entails distributing and using the energy close to the source of production. In the case of electricity, decentralized energy

² As an example, 2.4 billion people rely on biomass for cooking and heating. The smoke produced from the biomass results in 1.6 million deaths per year, making indoor air pollution the fourth greatest risk factor for death and disease in the world's poorest countries (ITDG, 2004).

generation, transmission and distribution were thought to be economically unviable for many years. For almost a century, economies of scale have allowed energy suppliers to decrease the price of energy while increasing the size of generation, transmission and distribution systems (Feinstein, Orans, and Chapel 1997). As a result, centralized, vertically integrated power generation has been the de facto system of power generation in most developed areas since the 1960s, and has increasingly been seen as the model for electricity provision. However, in the decades since then, a decrease in the costs of smaller scale generation technologies has resulted in a reduction of the economies of scale of vertically integrated generation systems. This reduction in economies of scale, coupled with rising inflation, has led to an increase in the cost of transmitting and distributing power, thereby weakening justifications for large centralized systems. According to some estimates, capital expenditures on transmission and distribution infrastructure may now outweigh those on generation facilities by a factor greater than four (Feinstein, Orans, and Chapel 1997). This high cost of infrastructure development may serve to make local generation and distribution facilities more economically viable.

Indeed, these high costs of transmission and distribution may be the main barrier preventing unconnected rural and remote communities from connecting to the grid. In order to remove this barrier, taxes on energy charges could be reduced in order to lower the effective price of energy and provide an incentive for distributors to reach rural markets (Barnes and Floor 1996). However, a system-wide reduction in taxes will have the side effect of reducing incentives for energy conservation, increasing energy use and greenhouse gas emissions, and—depending on the generation technology used—have the unfortunate side effect of increasing regional air pollution. Another possible method of inducing rural electrification through conventional, centralized distribution is the use of government subsidies. Unfortunately, subsidies are generally an ineffective tool to increase the access to electricity of the poorest members of society, and tend to undermine the quality and reliability of the service provided (Barnes and Floor 1996).

An obvious solution to the increased relative cost of distribution and transmission is to generate and distribute power at the smallest scale possible, as close to the site of use as possible. In remote rural communities that are not on a national or regional grid system, the cost of local generation and transmission can be equivalent to or lower than conventional methods of energy supply due to the high costs of connecting to existing infrastructures (Byrne, Shen, and Wallace 1998; Zhou and Byrne 2002). In this scenario communities have a variety of generation options ranging from renewable energy sources such as solar, biogas, wind, micro-hydro, or renewably harvested biomass to non-renewable options such as diesel generators, or a combination of the two. The higher initial cost of renewable generation solutions may be

mitigated by the long-term cost of importing fuel for generators, and the higher long-term maintenance cost associated with some non-renewable technologies (Holland et al. 2001). In terms of distribution, communities can choose from a range of options, from small-scale local power grids to a collection of completely autonomous households with individual generating facilities.

Many of the most cost-effective renewable energy technologies are small-scale in relation to conventional energy generation technology (e.g. power plants, large scale hydro projects). The small scale of these technologies, and the relatively small capital investment required to implement them, makes these technologies particularly suited to meeting the energy needs of small, rural communities. The small scale of these technologies (along with - in some communities - the lack of an existing power infrastructure) also makes them particularly well suited to community ownership and/or management. Community involvement in renewable energy projects will have practical benefits regarding issues in day-to-day management of the facilities, but may also have less tangible benefits in terms of community pride, cohesiveness, education, and quality of life.

Decentralized renewable energy projects with strong community involvement can help to move a community towards a sustainable path of development. Environmental integrity, self-sufficiency, and equity have all been identified as components of sustainability (Gibson 2002). Community renewable energy projects can have an impact on each of these components. Renewable energy technologies can reverse or reduce environmental degradation caused by traditional techniques of energy generation in rural areas by reducing emissions and reducing pressure on local biomass resources. Similarly, a local source of energy that is controlled by the community will increase the self-sufficiency of a community. Finally the provision of energy can increase equity in a community by reducing labour costs, economic costs, and health costs associated with a lack of energy, costs which are predominantly borne by women and children (Yechury 2000). For these reasons, successful implementation of community level renewable energy projects can enhance the sustainability of that community, while reducing its impact on the environment.

Certain biophysical characteristics³ of a community are clearly conducive to the use of a given renewable energy technology (RETScreen International 2002). Nevertheless, successful implementations of community renewable energy projects depend on many other characteristics of a community. Unfortunately, these other characteristics of communities are not as well established or documented as are the biophysical characteristics. This research is aimed at these gaps in the literature and the practice.

³ Biophysical characteristics such as wind resources, solar resources, geothermal activity, etc.

1.3.2 China Specific Rationale

Why would I choose to examine the manifestation of these characteristics in China and then undertake my case study in China? Community renewable energy projects have the potential to address some pressing concerns in China today. Decentralized community renewable energy projects will allow the Chinese government to provide energy to rural communities without the cost of the expansion of centralized energy-distribution systems, and without the environmental degradation associated with some common Chinese sources of energy (e.g. coal).

China is currently the world's second largest consumer and producer of energy, and the second largest emitter of carbon dioxide, second only to the United States in both cases (van Vuuren et al. 2003). China is also the world's largest emitter of sulfur dioxide, owing to its heavy reliance on coal-fired generation facilities; three-quarters of China's commercial energy is from coal (Taylor and Bogach 1998). The past two decades have seen the Chinese economy undergo double-digit rates of expansion (Martinot 2001); the growing economy is placing tremendous pressure on the Chinese energy sector as energy demands skyrocket. As discussed in Chapter 3, some predictions suggest that Chinese primary energy use could triple by 2020, resulting in a three-fold increase in coal consumption (assuming the use of all other energy sources increases by the same amount) and an associated increase in air pollution. To continue along their current energy-intensive path of development without severely exacerbating their current pollution problems, China needs to find cleaner energy sources to fill their energy needs.

At the same time, the disparity in income and quality of life between urban and rural Chinese is growing (Yang 2004). Increasing the quality of life and the economic prospects in rural China is of pressing concern to the Chinese government. Decentralized renewable energy projects in rural Chinese villages can address this issue without contributing to the environmental problems already existent in many areas of rural China.

1.4 Overview of the Thesis

This chapter concludes with a brief outline of the methodology used in this thesis and gives the reader an understanding of how the research will unfold. Chapter 2 follows, with the definition of the key terms used in this thesis: "community", "community energy projects", and the "success" of those projects. I then draw on a few notable works in community development (i.e. Korten 1980; Uphoff, Esman, and Krishna 1998) to further develop the conceptual framework to be used in this thesis. Using this framework, the chapter proceeds to explore what characteristics of a community might impact the success of community development projects in general, and—by extension—community renewable energy projects. Through a review of energy-related literature and the literature on community projects in general—drawing upon literature from fields such as rural development, appropriate technology, community resource

management, community development, and the diffusion of innovations—five broadly-defined characteristics of communities emerge that have affected the success of community development projects. I proceed to discuss the relevance of these characteristics to community renewable energy projects. These five characteristics combine with Korten's framework and my model of community projects to form a heuristic framework that is used during the case study in China.

Chapter 3 introduces and justifies the choice of China as the setting for the case study. The characteristics developed in the preceding chapter are then discussed in the context of Chinese culture. Rather than a reworking of the previously defined characteristics, Chapter 3 is more of a discussion on how a Western researcher might expect the broad characteristics defined in Chapter 2 to be manifest in modern-day China. This discussion is supported by literature on Chinese history and culture. Following this discussion, Chapter 4 introduces and discusses the methodology and research tools used for the case study.

Chapter 5 introduces the reader to the village of Cang Dong and its biogas plant and discusses the results of the research. The results of the research are discussed in terms of the five characteristics defined and discussed in Chapters 2 and 3. Chapter 6 concludes the thesis by discussing the results presented in Chapter 5, relating these results to current concerns such as international aid, carbon credit markets and the UN's Clean Development Mechanism, and by suggesting areas of interest for future research.

1.5 Methodology

This specific area of research—the role of the community in community renewable energy projects—has produced a relatively small body of literature. A literature review of previous work on this topic would therefore be rather short and may not provide enough information to guide further study. With this limitation in mind, the literature review in this thesis serves a dual purpose: while reviewing the (somewhat sparse) background research in this area and positioning my research in that body of literature, the literature review also draws parallels with other, related, bodies of literature and develops a set of propositions that will guide the rest of the research. As I will explain, this process results in a two stage, inductive research design that allows theory to develop from the data collected in the field, while using data from related literature to focus the data collection process.

There are two main types of types of knowledge generation: *deductive* and *inductive*. The *deductive approach* begins with a theory and attempts to apply that theory to observed reality and see how well reality fits the theory. Conversely, the *inductive approach* starts by studying an observed reality and attempts to use the data generated by such study to draw conclusions and state a theoretical position (Palys 2003). Conclusions drawn through deduction will generally be stronger than those drawn through induction since inductively-generated

conclusions are only as strong as the supporting evidence (Jennings 2005). Inductively-generated conclusions supported by many different pieces of well generated and well-documented evidence can be as strong (or stronger) than deductively-generated conclusions, but their strength grows incrementally with each piece of supporting evidence.

Quantitative, deductive methodologies based on the scientific method of research generally require the development of hypotheses prior to the start of data collection (allowing the researcher to use the data to test the hypotheses). In contrast, many qualitative (and all inductive) methodologies emphasize the generation of theories based on the data collected (cf. Glaser and Strauss 1967). While early textbooks on qualitative methodology encouraged researchers to be objective, "literally to ignore the literature of theory and fact on the area under study, in order to assure that the emergence of categories will not be contaminated..." (Glaser and Strauss 1967:37), it is now relatively widely accepted that there is no such thing as an objective observer whose observations are uncontaminated by expectations (Seale 1999). In reality, "[q]ualitative researchers who investigate a different form of social life always bring with them their own lenses and conceptual networks" (Kelle 1997:4.4). Indeed, "they cannot drop them, for in this case they would not be able to perceive, observe and describe meaningful events any longer - confronted with chaotic, meaningless and fragmented phenomena they would have to give up their scientific endeavour" (Kelle 1997:4.4). It is within this latter construct of the inductive tradition that this thesis is found.

The nature of this thesis is exploratory, inductive and largely qualitative. The research is inductive in that no preconceived theories are being tested. Rather, conclusions are being drawn from the data collected. The research is split into two main segments: a literature review and a case study. In the next chapter, a literature review of research deemed to be relevant or related to community renewable energy projects is undertaken in order to establish a conceptual framework to provide structure for the later case study. This literature review is itself inductive, in the sense that many articles and reports from a variety of fields were read with no preconceived theory. From this reading, common threads emerged to suggest characteristics of communities that—based on the literature examined—might be conducive to successful community renewable energy projects.

Subsequently, in the case study segment of the research, the hypothesis generated in Chapter 2 (that these five characteristics of a community have an impact on the success of community renewable energy projects) is *not* tested. Rather, the hypothesis forms a "loosely connected 'heuristic framework' of concepts" (Kelle 1997:4.4) which helps to focus the research and guide the semi-structured interviews of the case study while "helping the researcher focus his or her attention on certain phenomena in the empirical field" (Kelle 1997:4.4). Using this "heuristic framework", a community that has encountered success with their community energy

project is investigated in a case study using methods borrowed from the ethnographic tradition⁴, as described in more detail in Chapter 4. It bears repeating that the aim of the case study section of the research was not to test the hypothesis derived from the literature review *per se*, as might have been the case using a deductive approach (Hesse-Biber and Leavy 2004). Instead, the aim of the case study research was to gain a “thick description” (Geertz 1973) of a specific case of a successful community energy project and see what characteristics of the community involved may have led to their success. The characteristics identified through the literature review were used as a heuristic framework to guide the research rather than as hypotheses to test against the reality observed in the case study.

1.6 Conclusion

This thesis is an exploratory, inductive and largely qualitative piece of research. Rather than setting out hypotheses which are then tested, conclusions are gradually drawn from the data to form hypotheses that are only as strong as the data from which they were developed. Chapter 2 starts this process by reviewing the current literature on this topic and topics that are closely related to this topic. This review constitutes the first part of the research of this thesis, the second part of which is a case study in China (described in Chapter 4) examining a successful community renewable energy project using the hypotheses generated from the literature as a guide for that research.

⁴ I am *not* claiming that I performed an ethnographic study. The length of time I spent in China and the language and cultural barriers precluded me from ever blending into the village enough to gain a true understanding of their culture and their experience with the energy project. My research does have similar goals to ethnography in that I am attempting to “discover and represent faithfully the true nature of social phenomenon” (Hammersley 2002:66) (in this case, the social phenomenon is the community renewable energy project) by recording community members’ opinions and thoughts on what happened, how the project proceeded and why it succeeded (if they thought it did). My data *were* collected using methods common to ethnography (Fetterman 1989), such as open-ended, semi-structured interviews and participant observation.

Chapter 2: Fostering Successful Community Renewable Energy Projects

2.1 Introduction

What characteristics of a community are conducive to the success of community renewable energy projects? Answering this question necessitates the creation of a conceptual framework that establishes a common meaning of essential concepts, provides a frame of reference for the reader, and links the research methods to the research question. Such a framework must clearly define the terms “community” and “community renewable energy project”, and illustrate how the success of a project is to be measured. The framework must then establish a model to be used as a lens through which the implementation and operation of community renewable energy projects can be studied. Finally, the framework must provide the logic allowing the linkage of community characteristics to the success of community renewable energy projects. In this chapter, a conceptual framework will be built through reviews of community development literature, and the examination of case studies of renewable energy projects and other infrastructure-related projects. After the conceptual framework has been outlined, I will review literature addressing this particular issue (the success of community renewable energy projects), and literature on other, related, topics in order to identify key characteristics of communities that affect the success of community renewable energy projects.

2.2 Conceptual Framework

2.2.1 Key Terms and Categories

This thesis requires the clear definition of three main concepts: community, community renewable energy projects, and criteria for identifying a successful community renewable energy project. These definitions are provided below.

2.2.1.1 Community

The term “community” has come to mean many things. Although in this context I am speaking of geographically and physically defined communities (i.e. “places”), communities are clearly not confined to geographic locales, as demonstrated by online or religious communities which often spread out over vast physical distances. Lyon (1987) notes that while

the term [community] often does imply a small-town nostalgia in which neighborly [sic], homogeneous people care about and help one another [...] sometimes [...] a community is defined in a way that includes a modern-day ethnic neighborhood in a large city (Suttles 1972), a large corporation (Minar and Greer 1969), an informal professional group such as the “scientific community” (Kuhn 1962), or even a philosophical and psychological commitment to communal lifestyles (Nisbet 1953). (Lyon 1987:4)

While recognizing this ambiguity, I hereafter use the term community to describe the geographically-based concept of a community as

a social unit which consists of persons who share a common geographic area interacting in terms of a common culture and which incorporates a range of social structures which function to meet a relatively broad range of needs of all persons who make up the social unit. (Warren 1978:36)

Importantly, this definition does not rely solely on physical proximity; it also accounts for the nature of the relationships and interactions between the people in an area. Indeed, communities differ from cities and villages (other areas where people live in close proximity) in that they are not only defined by their geographic boundaries, but also by the interactions that occur between community members and the common bonds they share (e.g. ethnic communities). These interactions and bonds between citizens are what create and sustain communities. Within what types of associations do these interactions take place and foster those bonds? McKnight (1992:58) suggests three types of associations that “express and create communities”: formal associations such as service clubs or sports leagues, less formal clubs such as groups of neighbours who socialize together, and finally local businesses and offices where members of a community interact and converse with one another.

The types of interactions generated by these associations are complex, being intertwined and—to a certain extent—co-dependent and mutually reinforcing. Tönnies (1988) uses the terms *gemeinschaft* (roughly translated as *community*) and *gesellschaft* (roughly translated as *society*) to differentiate between two similar ways that people in close proximity interact. Tönnies differentiates between *gemeinschaft* and *gesellschaft* on the basis of the motivation behind the each type of interaction. *Gemeinschaft* (community) is more typical of communities in rural villages and small boroughs of larger cities. This type of interaction occurs in a spirit of “mutuality, common destiny, and [an acknowledgement of] the common bonds and obligations that arise therefrom [sic]” (Warren and Lyon 1988:2). *Gemeinschaft* is characteristic of families, neighbours and friendship groups (Warren and Lyon 1988). *Gesellschaft* (society), on the other hand, describes relationships based on a highly rational and thought-out type of relationship, typified by market exchanges. Tönnies suggests that this type of interaction is more prevalent in larger and less personal settings such as large cities. While *Gemeinschaft* relationships may operate on an assumption of reciprocity at a later date, the establishment of good will, or just a sense of improving the community, *Gesellschaft* relationships are purely rational and motivated by self-interest. Note that *Gemeinschaft* and *Gesellschaft* are ideals (i.e. neither exists in reality). Rather, “they are hypothetical, extreme constructs, existing for the purpose of comparison with the real world” (Lyon 1987:7).

These types of relationships and associations allow for the identification of communities that fit Warren's (1978) definition. For the purposes of this study, communities can be identified as geographic locations such as villages or areas of villages in which the inhabitants interact predominantly through what Tönnies describes as *gemeinschaft* type relationships. Locales with inhabitants interacting in this way may demonstrate two or more⁵ of the three types of the associations defined by McKnight (1992).

2.2.1.2 Community Renewable Energy Project

For the purposes of this study, a renewable energy project is defined as any endeavor that results in the provision of some form of energy derived from a renewable source. A community renewable energy project is defined as a renewable energy project that is designed and implemented in such a way as to have the capacity to impact the entire community (as opposed to specific individuals) in some way. Using this definition, a local government initiative to install photovoltaic panels on many homes would qualify as a community energy project, whereas an individual home owner's decision to place a photovoltaic panel on the roof of their dwelling would not.

2.2.1.3 Successful Community Renewable Energy Projects

The dependent variable in this study is the success of community renewable energy projects. To identify successful community renewable energy projects requires the establishment of consistent criteria to evaluate that success. In areas like community development, success can be an extremely subjective term—and therefore hard to determine—unless specific goals are set out prior to the implementation of the project, which can be used to gauge the results. However, measuring success by looking at the attainment of pre-defined project goals can be problematic and hard to generalize across projects since it precludes measuring the success of projects that did not have pre-defined goals, and takes no account of the ambition or appropriateness of any goals that may have been set. An alternative to using the attainment of pre-defined goals as a measure of the success of a community energy project is to look at the impact(s) a project has had on the community in a variety of different areas. This way of measuring success is also important in ensuring that there is construct validity⁶ in the research

⁵ I choose to use two of the three types of associations suggested by McKnight as my criteria for a community because McKnight did not suggest that all three types of associations were required for a community to exist, simply that these three types could express and create community. The presence of at least two of the three types of associations would seem to indicate that there is a good potential for the creation and maintenance of community in that area.

⁶ Construct validity refers to the "the degree to which inferences can legitimately be made from the operationalizations in [...a...] study to the theoretical constructs on which those

methods used, as multiple pieces of evidence regarding the project's impact on the community can be considered and weighed against each other (Yin 2003). Successful implementations of renewable energy projects can have positive impacts on many different facets of a community, including (but not limited to) environmental, social, economic, and political facets. A substantial body of literature describing these impacts already exists (e.g. Ahmed and Hossain 1990; Smith 2000; Ezzati and Kammen 2002; Foster and Tre 2003; Yang 2003; Edwards et al. 2004), indicating that successful projects may contribute substantially to some or all of these areas. However, depending on the relative importance assigned to different aspects of a community, certain projects could be deemed successful by one observer, but unsuccessful by another.

What aspects of a community should be used to judge the success of a community renewable energy project? In his study of appropriate technology, Dunn outlines what he considers to be the three principal aims of development projects: 1) to improve the quality of life, 2) to maximize the use of renewable resources, and 3) to create work places where the people now live (Dunn 1978:5). Because they include impacts on community that can be measured in many different areas (e.g. social, political, environmental, or economic), Dunn's principles are used here as the basis for the following definition of a successful renewable energy project. I have added a fourth point (return on investment) that—while not necessarily a “principal aim” of development projects—is an important part of any community project. Therefore, for the purposes of this discussion, a successful community renewable energy project is a project that has:

1. improved the quality of life of the members of the community,
2. increased the use of renewable resources in that community,
3. created or enhanced sustainable livelihoods in the community, and
4. functioned long enough to ensure a full payback of initial capital cost⁷.

Gauging whether a project has met these goals is itself a subjective decision (with the exception of the last point), but by detailing this standard list of goals against which all renewable energy projects can be judged, a more consistent evaluation of different projects is possible.

Furthermore, when assessing whether a goal has been met, evidence from different aspects of the community can be brought to bear on the decision, further enabling the comparison of vastly different projects and their respective outcomes.

operationalizations were based” (Trochim 2004:1) (e.g. when I measure what I call social capital, is that what I'm really measuring?).

⁷ Determining whether the fourth goal has been accomplished may take a long time. In the short term, all available evidence can be used to examine whether it is *probable* that the project will function long enough to ensure a full payback of initial cost.

How are these outcomes to be measured? What does “quality of life” mean? What is a “sustainable livelihood”? The criteria for judging the success of a community renewable energy project need some further exploration.

Quality of Life

The concept of quality of life (and how to measure it) has been discussed in great detail. Diener & Suh (1997) provide a good review of the competing schools of thoughts on the measurement of quality of life. Three general approaches to measuring quality of life are identified: the use of “social indicators such as health and levels of crime, [of] subjective well-being measures (assessing people’s evaluative reactions to their lives and societies), and [the use of] economic indices” (Diener and Suh 1997:189). Rather than attempting to decide which approach is the best for a given circumstance, it may be useful to broadly assess whether an energy project has improved the quality of life by any of these measures. The impact of an energy project on the quality of life in a community can then be judged by its observed effect on social indicators such as levels of crime and health, community residents’ subjective opinions on the change in their lives, and a project’s impact on the economy of the community.

The Use of Renewable Resources

Adding the goal of increasing the use of renewable resources in a community to the list of criteria for a successful community renewable energy project may seem redundant given that I have already defined a renewable energy project as any endeavor that results in the provision of some form of energy derived from a renewable source. However, there are conceivable situations where—even though the energy is derived from a renewable resource—the use of renewable resources in the community actually decreases despite the presence of a renewable energy project. A hypothetical example of this situation could be a poor rural community that builds a micro-hydro generator to provide electricity for the village. As a result of this project, the economy grows and the number of televisions and lights in homes increases. As living standards increase, villagers feel that the traditional use of sustainably-harvested firewood for cooking is no longer suitable and switch to imported natural gas stoves. Depending on the magnitude of the shifts, the overall use of renewable resources could decrease despite the provision energy from a community renewable energy project.

Sustainable Livelihoods

Sustainable livelihoods are at the same time a philosophy and an objective of development; there is a “sustainable livelihoods” approach to development research and development action, just as there are sustainable livelihoods that result from these actions. The

concept of sustainable livelihoods as an objective or end-goal is closely related to the concept of quality of life; the notion of "livelihood" encompasses both the costs and quality of daily life, including hard-to-quantify concepts such as pride, joy and security (Bebbington 1999). In what is generally credited as the seminal paper on sustainable livelihoods (cf. de Haan and Zoomers 2005), Chambers and Conway (1991) define three goals, the achievement of which are instrumental steps in achieving sustainable livelihoods. Those goals are capability, equity and sustainability. Capability refers to the ability of individuals to perform certain basic and necessary functions such as obtaining food, clothing and shelter, but also other, less basic, necessities such as the ability to lead a life without shame and the ability to enjoy time with friends and family. The idea of capability can be broadened to include many different facets of life depending on the perspective of the researcher and the context of the individuals being researched. When considered as a goal of a livelihood, equity refers to a relatively equal distribution of access to income, assets, capabilities, and opportunities. The definition of the concept of sustainability (like the concept of sustainable development) is often contested and differently interpreted depending on the context (e.g. Gibson 2002; Lele 1991; Phillis and Andriantiatsaholiniaina 2001; Qizilbash 2001), but in this context, the term is used to refer to "processes which are self-supporting without subsidy" (Chambers and Conway 1991:5).

The energy and services provided by a community energy project can influence sustainable livelihoods in a community. Judging whether an energy project has contributed to the creation or enhancement of sustainable livelihoods requires looking at the impact of the energy project on both the costs and quality of daily life in a community.

Economic return

From a purely economic point of view, a community energy project will not be successful unless the investment in the energy project is paid back in the form of actual profit and/or avoided costs to the community. On a broader scale, ensuring that community renewable energy projects can be justified on economic grounds increases the chances of obtaining financing and funding for future energy projects, as the economic successes of the projects can be demonstrated along with the social benefits.

2.2.2 A Model of the Process of Community Development Projects

Having established the definitions of key terms, the model through which community development projects (including community energy projects) are to be studied will now be expanded. At its most basic, community development can be defined as "a process designed to create conditions of economic and social progress for the whole community with its active participation and the fullest possible reliance on the community's initiative" (Rothman 1974:24).

Given this definition, community development projects can be thought of as specific undertakings designed to contribute to this process.

For the purposes of developing a model of community development projects, I will take a systems approach to the community (cf. Lyon 1987), focusing on the interactions and relations between actors in a community, and the roles and interactions of those actors with regard to a community development project. Murdoch (2000) and Mahanty (2002) discuss approaching community development projects from a systems perspective when they advocate using actor-network theory (cf. Latour 1999; Law and Hassard 1999; Murdoch 2000) to look at rural development from the perspective of the macro-level networks involved in the projects. To look at human activities (such as community development) in terms of systems is to “set some constructed abstract wholes (often called ‘system models’) against the perceived real world in order to learn about it [...] seeking insight or illumination” (Checkland and Scholes 1990:25). The model used is not considered the sole accurate representation of the situation, but rather a representation that is of use for this particular line of inquiry.

2.2.2.1 Actors and Roles

In order to create a model of a community development project, the roles played by actors involved in a community development project must be identified along with the factors that will influence the success of each role. The model for this research will include three roles: financiers, providers, and beneficiaries (Hoddinott 2002). Financiers provide the funds for the intervention, providers deliver the intervention, while beneficiaries are the “communities, households, and individuals who receive the benefits of the intervention” (Hoddinott 2002:149)⁸. Actors involved in a project may assume more than one role. At one extreme, a community which initiates, funds, designs, and implements a community development project could be identified as a financier, provider, and beneficiary of the project. At the other extreme, each role could be assumed by a different entity/actor. Using my definition of community renewable energy projects, the community will always be the beneficiary in this model.

2.2.2.2 Resources

How do these actors interact or work together on a project? Community development projects take place in a specific context that is determined by various aspects of the community. This context is the result of the interplay of various historical, political, cultural and social conditions of that community, including local culture and history; demographics; local economic and political conditions; and the wider macro-economic and political environments. The context

⁸ David Korten (1980) identifies two similar roles in a project: project beneficiaries and the ‘assisting organization’, which is analogous to Hoddinott’s (2002) provider actor.

of any given community will impact the quantity and quality of various community resources available for any community development project, which will in turn impact the success of the project. Community resources can be grouped into four main types of 'capital'⁹: two commonly recognized types of 'economic capital': financial capital (e.g. money and its instruments) and physical or natural capital (e.g. equipment or machinery and natural resources); and two types of less-tangible capital, namely cultural/human capital (i.e. 'know-how', education, technical skills), and social capital (the potential utility of social connections and networks—this concept will be discussed in greater detail later in this chapter). These resources can be of use to any actor in a community development project. As an example, an actor in the role of financier might take advantage of financial capital already in the community, the beneficiary might take advantage of existing social capital to increase its ability to clearly express its needs to the provider of the project, and the provider might use people in the community who possess a relevant 'know-how' to implement some technical portions of the development project.

⁹ For more information on the types of capital, see Bourdieu's influential essay "The Forms of Capital" (Bourdieu 1986), which describes cultural and social capital and discusses how they can be derived from economic capital.

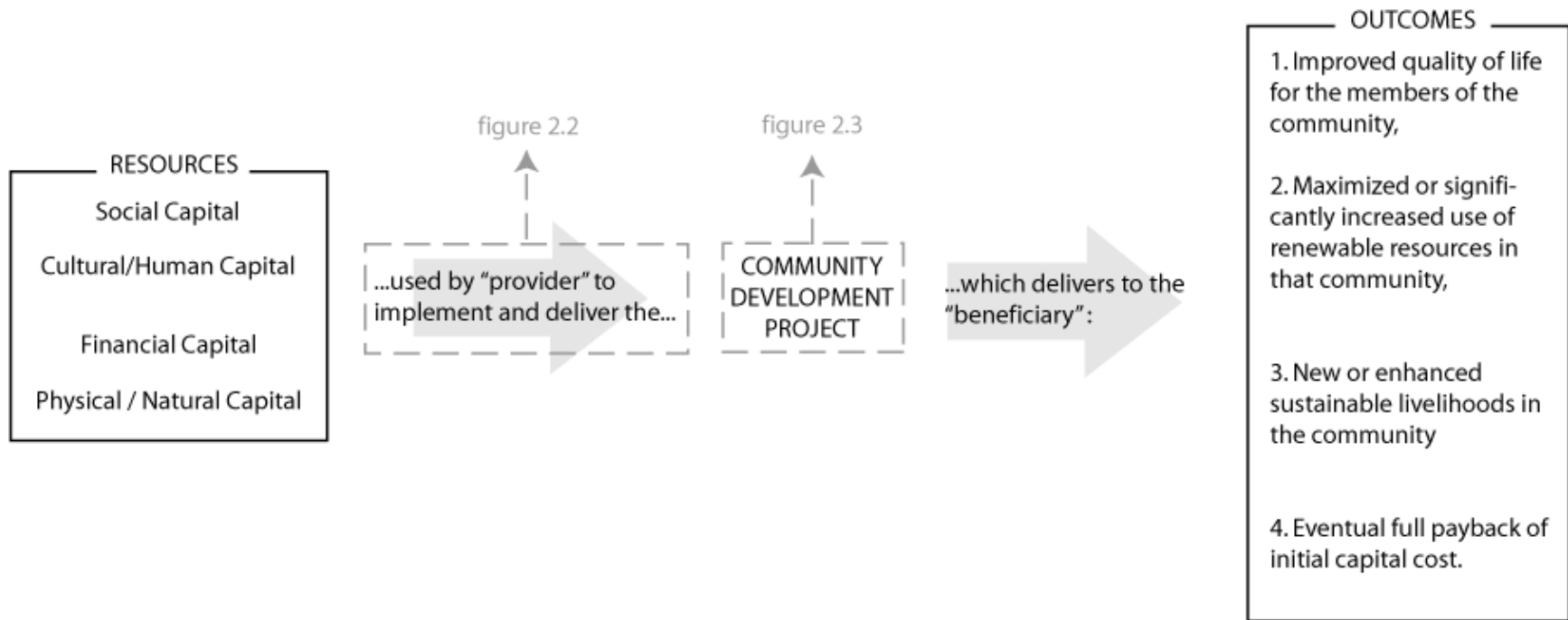


Figure 2.1: General model of community development projects showing (from left to right) the utilization of community resources by the provider to deliver the project outcomes to the beneficiary.

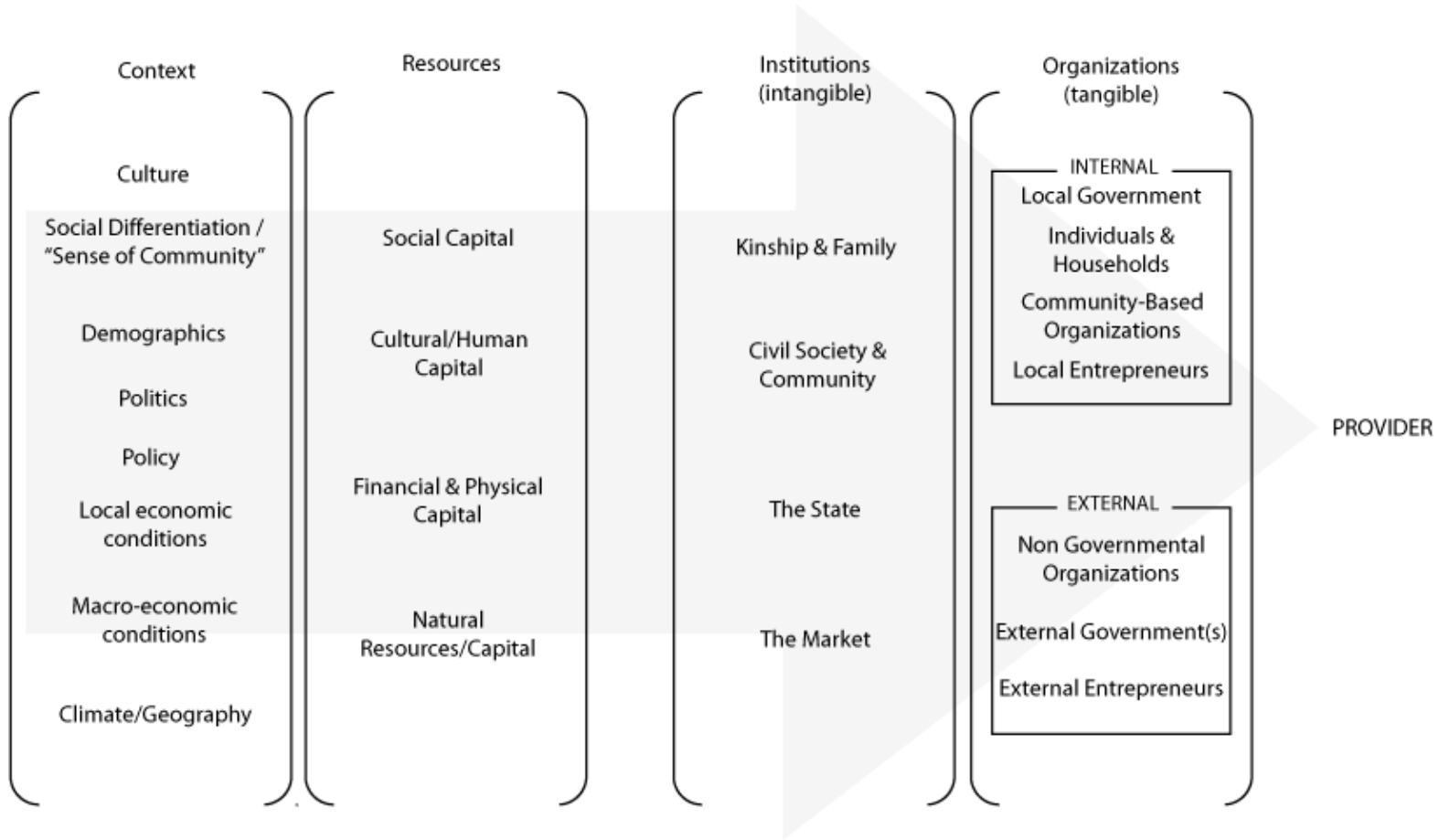


Figure 2.2: Model for the study of community development projects, depicting the pathway through which a provider accesses local resources

2.2.2.3 *The Model*

Figure 2.1 depicts the general model for this study of community development projects. Internal (within the community) and external (from the financier¹⁰) resources are used by the provider to deliver the community development project, which delivers the project outcomes to the beneficiary. Figure 2.1 is a general model of a community development project, but more detailed examination of how a provider obtains access to the community resources used in the community development project can help to structure the inquiry into what characteristics of a community influence the success of community renewable energy projects.

Access to community resources will generally be mediated and controlled by four main institutions: kinship and family, civil society and community, the state, and the market (Brett 1999). Institutions are the “humanly devised constraints that structure political, economic and social interaction”, consisting of “both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)” (North 1991:97). Institutions used in this sense are intangible—they become accessible to external actors through local entities such as individuals, households, and local organizations (Mule No Date). These institutions—accessed through local organizations—govern and mediate how the actors involved in the project gain access to the community resources that can then be used in the community development project. As an example, in a project where the community assumes the roles of both the financier and the beneficiary, the market will often govern the assisting organization’s access to financial capital in the community (e.g. through the setting of prices). This access might also be mediated by the institution of civil society and community, through individual community members and households who may donate money or other resources to the project. Similarly, access to natural resources might be governed by both the state (rules and regulations regarding the use and exploitation of those resources), accessed through the governmental organizations; and the market (the institution governing the purchase of those resources), accessed through local entrepreneurs or households. Figure 2.2 depicts the potential avenues by which providers can access local resources. The two columns on the left depict the resources and the contextual factors which can influence the amount and types of resources present. The two columns on the right depict the four institutions and the main local organizations through which they can be accessed and used. Although this model is depicted in a linear sequence (from context to resources through institutions accessed through local organizations to providers), the two categories will often be interdependent and constantly

¹⁰ If the role of financier is not played by the community.

changing (e.g. social capital will affect sense of community, and external governments may affect the institution of “the state”).

The community development project that successfully uses resources to deliver appropriate project outcomes will be the result of specific interactions between and competencies of the provider and the beneficiary. However, the nature or design of the project itself will also affect the success of this delivery process. During his description of the “learning process”¹¹ approach to community development, Korten (1980) discusses five successful community development projects, suggesting that the projects were successful because “they had achieved a high degree of *fit* between program design, beneficiary needs, and the capacities of the assisting organization” (Korten 1980:496. Emphasis in original). Figure 2.3 shows a modified version of Korten’s schematic representation of fit requirements that models the interactions subsumed within the “community development project” box in figure 2.1¹².

While the relationships between the actors in a community development project are relatively clear in this model, the exact nature of a community, project or organization that would be conducive to a successful project is not a unchanging, clearly definable entity. Each one is contextual and relative, changing as the others change; what is important is how the actors and the project interact and relate. Korten’s (1980) contention is that community development projects will succeed more often if they seek to maximize the “fit” of three important interactions:

1. the fit between the needs of the beneficiary and the benefits delivered by the project (#1 in figure 2.3),
2. the fit between the requirements of the project and the competencies possessed by—or available to—the provider (#2 in figure 2.3), and
3. the fit between the means by which the beneficiary expresses its needs and the process by which the implementing organization makes its decisions (#3 in figure 2.3).

¹¹ Korten (1980) identifies two approaches to community development: the “blueprint” approach common to planners and government, and what he calls the “learning-process” approach which he considers more useful and cost-effective than the blueprint approach. A project taking the learning-process approach incorporates the community’s expertise and needs, allowing a project to be continually shaped as it evolves, in marked contrast to the centrally planned and implemented blueprint approach. The advantages for rural development associated with the learning-process approach have been “increasingly accepted in principle [...but...] bureaucratic processes and requirements continue to distort and truncate efforts to work in this inductive mode” (Uphoff, Esman, and Krishna 1998:20).

¹² The financier is not shown in this figure because—while the financier is involved in the provision of resources that are used in this process—the financier is not directly involved in the process depicted in figure 2.3.

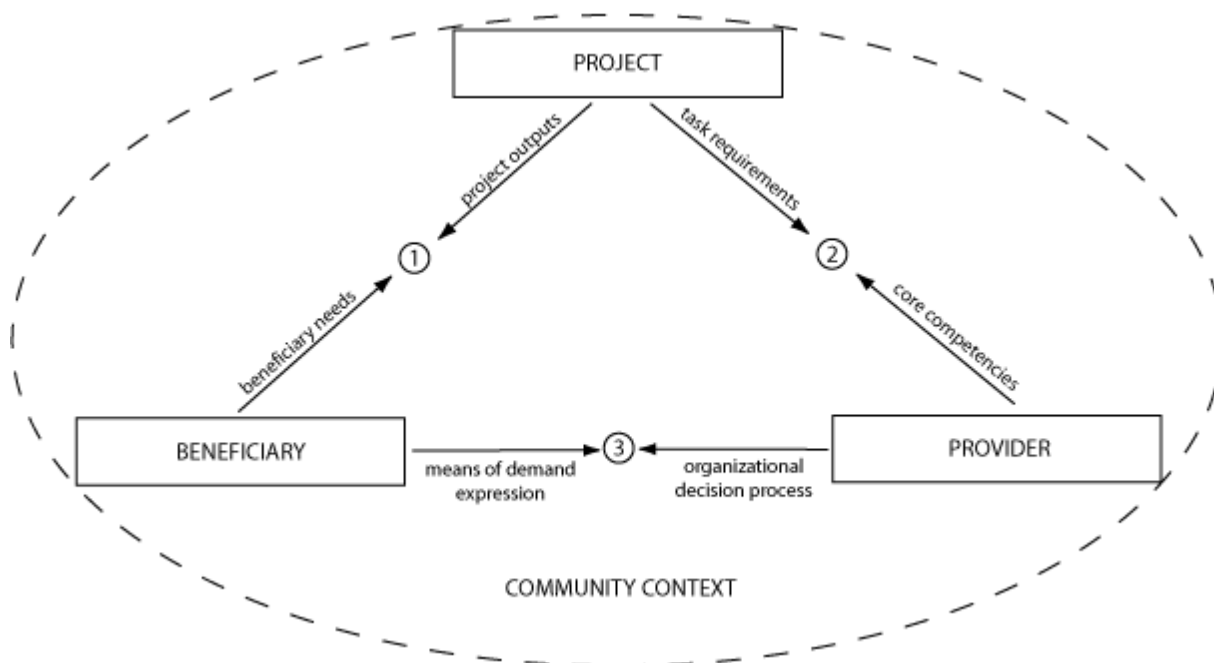


Figure 2.3: Interactions between actors in a community development project (Adapted from Korten 1980:495).

The quality of each of these three interactions depends on different qualities of the two actors and upon the characteristics of the project itself. Broadly speaking, the character of the beneficiary will affect the first and third interactions, while the second interaction will be largely affected by the nature of the specific project and the make-up of the implementing organization.

The three figures presented above (figs. 2.1, 2.2 and 2.3) each depict different levels of details of a model of community development projects. Community renewable energy projects are a type of community development, and as such the model presented above can be used to examine successful community renewable energy projects and explore characteristics of the communities that may have influenced their success. This model is not the only relevant model of the social system that comprises a community development (cf. Rothman 1974), it is a model that I believe is useful for the purposes of this study.

2.3 Successful Projects

Despite the relative wealth of information on characteristics of successful community development projects, most analyses of successful community development projects focus—somewhat understandably—on the nature of the project itself, rather than the nature of the community it benefits (e.g. Uphoff, Esman, and Krishna 1998). This focus is necessary to identify and dissect successful projects in an attempt to learn from them for the design of future projects. Still, the characteristics described as a result of such examinations are only indirectly

related to the qualities of the community in which that successful project occurred. Despite this indirect relationship between characteristics of successful projects and the context in which they succeed, examining the literature on successful projects is still relevant to this research question; characteristics of communities that are conducive to successful projects will be linked to those of successful projects. In the remainder of this chapter, I will briefly examine characteristics of successful projects, and then discuss characteristics of communities that will foster or enable these characteristics in community projects¹³.

During their assessment of 30 rural development projects that have experienced long term success, Uphoff, Esman and Krishna (1998) identify seven components common to these projects. These components are:

1. creative leadership;
2. effective local organizations and people's participation;
3. an adaptive system for the management of program activities;
4. appropriate technologies and training that shares needed knowledge among people at many levels of the operation;
5. systems that use information as a management tool—process documentation as well as monitoring and evaluation;
6. linkages with key local, regional, national, and international actors; and
7. political support, deftly mobilized and managed.

The authors note that these components are not necessarily prerequisites for successful development—they can arise or be improved during the course of the project—but are elements that allow a project to be navigated successfully from the inspiration stage to the point of long-term sustainability. Other studies tend to agree with Uphoff et al's hypothesis; a study of 25 completed World Bank projects found that local participation, effective local organizations and creative leadership were crucial to the continuing success of agricultural projects (Cernea 1987). The importance of appropriate technology is widely recognized, and it is now widely accepted that local participation (Mog 2004) and linkages with internal and external actors (Pretty and Ward 2001) are essential elements of successful development projects.

In the context of the model of community development projects described above, how do the components of successful projects listed above link with the community context?

¹³ As discussed in chapter 1.5, the paucity of literature on this exact topic necessitated reviewing literature on related topics that could be logically linked to the topic at hand. As a piece of inductive research, this chapter is the result of an iterative process wherein literature is reviewed and hypotheses are drawn and revised as more literature is reviewed, adding or removing support for those hypotheses. Relative to this looping process of research, this chapter is written in a linear way. This linearity does not reflect the style of research, but is a stylistic choice I made.

2.3.1 Creative Leadership

Leadership is an important part of any community development project. Leadership can be found at both the project level and at the community level. In the model of community development discussed above, project leadership would be provided by the actor in the role of provider. In the context of this model, a provider must either possess or successfully acquire competencies to meet the requirements of the community development project (interaction 2 in figure 2.3) while making decisions in a way that is compatible with the expressed needs of the beneficiaries (the community—interaction 3 in figure 2.3). In order to maximize the “fit” of these interactions, the provider must also be able to interface effectively with local organizations to gain access to local resources through local institutions (figure 2.2).

Some projects will be led by local government, some will be led by leaders of external organizations. In some cases the leadership of one individual (a champion) will heavily influence the success of a project, but more often success is the result of some form of collective leadership by groups of people playing one or many of the roles of staff and administrators, technicians and trainers, and catalysts (Uphoff, Esman, and Krishna 1998). As an example, groups of farmers working as “extensionists” in Vietnam play a key role in promoting and initiating the diffusion of biogas technology (Lauridsen and An 1996). In general, project leadership seems to have a greater impact on the success of complex projects than on other, less complex, projects (Khwaja 2002; Muldavin 2000)¹⁴.

The role of leadership in local government is also important. In the context of the model discussed above, leadership of the beneficiary actor will enhance the capacity of the beneficiary to identify and express its needs to the provider actor. When communities take on the role of both provider and beneficiary, the role of local leadership is doubly important. Village leaders capable of mustering support among the community were found to be key components of successful community agricultural projects in China (Sanders 2000b,, 2000a). A lack (or loss) of legitimacy in local government reduces community members’ willingness to participate in “collective activities which support long-term sustainable production for the village as a whole” (Muldavin 2000:267). Rules and regulations governing the actions of local officials—providing a legal framework within which community members can influence the quality of their government—were found to influence the performance and impacts of community-based water

¹⁴ In discussing other research on successful community projects, I am making an implicit assumption that success as measured by other researchers is comparable to success as I define it. In these cases, the authors’ measure of success is the long-term upkeep of community-maintained public infrastructure processes, which is similar to my criteria regarding return on investment, but does not specifically address my other three criteria.

projects (Isham and Kähkönen 1999). Characteristics of successful leaders include a long tenure, a history of past successes, and a history of standing up to authority (Sanders 2000b).

In contrast, a study of 44 community-based water projects in Indonesia found a negative correlation between villagers' satisfaction with the project and the involvement of village leaders (Isham and Kähkönen 1999)¹⁵. Interestingly, the same study found that when households or a group of households contributed to project leadership, the end-user's satisfaction with the projects rose. The authors concluded from these results that the negative correlation was due to village leaders placing less importance on the preferences of the end-users. When end-users (households) were involved in the leadership, the success of the projects rose. While leadership remains an important factor of a project's success, the quality of that leadership (in this case determined largely by who provides it) mediates the impact of that leadership.

A pattern emerges from these various case studies: creative leadership in either of the two roles shown in figure 2.3 can influence the success of the project. Leadership within the beneficiaries can impact the success of the project by increasing the effectiveness of the expression of the beneficiaries' needs (Sanders 2000b; Isham and Kähkönen 1999). Skillful leadership from the actor in the role of the provider can affect the success of the project by increasing or augmenting the competencies of the provider actor (Khwaja 2002; Lauridsen and An 1996).

2.3.2 Effective Local Organizations and People's Participation

Effective local organizations and the participation of beneficiaries have been shown to increase the long-term chances of success of a project. Empirical evidence has shown that effective local organizations improve the chances of success of community development projects that require the coordination of local stakeholders (Isham and Kähkönen 1999). The strength of these community-based organizations have a significant positive influence on rural development (Xiaoyun, Ou, and Shengkun 1996), and community management initiatives (Korten 1986). Community groups and user organizations with high levels of local participation have been widely recognized as necessary to ensure equity and sustainability in local infrastructure investments (Holland et al. 2001; Ahmed and Hossain 1990).

Similarly, community participation in the planning, implementation and delivery of development projects has repeatedly been shown to have a large influence on their success in a wide variety of areas, from community based management of natural resources (Metcalf 1997; Murray 1997; Castilla and Defoe 2001; White, Courtney, and Salamanca 2002), through

¹⁵ In this case, the authors' measure of success (villager satisfaction) is similar to my criterion regarding quality of life.

community-managed drinking water provision (Williamson 1983) to community-based management of solar home systems (Dauselt 2001). Community participation in 'non-technical decisions' (e.g. decisions regarding the amount of community involvement and resource-provision, rules regarding access to infrastructure and the sanctions for violating these rules) has been positively correlated with lowered maintenance requirements over the life of community infrastructure projects¹⁶ (Khwaja 2002).

In the context of the model of community development projects, effective local organizations and community participation in projects will increase the ability of the community (as the beneficiary actor) to express their needs, increasing the fit of interaction 3 in figure 2.3. In projects where the community is acting in the roles of provider and beneficiary, effective local organizations and community participation will ensure that the decision-making processes of the provider are related to the needs of the beneficiaries (interaction 3 in figure 2.3).

What constitutes an "effective local organization", and what impels local people to participate in community projects? The concept of effective local organizations is closely linked to levels of local participation since local organizations will also be made more effective through meaningful participation of local people. I consider this further in the next section.

2.3.2.1 Effective Local Organizations

In order to be effective in a community, local organizations must accurately reflect and respect the institutions in that community (Murray 1984;, 1987; Mule No Date). Institutions stabilize interactions in a community by lowering transaction costs through the prescription of accepted norms for actors in the transaction (informal constraints), and the provision of formal rules governing such transactions (e.g. labour laws, legally recognized property rights, etc) (North 1991). In order for organizations to function effectively in a given community, their procedures, actions, and regulations must accurately reflect the institutions in that society (Mule No Date; Rogers 1995). Local organizations will more accurately reflect local institutions if they accurately represent the local society. This representation can be increased through the participation of local people, "who can clearly articulate and implement the community ethos [...and therefore] must be empowered with the responsibility and the luxury to frame the planning discussion" (Grunkenmeyer and Moss 2004:33). Communities with local organizations made effective through local participation may also have increased local participation in other community undertakings such as community development projects.

¹⁶ Interestingly, Khwaja also found a negative correlation (albeit statistically insignificant) between community participation in technical decisions and the success of the project (measured in terms of long-term maintenance and function).

2.3.2.2 Local Participation

What is it about a community that encourages local participation? Local participation in communal projects or local organizations will depend largely on two features of a community. First, local participation will be contingent on the existence of some type of mechanism for “the discussion of common issues, for the resolution of differences in opinions, for the allocation of costs and benefits associated with group decisions and for the efficient and effective monitoring of actions taken by a few on behalf of the many” (Hoddinott 2002:150). This mechanism may be provided by effective local government or leaders, or may be provided through other local organizations. Secondly, local participation in community projects will depend on the existence of trust between community members that any benefits accruing from group efforts will be shared in an equitable manner. This trust can come from a variety of sources, but two of the most widely discussed are social capital and sense of community.

Social capital refers to the “networks of quality relations which operate as a resource to collective action” (Pooley, Cohen, and Pike 2005:72), conferring upon individuals “the ability [...] to secure benefits by virtue of memberships in social networks or other social structures” (Whittaker and Banwell 2002:252). Social capital has been positively correlated with increased community participation in community projects (Isham and Kähkönen 1999; Bridger and Luloff 2001) and with positive outcomes and impacts of those projects (Isham and Kähkönen 1998). Bourdieu (1986) is largely credited with reintroducing the concept of social capital to the modern debate, but James Coleman (1988), Michael Woolcock (1998; Woolcock and Narayan 2000; 2000) and Robert Putnam (1993; 1995; 2000) have all contributed important ideas to the evolution of the concept.

The use of the term ‘capital’ draws parallels to types of capital commonly discussed in economics such as physical and financial capital. While physical and financial capital are largely owned by individuals, social capital “resides in relationships and therefore is almost by definition a collective property” (Hooghe and Stolle 2003:4). Many studies indicate that higher levels of aggregate social capital in a community positively affect the community as a whole in many areas (Grix 2001; Putnam 1995; Silverman 2004). High and low levels of social capital have been correlated with success or failure (respectively) in community issues as diverse as health care (Whittaker and Banwell 2002), education (Coleman 1988), and crime (Kawachi, Kennedy, and Wilkinson 1999), but also with multi-sector outcomes such as economic growth (Dasgupta and Serageldin 2000) and more responsive government (Putnam 1993).

Despite the collective nature of the benefits of social capital, individuals derive benefit from social capital when the relationships provide a form of social insurance, provide information and communication, and create norms and sanctions that allow social interactions (Coleman 1988).

Woolcock (2000) argues that there are three essential forms of social capital upon which individuals draw: *bonding* (e.g. relationships and networks with immediate family, friends and neighbours), *bridging* (e.g. interactions and networks with more distant acquaintances, family members and associates) and *linking* social capital, a sub-category of bridging that specifically refers to networks and connections with people in positions of authority.

It is also apparent that social capital is not inherently good (Pretty and Ward 2001). Social capital may exist in the form of trust, expected reciprocity and goodwill in criminal organizations such as Mafia or prostitution rings. While this type of social capital will not benefit the community at large, it still benefits the community of the criminal organization. A less sensational example could occur in a society that has striking socioeconomic divisions where social capital between members of the upper class (e.g. trust, expected reciprocity, etc.) increases transaction costs for lower class citizens by reducing their access to resources that are more easily accessed by the upper class due to their higher “stock” of social capital (Gupta et al. 2003; Bourdieu 1986).

Robert Putnam defines social capital as the “networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit” (Putnam 1995:66). Critics have pointed out that Putnam fails (as do others) to clearly distinguish between sense of community and social capital (cf. Colclough and Sitaraman 2005). Sense of community and social capital are often hard to distinguish because they share common roots in the trust that develops among community members, and are—in some cases—mutually reinforcing (sense of community can foster the interactions that develop social capital, and the use of social capital can increase an individual’s sense of community). Both social capital and sense of community arise out of trust in a community; social capital is the utility inherent in the social networks that are created through that trust (Coleman 1988), while sense of community is a broader concept encompassing an individual’s perceptions of the social norms, trust and networks that form a community—the *Gemeinschaft*-type interactions in a community that were discussed previously¹⁷—and their place and influence in that community.

Both social capital and sense of community are generated by trust in a community. Social capital and sense of community both also serve to generate more trust. Granovetter argues that “social relations, rather than institutional arrangements or generalized morality, are mainly responsible for the production of trust in economic life” (Granovetter 1985:491). This trust, a

¹⁷ McMillian and Chavis (1986) identify four main components of sense of community: (1) membership, referring to an individual’s sense of belonging to a group; (2) influence, referring to the amount of impact an individual has on the decisions of the community; (3) integration and fulfillment of needs, referring to the reinforcement individuals receive from the community regarding their membership; and (4) shared emotional connections. It is this final component that is reflected in the *Gemeinschaft*-type interactions in a community

“social relationship in which principals—for whatever reason—invest resources, authority, or responsibility in another to act on their behalf for some uncertain future return” (Shapiro 1987:626), will invest trusted leaders of the community (whether within government or local organizations) with the authority to make decisions that are more likely to be accepted by the community.

Trust is a multifaceted concept that cannot in one word be adequately captured for the purposes of detailed social research (Grix 2001). To illustrate the problematic nature of the concept of trust, consider the example of the difference between intra-personal trust and the trust of government (and other organizations in the community). Both types of trust build social capital and influence an individual’s sense of community, but ways of measuring and fostering the different types of trust are often divergent. By some estimates as many as six different types of trust are represented in the concept of social capital: “interpersonal trust, social solidarity, general norms of reciprocity, belief in the legitimacy of institutionalized norms, confidence that these will motivate the action of institutional actors and ordinary citizens (social solidarity), and the transmission of cultural traditions, patterns, and values” (Jean Cohen, as quoted in Grix 2001:195). A further complication arising from the multifaceted concept of trust stems from the fact that levels of social trust seem to vary according to socioeconomic status, with social trust being generally higher in more advantaged groups and lower in disadvantaged groups (Hooghe and Stolle 2003). Critiques of Putnam’s (1993) approach to social capital¹⁸ suggest that simply looking at levels of associational activities (i.e. membership and participation in community groups) in a community ignores the multifaceted nature of trust and the ways in which different types of trust are generated and maintained outside of regular associations. Any investigation of social capital and its roots will have to examine questions surrounding the origins and maintenance of different types of trust in all members of a community, and why levels of trust vary in a community.

In the case of community renewable energy projects and community development projects in general, social capital and sense of community seem to be correlated with increased social solidarity and trust in other members of the community (interpersonal trust and belief in the legitimacy of institutionalized norms). These two types of trust allow community members to contribute to the implementation and support of a project secure in the knowledge that the project leaders and other members of the community will ensure that their contributions result in some benefit from that project (Shapiro 1987). If the actor playing the role of the provider can

¹⁸ In his influential book *Making Democracy Work* (1993), Putnam suggests that levels of civic engagement through associations (e.g. service clubs, bowling leagues, etc.) play an important role in generating and maintaining social capital in a community.

access that trust, the development project will—in general—be much more effective (Cebulla 2000).

Sense of community influences people's willingness to participate in local organizations and community development projects (Zanetell and Knuth 2004; Chavis and Wandersman 1990). As discussed above, increased local participation in development projects and in local organizations increases the probability of success of a development project. This participation will also increase levels of trust in those organizations and projects, further enhancing the prospect of success for the development project. In this way, high levels of social capital and an increased sense of community will enhance the fit of the interaction #3 as illustrated in Figure 2.3, the relationship between the provider and the community. A greater degree of social cohesion and sense of community will better allow the community to express their opinions and needs. High levels of trust, coupled with increased participation in the project, may also allow for greater consensus on the most important opinions and urgent needs of the beneficiary. This increased ability to articulate needs and opinions will improve the ability of the beneficiary (community) to express their needs, which will help the provider to make better decisions during the implementation and management of the development project.

2.3.3 An Adaptive System for the Management of Program Activities

Adaptive systems of management are systems which efficiently mobilize internal (to the project) agents to utilize available resources while responding and adapting to changing circumstances (Uphoff, Esman, and Krishna 1998). These systems, while a key part of a successful project, will be affected only marginally by the community context, through the actions of creative leaders (as discussed above), and effective local organizations and participation (also discussed above).

2.3.4 Appropriate Technologies and Training

In community renewable energy projects, which are often relatively technologically dependent¹⁹, the technology used and the presence of skills and knowledge in a community will be particularly important to the success of the project. Although technology and training are very project specific, a clear link with the community context is evident. Indeed, the concept of appropriate technology carries with it an embedded notion of locality and its social context.

¹⁹ It is important to recognize that not all renewable energy projects will involve new technology. Many renewable energy technologies have existed for decades (e.g. biogas), or even centuries (e.g. windmills, watermills, etc.).

Largely attributed to the economist E.F. Schumacher (1973)²⁰, the concept of appropriate technology holds that instead of employing the most efficient or advanced technologies, development efforts should employ technologies that provide the maximum benefit to the people who use it everyday. These benefits should come to local people in the form of increased opportunities for meaningful work in their community, and the increased use of local materials in the production of goods for local consumption. The technology used to secure these benefits should be relatively affordable, and simple enough that there is minimal demand for skills not held within the community (Schumacher 1973:175-176). Although discussions on appropriate technology often focus on the nature of the technology, the unstated consequence of looking at technology through this 'lens' is that *the appropriateness of a technology is largely determined by the context in which that technology is used*. Different technologies will be more or less appropriate for a given project depending on community characteristics such as local skills and local technical resources. These characteristics, and the ability of providers and beneficiaries to effectively draw on them, will determine the 'appropriateness' of the technology.

2.3.4.1 Local Skills

Skilled people are of crucial importance to the success of community development projects. In a study of 489 solar pumping projects in Northern Thailand, a lack of adequate skills in local people was identified as a key factor in the failure of 45% of those projects (Kaunmuang et al. 2001). Local skills and the training that generates those skills play key roles in determining what technologies are 'appropriate' for a given community. The provider actor can augment their competencies (increasing their 'fit' with the project's requirements) by taking advantage of local skills. Training is directly related to the presence of knowledge in a community. This knowledge may be imbued in local residents possessing the skills to install and service the technology required for a project, or it may reside in the general education levels of local residents which allow them to quickly grasp and learn new ideas. The presence of knowledge in a community will be fostered primarily in two ways: through past experience with innovative technological solutions, and through the access to education (academic or experiential²¹).

Past experience with community development projects will generally increase the chances of success with similar community development projects in the future. Experience with renewable energy projects or technical projects in general will—all else being equal—affect the

²⁰ Schumacher actually coined the term 'Intermediate Technology', referring to technology that was an intermediate step between the technologies available in developing countries and the most advanced technologies available at the time. Schumacher's ideas took root and guided the nascent Appropriate Technology movement.

²¹ Well-developed social networks can accelerate collaborative, experiential learning (Gupta et al. 2003), emphasizing once again the importance of social capital and sense of community.

ability of a community to successfully implement community renewable energy projects. Communities with a history of innovative solutions to local problems (solutions that may not involve new technology) will most likely be more open to projects relying on unique or non-traditional practices. Similarly, communities with a history of cooperative or collaborative projects will—in general—be more successful at cooperative community projects in the future. In the previously mentioned case study of seven Chinese ecovillages, Sanders (2000b) found that the most important factor affecting the success of Chinese ecological agriculture undertakings was the presence of a strong collective with responsibility for agriculture. It is this type of experience with cooperation and collaboration that is invaluable when planning another cooperative project. Past experience with innovation, cooperation and collaboration will help convince community members that the proposed solution will work (and ensure that the beneficiaries have realistic expectations of the project outcomes), thereby increasing acceptance of the technology (essentially redefining the beneficiary's needs, improving the fit with the outputs of the project). This type of user acceptance of technology is an important factor in the successful implementation of renewable energy projects (Lauridsen and An 1996).

Past experience with technology and innovation will generate know-how within the community. Know-how is defined as "the ability to leverage business or scientific knowledge in linking talent, technology and capital in emerging and expanding enterprises" (Smilor and Feeser 1991:167). While these authors are referring specifically to entrepreneurial ventures involving new technology, their reasoning is equally applicable to community ventures. In the community sense, know-how might be described as the ability to leverage political and managerial resources, local knowledge, and external support in linking local talent, technology and capital in community undertakings. This ability will derive from many different areas, but will be fostered and extended by experience. Miller (1998), draws parallels between Smilor and Feeser's (Smilor and Feeser 1991) know-how and other authors' use of the term "competence", linking the two concepts by the fact that they both seem to be derived from past experience. Providers that have access to managerial, technical and capital resources in the community that have previously been used for similar projects will have a greater chance of success when initiating and implementing community renewable energy projects.

One of the most common causes of failure in renewable energy projects is a lack of trained personnel to properly maintain the technology (Dauselt 2001; Diaz Lopez et al. 2000; Cabraal, Cosgrove-Davies, and Schaeffer 1996); training and equipping technicians has been found to be highly correlated with successful renewable energy projects (Liebenthal, Mathur, and Wade 1994). Significantly, it is not only the presence of trained personnel that will help a project succeed, but the presence of extension agents or trainers who can introduce the technology and train local people to use and maintain the technology is equally important (Lauridsen and An

1996; Mrohs 1998; Miller 1998). Increased access to support and maintenance services will require such trained personnel at a local (or nearly local) level. Educational opportunities in the community (e.g. quality of schools, affordability of tuition, etc.) will help develop these trained personnel. The presence of these personnel will help avoid the unfortunate situation of a successfully implemented and operated renewable energy project being left stagnant simply because the community does not possess the capacity to fix the inevitable problems that will arise.

2.3.4.2 Local Technical Resources

The term 'technical resources' refers to factors crucial to the implementation and ongoing operation of a renewable energy system. Technical resources includes factors such as access to support and maintenance services (including local skills, as discussed above), locally produced technology and replacement parts (or well established import channels), and extension agents/trainers. Technology that draws on local technical resources will be more 'appropriate'.

Long wait times for—or a complete lack of availability of—parts will result in project delays or service outages until the parts are available. Long periods of unavailability will reduce consumer confidence and hence demand for the services provided by the energy project. The presence of a local distributor or supplier of replacement parts will quickly help to alleviate this problem. If the technology is locally produced, maintenance capacity can be provided by the local producer. When compared to mass-produced, imported, technologies, locally produced technology can make up for lost economies of scale by reduced distribution and maintenance costs, although quality can be so low as to risk affecting demand (Barnett 1990).

Technical resources, defined in this way, influence the diffusion of a technological innovation (user acceptance). The use of a new technology carries with it a certain amount of risk of rejection due to uncertainty surrounding its use. Potential users will deal with this uncertainty by consulting with their peers—usually those who have experience with the innovation in question (Rogers 1995). Rogers (1995) argues that this consultation makes the diffusion of innovations a *social* process. This social process of consultation will be facilitated by well-established social networks and the presence of individuals who are knowledgeable about—and have experience with—the new technology in question. In short, the diffusion of innovations will be fostered by high levels of social capital and technical resources.

2.3.5 Systems that use Information as a Management Tool

Uphoff, Esman, and Krishna (1998) find that the collection and management of information that is then used to guide management decisions is a key component of successful projects. This characteristic of successful projects is very specific to the management of the

project, and does not relate directly to the community. If the community is involved in the management of the project or the collection of data that informs that management, leadership, local skills (for the collection of data) and local resources (as discussed above) will affect this project-level characteristic.

2.3.6 Linkages with Key Local, Regional, National, and International Actors

The availability of resources from external actors can be an important component of successful projects. The progress of community development projects can rely on the actions of external actors. These actions can include eliminating bureaucratic hurdles²², finding financiers (or sources of funding for the financiers)²³, acting as intermediaries providing representation to national government (Holland et al. 2001), and educating project participants on lessons learned from other, similar projects. These linkages will reduce the competencies required by the provider actor (the linkages will either lower the requirements of the project or augment the provider's competencies), may enhance the resources available to the financier, and could increase the fit of the project outputs with the needs of beneficiaries (by learning from other, similar projects).

What are the characteristics of a community that will foster these key linkages? These linkages will be fostered by creative or well-connected leaders (essentially social capital outside the community), past successes that have brought media attention to the community or established communication with external actors. Political support (see below) for a project or a community can also increase exposure to external actors, increasing the chance that external linkages are made.

2.3.7 Political Support

As mentioned above, political support can reduce the bureaucratic hurdles faced by a project. Financial support from higher levels of government can increase the resources available to the financier (or play the role of financier). Political support will be largely fostered by the same characteristics of communities that foster external linkages: creative and well-connected leadership and the community's past successes.

²² Acker and Kammen (1996) note the role that linkages to regional government (being in "politically favoured areas" (90)) can play in reducing the bureaucratic and patronage problems often associated with the grid connection of rural communities in Kenya.

²³ As an example, the Vietnamese Women's Union installed 137 photovoltaic installations in rural Vietnam with the help of an international non-governmental organization, the Rockefeller Brothers fund (CADET 1996).

2.4 Characteristics of Successful Communities

Three themes arise from the above discussion of the characteristics of successful projects and related community characteristics. Characteristics of communities that are conducive to successful community renewable energy projects include:

1. A large stock of social capital and a strong sense of community;
2. Effective leadership from local government and local organizations , and
3. Experience with innovation and cooperation, and a high levels of technical resources

Two additional community-level characteristics will influence the success of community renewable energy projects without directly contributing to the development of the characteristics of successful projects as discussed above. These two characteristics are:

4. Appropriate macro- and micro-economic environments; and
5. Sufficient stocks of biophysical resources appropriate to the technologies being used.

The first three community characteristics will contribute to the development of the components of successful projects as identified by Uphoff, Esman, and Krishna (1998). The final two characteristics will influence the ability of the community to receive the project. In the next sections I will briefly revisit and expand on these characteristics with respect to community renewable energy projects.

2.4.1 A Large Stock of Social Capital and a Strong Sense of Community

High levels of social capital and a sense of community increase community participation in community development projects (Isham and Kähkönen 1999; Zanetell and Knuth 2004). Community participation is a key component of successful community development projects, increasing the quality of the interaction between the provider and the beneficiary (the “fit” of interaction 3 in figure 2.3). Social capital, sense of community, and the associated levels of trust and community participation will increase the effectiveness of local organizations, increasing the chances of success of a community development project. Local participation in the project and collaboration with the provider will also increase the chances of success (Cebulla 2000).

This characteristic is not necessarily any more relevant in community renewable energy projects than in other community development projects, but it has a large impact on certain facets of community renewable energy projects that are crucial to such projects’ success, specifically aspects that require action for the collective good, aspects like maintenance and repair of collective assets, fundraising, and coordination of collective action.

2.4.2 Effective Leadership from Local Government and Local Organizations

Leadership is an important part of any community development project; leadership at both the project level and the community level is important. The success of a project will be aided by community leaders capable of mustering local support for the project (Sanders 2000b). Effective project leadership will increase the competencies of the provider actor, increasing the “fit” of relationship 2 in figure 2.3 (Khwaja 2002; Lauridsen and An 1996), and improve the decision-making processes in the organization (increasing the fit of relationship 3 in figure 2.3). Effective leaders will generally be long-tenured with a history of standing up to authority (Sanders 2000b), possess an understanding of local institutions (Mule No Date), and accurately reflect the preferences and desires of the end-users (Isham and Kähkönen 1999). In general, both levels of leadership will be provided either by the local government or by local organizations (or local representatives of external organizations, which I consider to be a type of local organization).

2.4.2.1 Leadership from Government

Effective leadership in local government is itself a characteristic of a community, one that—as discussed above—contributes heavily to the success of a community development project. The presence of an effective leader is likely influenced by other characteristics of a community. What characteristics of a community will serve to foster effective leaders in government? The legitimacy of local political leaders with the local population (Muldavin 2000) and the presence of a framework (moral or legislative) that allows effective regulation of government activities (Isham and Kähkönen 1999) will help to ensure that effective leadership is provided by government. The legitimacy of local government with the local population will increase with levels of trust in the government. This trust will be fostered (and reflected) in sense of community and social capital, as discussed above. Social capital and sense of community will also increase local participation. Such participation in local government (either through an effective democracy or the presence of local people in decision-making positions) will also increase levels of trust in governmental leaders.

Decentralization of authority to a community level will provide a greater reflection of local institutions in government, increase the accountability of key-decision makers (Devas and Grant 2003; World Bank 2003), and invest in local leaders the authority to make and implement decisions that influence the success of the project. Decentralization entails transferring political control of public responsibilities and powers to local governments (Bardham 2002) in the belief that local governments have more accurate knowledge of the local society and its needs, are more accountable to their constituency, and have a greater ability to include end users in decision making processes. Increasing local people’s access to decision makers in this way will

increase their stock of linking social capital. This decentralization of authority may occur through the transfer of financial resources from higher levels of government, or simply from the ability to make important decisions without returning to those levels of government. There are ways other than decentralization to obtain an effective transfer of authority²⁴ to the local level including a prosperous local tax base or government-owned enterprise (affording a measure of financial autonomy and allowing local government to make and implement decisions (Sargeson and Zhang 1999)), or the presence of a leader with large stocks of linking social capital (i.e. connections with higher levels of government) (Woolcock 2000). These attributes will increase the ability of local government to act even though political power may not have been officially decentralized. These types of empowerment will augment the effectiveness of an already effective leader (as discussed above), but empowering an already ineffective local leader/government risks exacerbating existing problems.

2.4.2.2 Leadership from Local Organizations

Empirical evidence has shown that effective local organizations improve the chances of success of community development projects requiring the coordination of local stakeholders (Isham and Kähkönen 1999). The strength of these community-based organizations have a significant positive influence on rural development (Xiaoyun, Ou, and Shengkun 1996), and community management initiatives (Korten 1986). Many of the factors that increase the effectiveness of local leaders and government will also apply to local organizations, factors such as increased levels of trust, and increased participation will also increase the effectiveness of local organizations, as will an increase in the ability to deliver on projects (in the case of organizations, this ability will generally be realized through the presence of increased resources—financial or human—that can be applied to the project).

2.4.3 Experience with Innovation and Cooperation, and Access to Technical Resources

2.4.3.1 Experience with Innovation and Cooperation

Past experience with innovative projects or projects requiring collective action will increase the chances of success on similar projects. Shi and Gill (2005) found that risk aversion and lack of information are key barriers to the successful implementation of new agricultural practices. Past experience with similar projects will reduce the perceived risk and increase the amount of information available to local citizens. Indeed, Muldavin (2000) identifies past

²⁴ By effective transfer of authority, I am referring to factors other than official decentralization of power that effectively transfers power to local governments.

technological successes and knowledge gained therefrom as key factors in the success of ecological agriculture in China. This type of past experience will build skill levels in the community, increasing the technical resources available in the community. Increased skill-levels in the community can increase the competency of the provider, whether the community is acting as the provider, or the provider hires (or otherwise employs) local people. This local participation in the project will also have other benefits for the project (as discussed above).

2.4.3.2 Technical Resources

Increased levels of (or access to) technical resources in a community will increase the success of a community development project, especially projects such as renewable energy projects that involve technology (Isham and Kähkönen 1999). As discussed earlier in this chapter, technical resources include skilled people and access to important materials and parts for the technology. The technical resources available in a community will help to determine how “appropriate” a technology is for use in that community (increasing the “fit” of interaction 1 in figure 2.3).

As projects become smaller in scale, the technical resources required for that project will need to be available increasingly closer to the site. As the cost of transporting personnel and equipment to remote locations decreases relative to the total project cost (e.g. on big projects), more distant sources of technical capital will be able to influence the success of local projects. However, as the total cost of the project decreases, so will the ability to bring in distant sources of expertise (unless that expertise is subsidized by some organization such as a higher level of government or a non-governmental organization, that is external to the project itself).

2.4.4 Economic Perceptions and Realities

The final two characteristics of a community that are conducive to the success of a community renewable energy project are not directly related to the above-discussed characteristics of successful projects. Rather, these characteristics impact the ability of the community to receive and sustain such a project. These characteristics are economic perceptions and realities, and biophysical resources appropriate to the technology being used.

Economics will play a large part in determining the long-term viability of a renewable energy project (Bhatia 1990). Given our definition of a successful project, the local economic environment will have a large effect on criterion number four—that the project functions long enough to ensure full payback of initial capital costs. Ensuring that this return on investment is met (and the length of time it takes) will be a product of two factors: the lifespan of the technology used, and the profit (or savings on energy costs) it generates. The lifespan of the technology will be largely dependent on the specific technology used and the technical capital

available for its maintenance and operation. The second factor—the effective return on the project—will depend largely on the economic environment. In a project with a for-profit company in the role of financier and/or provider, this return will be in the form of financial profit. In a project with a government or another not-for-profit company acting in those roles, a return in the form of net-savings for consumers would also be an acceptable form of return. In both situations, the effective return will depend on consumer behaviour (for profits in the for-profit case and in net-savings in the not-for-profit). Given an alternative source for an energy service (e.g. diesel generator, fuelwood, etc.), consumers will almost always opt for the cheaper source unless there is a marked difference in convenience of use or the quality of the energy service provided²⁵. As such, a community renewable energy project must offer either a lower price, greater convenience, or a higher quality energy service when compared to the main alternative.

Several other factors besides the behaviour of consumers and the cost of alternative energy sources will affect the effective return on investment that can be generated by the new energy source. As an example, consider community renewable energy projects for electricity provision. These projects—which tend to be decentralized, off the grid (or micro-grid) projects—will gain a comparative advantage over grid-provision if the economics of grid expansion are unfavourable. Economics of grid extension will be unfavourable in areas with low load densities and high distances from energy source to users (Cabraal, Cosgrove-Davies, and Schaeffer 1996). Unfortunately, unfavourable economics of grid expansion alone may not be sufficient since governments often subsidize the provision of rural, grid-supplied electricity (Miller 1998). In order to be profitable in such an environment, the cost of locally generated electricity must be equal to or lower than the subsidized cost of grid-provided electricity or equally subsidized. In the case of non-electrical renewable energy projects, the relative cost of competing sources is still important. During research into factors affecting the success of polyethylene biodigesters in Vietnam, Lauridsen and An (1996) found that the availability and cost of alternative solutions is an important factor affecting farmers' decision to adopt biogas technology.

The profits (or savings) generated by an energy project are also largely affected by government policies. Not only do government subsidies of alternative sources of energy affect the demand for and profit of renewable energy technologies, but import duties, taxes, and other fiscal instruments can greatly affect the costs of renewable energy projects and demand for their services. As an example, import duties in Kenya and Sri Lanka significantly affected the price of photovoltaic technology (Cabraal, Cosgrove-Davies, and Schaeffer 1996). In each case (a 40% price increase in Kenya and an increase of \$2.50 per Wp in Sri Lanka), the added cost significantly affected the cost of implementing a renewable energy project based on photovoltaic

²⁵ This assumes that no value is placed on externalities like reduced environmental damage.

technology. Local production of technology can avoid punishing import duties while complementing the project in other ways (see above), but for emerging technologies such local production is often not possible.

On less of a macro-economic scale, the financial situation of community members and the community in general will affect the success of renewable energy projects. To begin with, there must be a demand in the community for the service to be provided by the community energy project. Uphoff et al (1998:38) noted that "local capacity is most effectively built in connection with meeting some particular need that communities identify as pressing". A need for a service or energy source will stimulate demand for that service or source. Secondly, if the services provided by a community renewable energy project are to be purchased by local users, those users must have enough purchasing power to generate a demand for that service. Governmental policies can offset these problems to some degree with tax credits and rebates, but taxes rebates only affect wealthy citizens (who pay taxes), and may therefore not be a practical solution in poorer areas (Barnett 1990). Similarly, a community must have the purchasing power and financial resources necessary to fund the implementation and operation of an energy project²⁶. Both of these elements (household and community purchasing power) will be related to the general economic health of the community. Additionally, communities must take care to—to use a cliché—not put all of their eggs in one basket. Sanders (2000b) found that communities with economic activity other than agriculture (in the Chinese case this consisted of Township and Village Enterprises) were more successful at implementing Chinese ecological agriculture systems. In a sense, these communities could afford to be innovative with their agriculture because their economy did not depend on it. Analogously, communities that have other reliable sources of energy or energy services will be more able to innovate with regards to their energy supply²⁷.

2.4.5 Biophysical Resources Appropriate to the Technology Used

This category verges on being too obvious to mention, but for the sake of completeness I include it here. As mentioned in Chapter one, this characteristic of a community is often the only one looked at—does the community have enough of the resources used to generate the energy for the project to succeed and to be sustainable. This is an issue that—while relevant across all technologies—will be very specific to a given technology. A village that might succeed at a wind project might fail at a micro-hydro project simply because there was not enough water (in this case) to generate the energy needed.

²⁶ Or it must be able to secure access to these resources through external partners.

²⁷ Ironically, such communities will probably not have the incentive to innovate with their energy.

2.5 Conclusion

There is always a risk when making broad statements about what is conducive to success in general. Such statements bear an implicit paternalism—the implication that the author ‘knows what is best’ for the situations in question. These statements “are justified only as a stage in a constant struggle of questioning, doubt, dialogue and self-criticism, in which we try to see what is right and practicable [...] In these, and other concepts, there can and should be nothing final” (Chambers and Conway 1991:3)²⁸. In this vein, the characteristics presented above are only the first step in a dialogue determining what aspects of a community are most likely to influence the success of a community renewable energy project. The discussion is drawn from the work of past researchers, and—more importantly—the experience of actual communities, both successful and unsuccessful.

Critics of such broad statements will suggest that each project is unique and therefore that a search for generalized truths about characteristics capable of positively influencing the success of community renewable energy projects in general is an exercise in futility. Similar objections have been voiced with regards to comparative cross-cultural research, namely that:

“cultures are so diverse and unique that they can only be described in their own terms [so] comparison is a waste of time, if not wholly illegitimate. The argument is that there are no similarities between cultures, because every culture is unique, and therefore no general statements can be made [...however...] this argument is not correct [...] uniqueness and similarity are always present, simultaneously. Which you see depends on how you focus” (Ember and Ember 2001:3).

By attempting to make general statements about community renewable energy projects as a whole, I am not denying the uniqueness of each project; I am simply focusing on the similarities that do exist between individually unique yet similarly successful community energy projects.

This chapter explored various bodies of literature to determine what characteristics of a community can positively influence the success of a community renewable energy project. This literature review serves a dual purpose: in addition to reviewing the background research in this area, I also drew parallels with other, related, bodies of literature and developed a set of propositions that will guide the rest of the research. In the next chapter, I will discuss my field methodology in more detail and explore how the characteristics discussed above might be applied in a Chinese context.

²⁸This quote comes from Chambers and Conway’s (1991) discussion paper on sustainable rural livelihoods, following the introduction of three concepts they believe are key components of sustainable rural livelihoods.

Chapter 3: The Chinese Context

3.1 Introduction

Chapter 2 examined successful community development projects to look at the characteristics of communities that are conducive to the development of successful community renewable energy projects. The chapter concluded with five key characteristics of a community that can influence the success of a community renewable energy project. In order to examine more closely these five community characteristics, a case study was undertaken in a village that had successfully implemented a community energy project. For various reasons, including funding available through the University of Waterloo and the Canadian International Development Agency, China was chosen as the site for this case study. In this chapter I will address why China was chosen as the site for this research, and what methodological or conceptual challenges that choice presented with regards to the five characteristics advanced in Chapter 2.

3.2 Why China?

The question of why China was chosen for the fieldwork must be addressed early in this discussion. This question can be answered on many different levels, each of which had varying degrees of influence when the decision was made.

On a very specific and individual level, China was chosen because the University of Waterloo had an established program of research, cooperation, and funding in China's Hainan province through the "Eco-Planning and Environmental Management in Coastal Communities of China" (Ecoplan China) Project. The Ecoplan China project works in the mainland cities of Nanjing and Dalian, and also in the southern island province of Hainan (see figure 3.1). In Hainan, the project aims to build capacity in China through directly contributing to the Hainan eco-province initiative (Ecoplan China 2003). As part of the Ecoplan China project, my research contributed to this larger initiative.



Figure 3.1: Map of China with Hainan circled in the lower portion of the map.

At a broader level, I chose China as the study site because of China's growing prominence in the world, and the mounting environmental pressures associated with that rise in wealth, population and status. The 1980s and 1990s saw the Chinese economy undergo double-digit rates of annual expansion (10.2% and 11% respectively²⁹) (World Bank 2001); the average annual rate of expansion slowed slightly between 2000 and 2003, but—at 8.25%—was still markedly higher than either Canada or the United States (at 3% and 2.5% respectively) (World Bank 2005). Government policies have targeted a 7% sustained rate of economic growth per year, which would result in a doubling of output every ten years (Shiu and Lam 2004), but—as noted—the economy has often surpassed this goal. The Chinese government is well aware of the hazards (environmental, social, and economic) of such booming growth (Zhong 2003) and has been trying, unsuccessfully, to slow the rate of growth by tightening monetary policy, reducing spending on capital projects, taking measures to slow lending, and issuing bonds and bank notes to reduce liquidity in the market (Bremner, Balfour, and Roberts 2005; DOE, 2004;

²⁹ As a reference, Canadian rates of economic expansion in the 1980s and 1990s were 3.3% and 2.2% respectively.

DOE, 2005b), still in 2004 the growth rate remained high at approximately 9.5% (Bezlova 2005; DOE, 2005b).

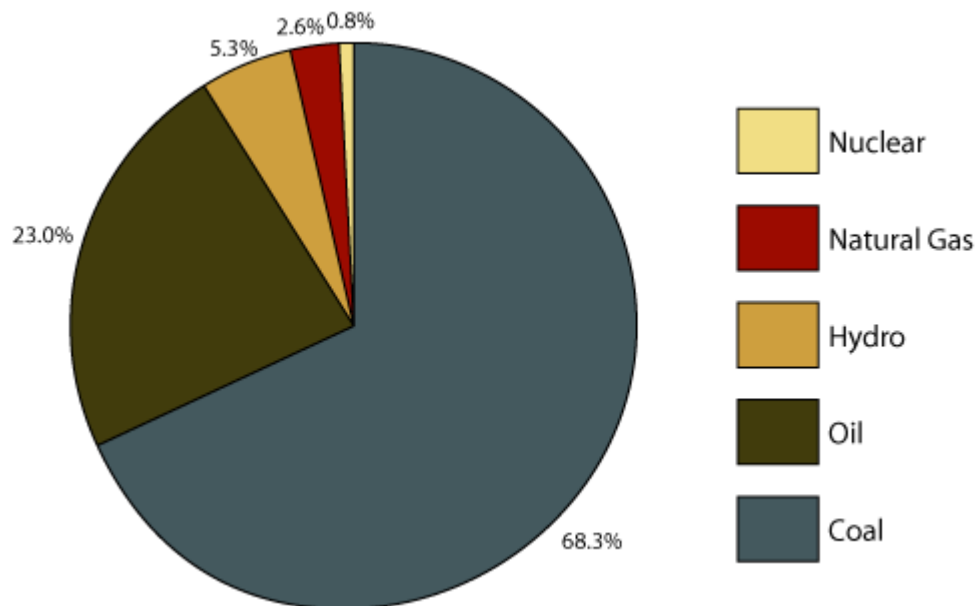


Figure 3.2 Chinese Energy Consumption by Type, 2004 (data from BP, 2005)

The booming economy has brought with it severe environmental problems, the most noticeable of which involve air pollution. The large majority of this air pollution is caused by China's reliance on coal as its main energy source. Figures 3.2 and 3.3 show the fuel types on which China currently relies (figure 3.2), and the historical trends in energy use (figure 3.3). As can be seen in figure 3.2, approximately 68% of China's total energy consumption³⁰ (The People's Daily 2005a) comes from coal, making China the world's largest consumer of coal (BP 2005). China has a long history of reliance on domestic sulfur-rich coal to power coal-fired electricity generation facilities and to feed the high demand for steel from blast furnaces and smelters fueled by unwashed coal (Fak 2004). This history has resulted in China becoming the world's largest emitter of sulfur dioxide. China is currently the world's second largest consumer³¹ and producer of energy, consuming 13.8%³² of the world's primary energy as compared to the United States' 22.8% (BP 2005). China is also the world's second largest emitter of carbon dioxide (13.5%), again second only to the United States (van Vuuren et al. 2003; DOE, 2004).

³⁰ Three-quarters of China's commercial energy comes from coal (Taylor and Bogach 1998).

³¹ It is worth noting that—despite the nation's voracious appetite for energy—individual Chinese consume (on average) less than one-tenth of their North American counterparts; Chinese per capita energy consumption in 2002 was 33.3 million Btu vs. 339.1 million Btu in the United States (DOE, 2004) and 418 million Btu in Canada (DOE, 2005a).

³² This figure includes Hong Kong.

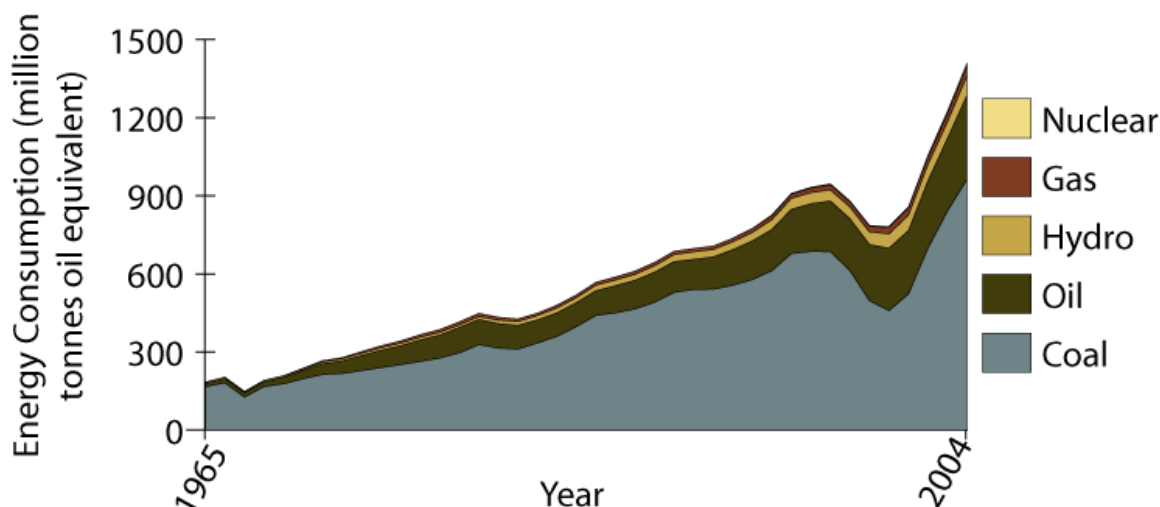


Figure 3.3 Chinese Energy Consumption by Type, 1964-2004 (data from BP, 2005)

China's economic growth is fueled by energy and—while energy trends in general are hard to predict³³—as living standards rise across the country, so will the demand for electricity and energy in general. Between 2000 and 2004, China's demand for electrical power alone grew by 69% (Roberts 2004). In 1996, the World Bank predicted that China's total primary energy use will more than triple between 1990 and 2020, growing at an average rate of 4.1% per year³⁴ (Johnson et al. 1996). If this forecast were realized, China would experience a three-fold increase in coal consumption by 2020 (from one billion tons in 1990 to three billion in 2020) (Johnson et al. 1996). This is a relatively conservative scenario, one that assumes a corresponding large-scale increase in the consumption of oil and natural gas and increased hydroelectric and nuclear power facilities for electricity provision³⁵. Without these parallel increases, the demand for coal could be much larger. Any increase in coal consumption will result in a concomitant increase in sulfur dioxide and carbon dioxide emissions³⁶.

³³ Energy use in China has generally risen with the rise in GDP, but does not seem to be tied to GDP in the sense that the rates do not move in concert. Despite this, the Chinese economy's heavy reliance on industry (an average of 50.6% of GDP came from industry between 1999 and 2003) suggests that energy use will continue to rise with economic growth, although not necessarily in direct relation (all data from World Bank 2005).

³⁴ This baseline scenario assumes a sustained energy use/GDP growth elasticity of approximately 0.5. This figure is comparable to historical data; the figure from 1981 to 1990 was 0.52, and 0.4 from 1991 to 1993 (Johnson et al. 1996:21).

³⁵ The same scenario (Johnson et al. 1996) predicts an average annual growth rate of 6.3% for electrical power use over the same period, with the use of coal for power generation rising by a factor larger than 5.

³⁶ Admittedly, the reverse logic is true; any technological advances in "clean coal" technology, or increased market penetration of renewable energy could negatively impact the growth rate of coal consumption, and the concomitant increase in emissions.

Until recently, in a strange twist of fate unique to “market-oriented socialism”, China’s electricity producers had been backed into a corner by the “invisible hand” of the coal market and the fixed costs of electricity that the government has mandated (Ying 2004). China buys and sells coal on a free market and coal prices fluctuate with demand. As the economy booms, demand for electricity rises and with it the demand for—and price of—coal. With the economy soaring in 2004, the price of coal rose by 50% (Ye 2005). As the price of coal rises, the cost of generating electricity—which accounts for 67% of China’s coal consumption—also rises. On December 30th, 2004, the official Xinhua news agency predicted that demand for coal would rise by 7.4% in 2005, resulting in demand for coal outstripping domestic supply for the first time (Cheng and Ng 2005). With this increased consumption, the Chinese National Coal Association predicted that the price of coal would rise from its then record high by at least another 10% in 2005 (Cheng and Ng 2005). These price increases would be palatable to electricity producers in a free market, but until very recently, the Chinese system fixed the price of electricity, allowing only slight increases in price every year (The People's Daily 2004). This policy and others like it (a similar policy keeps the price of refined oil artificially low) kept costs of production in other areas of the economy relatively constant, and have been a large factor in the recent economic boom. As the cost of electricity production rose with no method of raising prices to match, coal-fired power plants became a huge drain on electricity producers (Ying 2004). In late December of 2004, the Chinese government approved a proposal to link coal and power prices in 2005 (Ye 2004), a scheme which was intended to raise power prices, relieving some of the burden from the coal fired power plants (Ye 2005).

In addition to the pollution associated with coal use, coal faces a public relations challenge as coal companies are coming under increasing public pressure to improve their safety records; as both the domestic and global media have begun to notice their poor safety record (AP, 2005a). Despite representing less than 4% of the Chinese industrial workforce, the coal mining sector contributes over 45% of Chinese industrial fatalities (Wright 2004)³⁷. In China, the fatality rate per tonne of coal is almost 100 times that of the United States (Dickie 2004), with 40% of the coal produced in 2004 produced in mines with insufficient safety controls (Asia Pulse 2005). Despite the key role that coal has played in China’s recent economic surge, an alternative to coal-fired power generation is clearly attractive to China, economically, socially and environmentally.

Recognizing the need for alternatives to coal, China has increasingly turned its attention to other energy sources, primarily non-renewable ones such as oil, natural gas and nuclear

³⁷ Over 6000 miners were killed in 2004 (Ang 2005), and in the first three months of 2005, 1,113 coal miners were killed (AP, 2005b).

power. Gao Shixian, the director of energy economics and development strategy at China's National Development and Reform Commission (the organization responsible for national energy strategy), estimates that by 2010 China will rely on oil (mostly imported) and gas for over 70% of its energy needs (51.4-52.6% from oil and 20% from natural gas) (Voss 2005), while 40 new nuclear generation units will help to meet the country's electricity needs (The People's Daily 2005a).

China already relies on oil for approximately 25-29% of its energy consumption (Voss 2005; DOE, 2004; DOE, 2005b). With a 15% rise in oil demand in 2003 (AFP, 2004), China surpassed Japan as the world's second largest consumer of petroleum products (DOE, 2004). Like coal, oil is a problematic energy source for China; despite its large appetite for oil, China holds only 1.4% of the world's total proven oil reserves (as of 2004) (BP 2005). As a result, oil imports must make up the difference between production and consumption. These imports currently account for 41% of Chinese oil consumption (Cheng and Forster 2005). To fuel this growing thirst for oil, China is involved in oil and natural gas projects in many countries including Sudan, Iran, Oman, Algeria, Libya, Iraq, Venezuela, Peru, Syria, Saudi Arabia, Kazakhstan and Canada (Butt 2004; AFP, 2004; Romero 2004; The People's Daily 2005b; Petroleum Economist 2005). The lack of domestic oil sources causes China to give priority to energy issues in its foreign policy initiatives, constraining all energy-related policies to focus on energy security to the exclusion of all other policy objectives such as poverty reduction or environmental initiatives (IEA, 2000). As an example, China's dependence on Sudanese oil (6% of China's total oil imports) led observers in 2004 to speculate that China might use its veto on the U.N. Security Council to avoid any sanctions against the Khartoum regime in response to the ongoing Darfur crisis (Butt 2004). Similar speculation exists with relation to Security Council action against Iran, as Iranian oil represents 14% of China's total oil imports (AFP, 2004). In a similar vein, China has long-standing diplomatic disagreements with its neighbours over disputed claims to under sea gas deposits, including a dispute with six neighbouring nations over the Spratly Islands, and a bitter dispute with Japan over the Senkaku (or Diaoyutai in Chinese) Islands (Petroleum Economist 2005). China's dependence on foreign oil, coupled with the increasing emissions and skyrocketing demand for energy, make the development of a renewable energy supply strategically important for reasons of local, regional and global environmental sustainability (Taylor and Bogach 1998) and for reasons of energy security (IEA, 2000)³⁸.

³⁸ While the Chinese government seems to have recognized the need for energy conservation (Sulei 2005) and renewable generation (Business Daily Update 2005), the government's position vis-à-vis reducing their dependence on oil is unclear, with a large new pipeline project in the works (AFP, 2005), and no apparent plans to reduce their dependence on oil.

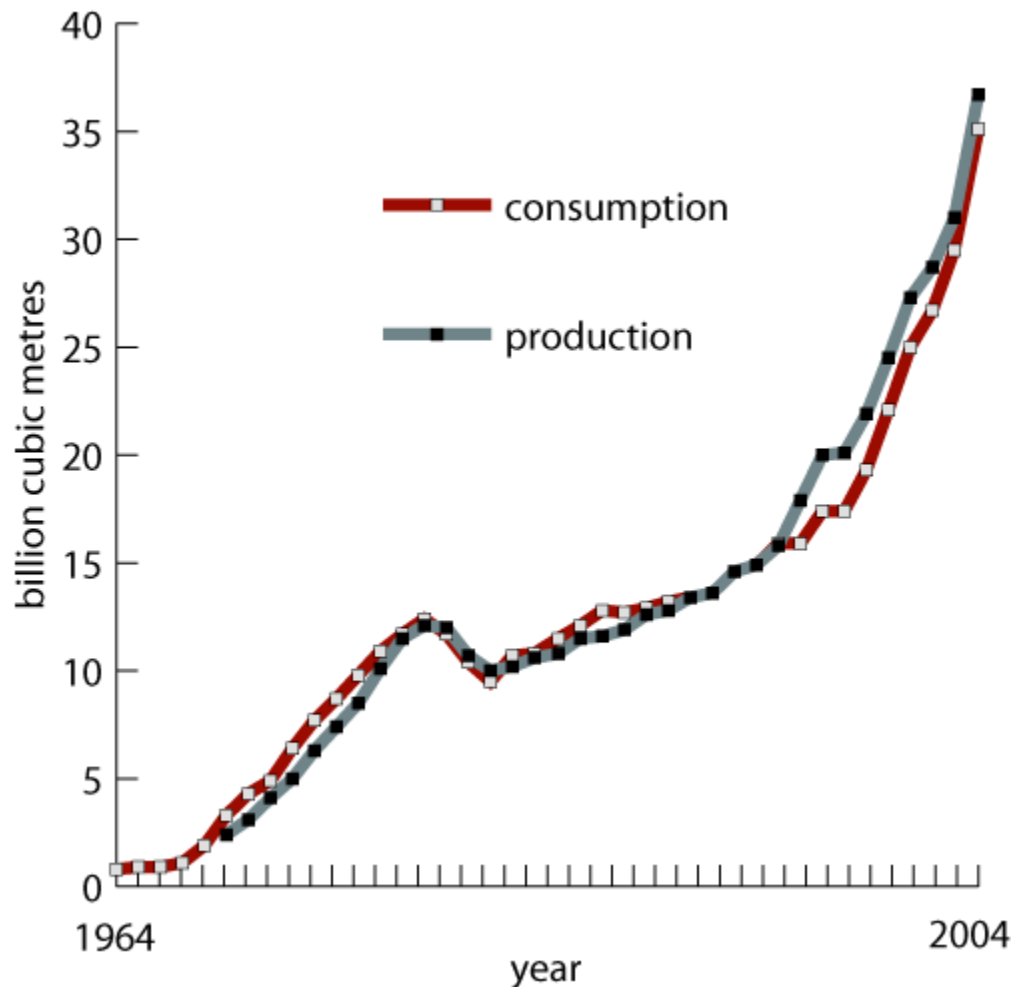


Figure 3.4 Chinese Gas Production and Consumption, 1964-2004 (data from BP, 2005)

The Chinese government seems to have recognized many of these problems and attempted to take steps to ameliorate the situation; they are currently in the midst of an ambitious plan to expand China's natural gas market (IEA, 2002). As shown in figure 3.4, Chinese production and consumption of natural gas has more than doubled over the past ten years (BP 2005). China has historically relied on gas produced from the gasification of coal to augment its supply of natural gas (IEA, 2002), but although this process lowers emissions and increases efficiency relative to burning coal to fire steam turbines, it still emits carbon dioxide and sulfur dioxide during gasification and the burning of the resulting gas (Cline 2004). Whether the clean energy system proposed for China is based on gas from coal gasification or natural gas from any of the undersea gas beds currently being explored, a gas-based infrastructure is ultimately unsustainable due to the non-renewable nature of natural gas. A sustainable clean energy structure for China—or elsewhere—must ultimately be based on renewable sources of

energy. This need for a renewable source of energy, coupled with China's large rural population and history of communal work, makes China an ideal country in which to study community renewable energy projects.

3.3 The Chinese Context

To live in China is to live in a different reality. The rules, rewards, and sanctions are different [than in the West]. 'In Asia...you either lose your inner moorings, start to sink, go some kind of crazy, and just let it happen, or you will leave sooner than you expected and not learn anything' (Holm, 1990; 20). This advice is contrary to our academic training. Yet to understand China, we must suspend our paradigmatic preconceptions. Deductively applying Western models to describe [...China...] is misleading. Foreign experts cannot even take their interpreter's words at face value. These difficulties impose limitations on us as interpreters of [China...]. They make descriptive study more realistic and useful. Even so, our words also should be taken tentatively.

(Aufrecht and Bun 1995:176)

Attempting to study the five characteristics discussed in Chapter 2 in China requires an examination of how these characteristics exist in, and relate to, contemporary Chinese society and culture. Any application of a general framework will require some contextualization³⁹ when attempting to use it to study a local situation, and this research is no exception. The presence of a strong central government, a system of "market-oriented socialism", and a history of rural-driven revolution and a communist government could result in very different manifestations of the characteristics developed in Chapter 2 when compared to their manifestations in a Western culture (my personal and educational background). Fortunately, the relationships and correlations discussed earlier do not stem solely from a Western context. Many of the ideas and cases discussed in Chapter 2 were derived in Asian countries, and some in China itself. The exploratory nature of this research meant that the framework—although contextualized to an extent through a literature review prior to departure for China—was also contextualized through field observations and reflections upon my return in a recursive approach. In this chapter, I revisit four of the five hypotheses developed in Chapter 2 that needed to be contextualized for use in China⁴⁰. This contextualization draws upon literature on contemporary Chinese culture and my own field observations in an effort to understand how the characteristics explored in Chapter 2 might manifest themselves in rural China today.

³⁹ In this sense, contextualization implies augmenting the understanding of these characteristics with a thorough knowledge and assessment of their potential manifestations in the specific context. If the characteristics need extensive reworking, then they may not be sufficiently general, or the specific situation may not fit within the assumptions from which those characteristics arose.

⁴⁰ I do not contextualize the need for access to appropriate biophysical resources, as I believe that this characteristic will not be manifest differently in China than in other social contexts.

3.3.1 A Brief History of Rural China

The first step in contextualizing a framework for use in a specific area is to understand the history of the area. China has a vast history spanning thousands of years; to fully understand the history of such a place requires a lifetime of devoted study. Many of the authoritative Chinese history texts have not yet been translated into English (Jiao Shiadong, personal communications 2004), making a true understanding of Chinese history almost impossible for someone who cannot read Chinese to obtain. The following summary only skims the surface of that history.

For centuries rural China consisted mostly of small plots of land either owned and worked by peasants or owned by rich landholders and worked by rural labourers. In the mid to late 20th century, rural China was transformed by a series of revolutions and changes (Unger 2002). The communist revolution of 1949 replaced the long-standing land tenure system with a system of agricultural collectives, redistributing approximately 43% of China's cultivated land from landholders and rich peasants to agricultural labourers and poor peasants (though the title was—and is still—held by the state, citizens were simply given the right to use it) (Huang 1995). This redistribution did little to transform agricultural productivity—an elaborate system of quotas and tithes ended up actually harming agricultural productivity (Unger 2002)—but thoroughly transformed rural social relations nonetheless. The “class struggle” against landlords and rich peasants, encouraged by Mao's government, turned old class distinctions upside down, creating a rigid system of discrimination against the “four bad categories element” (*si lei fenzi*), of landlord, rich peasant, counter-revolutionary, and “rotten element” (Unger 2002:32). The concept of collective agricultural units led to the formation of larger communes (often encompassing more than one town and several villages) during the ambitious “Great Leap Forward” in 1958. The disastrous agricultural policies of the “Great Leap Forward” triggered a policy-driven famine that killed millions between 1959 and 1961. Between 1966 and 1976 Mao led his “Cultural Revolution”, a political and ideological campaign intended to revive revolutionary spirit but instead resulting in massive social, economic and political upheaval.

In 1978—two years after Mao's death and the end of the Cultural Revolution—the government of Deng Xiaoping reversed most of the Maoist programs and rural Chinese returned to family farming (Unger 2002). Although land is still owned by the Chinese government, families now obtain rights to the land for a given period of time, allowing them to work it more or less as independent farmers. Decollectivization seemed to have solved many of the problems associated with the collective period, but brought with it new issues, dilemmas and tensions (Unger 2002). During the first phase of the market reforms (from 1978 until approximately 1992), incomes throughout China were relatively equal, however with the second phase (starting

in 1993) and its increasingly open markets⁴¹ came increasing economic inequality both between urban and rural areas, and between regions in China (most notably between the wealthier, more urban East and the poorer, predominantly rural West) (Wang 2000). The costs of these reforms have been borne primarily by the working class, with workers and peasants experiencing a “sharp decline in social status, accompanied by a steeply widening income gap between themselves and the elite of society” (Yang 2004:21). By the end of the 1990s China had become “one of the most polarised countries in the world, with a Gini coefficient⁴² approaching those of Sub-Saharan Africa and Latin America” (Yang 2004:21).

Rural Chinese now largely face increasing poverty while watching a booming economy that presents little opportunity for their entry. Hampered by *hukou* (residency permit) laws restricting their migration to more prosperous cities⁴³, rural Chinese families are forced to rely on family plots to support ever-growing families and extended families, plots which are increasingly appropriated for industrial use, often with little or no compensation to the rights holder. It is within this context of rural-urban inequality and growing poverty that my research occurred, and within which the five characteristics discussed in Chapter two will be examined in the case study.

3.3.2 The Characteristics in a Chinese Context

3.3.2.1 A high degree of social capital and a strong sense of community

Social Capital and Governance/Culture

Does the concept of social capital change with different types of governance or in different cultures (and if so, how)? As discussed in more detail below, the modern resurgence of interest in social capital was influenced by research on the relationship between social capital and governance in democratic societies. However, there is nothing about the concept of social capital itself that confines the utility of the idea of social capital strictly to questions of democratic governance. Indeed, social capital has since been used to study questions entirely unrelated to

⁴¹ The gradual adoption of freer markets has impacted urban residents more than rural residents as rural residents are still limited with regards to land holdings and are not allowed to sell or convert their agricultural land for other, more prosperous activities. As a result, urban residents are freer to enter into the new economy.

⁴² A Gini coefficient measures the polarization of income between the richest and the poorest in a country. Values range from 0 to 1, with 0 representing perfect equality (everyone has exactly the same income), and 1 representing perfect inequality (one person has all the income, all other citizens have no income).

⁴³ These laws are not always followed, as the hordes of illegal workers in “Special Economic Zones” like Guangzhou demonstrate. Because of discrimination against (and exploitation of) illegal migrant workers, the economic return on migration without a permit is much smaller than legal migration.

governance, focusing more on the utility of social capital in the daily lives of community members (Whittaker and Banwell 2002; cf. Kawachi, Kennedy, and Wilkinson 1999). How the concept of social capital might manifest itself in a non-democratic⁴⁴ (or less democratic⁴⁵) society such as China, and how social capital might impact the quality of leadership and extent of participation in communities in these societies remains a relevant question that has not yet been widely explored.

The recent resurgence of interest in social capital has been largely influenced by the American scholar Robert Putnam (Szretzer 2002). In his influential 1993 book *Making democracy work: civic traditions in modern Italy* (Putnam 1993), Putnam drew on the results of a detailed 20 year empirical study of regional governments in 20 different regions of Italy to propose that quality of governance was positively related to “longstanding traditions of civic engagement (or its absence)” (Putnam 1995:66). In his later writing, Putnam (2000) focused on a “lean and mean’ definition of social capital” (Woolcock 2004:185) as the networks and norms that facilitate collective action. In this work, Putnam suggested that memberships in civic associations (clubs, service groups, unions, etc) could be used as an indicator of social capital in a community, and proceeded to highlight the declining membership of such associations in the United States and its correlation with a declining quality of governance in America.

From this brief description of Putnam’s recent influential work, it is apparent that Putnam’s application of the concept of social capital and his ensuing analyses is largely (if not entirely) situated in the social context of a democratic society. Perhaps due to this context and Putnam’s roots in political science, a large portion of research following Putnam’s revival of interest in social capital has been done in democratically governed societies and has focused on the relationship between social capital and the quality of governance (Grix 2001). Furthermore, the methodology that has evolved in the “Putnam School” of social capital research largely ignores the social context in which that capital is generated through a focus on the use of quantifiable indicators of interpersonal trust (e.g. responses to survey questions) to measure social capital (Grix 2002). This focus minimizes the importance of qualitative information describing the context in which that trust is generated, and hinders further exploration of this context (Grix 2002). But “[c]ommunities do not exist in political isolation; [...] [b]oth states and

⁴⁴ A reviewer has pointed out to me that the notion of democracy being more established in capitalist (i.e. Western) societies than in socialist ones could be contested, in that some Marxist interpretations suggest that socialist economies are arguably more democratic than capitalist economies. I use the term democratic in the same sense as Putnam (1995) used it in his research (i.e. a government elected by the people).

⁴⁵ By Chinese law, government at the village level in China is nominally democratic. However, outright opposition or criticism of government by citizens is not well tolerated by government (Muldavin 1997).

societies must be understood and discussed together, since they are mutually interdependent” (Woolcock 2004:186). By largely ignoring the social context in a community, approaches such as Putnam’s implicitly assume that the actions of those individuals is the most important factor in generating the networks required to create social capital (Coleman 1988). Such an assumption overlooks the role of the social context in enabling or inhibiting the formation of those social networks (Maloney, Smith, and Stoker 2000).

In communities operating in political contexts like China’s where the state represses the pursuit of self-defined interests and the resulting associational activity (Yang 2004) a model that does not incorporate this context will be ineffectual. While Putnam’s methodological approach has been used by other researchers with great success—and has certainly helped to advance the understanding of social capital—its utility in exploring social capital’s impact on social phenomena outside of a democratic context (phenomena like the success of community renewable energy projects in China) is unclear.

Recent work—building upon the work of Putnam and others (cf. Coleman 1988)—has circumvented some of the methodological problems discussed above by including more qualitative measures that attempt to include contextual factors such as access to stocks of social capital (Grix 2001) or other factors unique to a particular social context (cf. Woolcock and Narayan 2000). This approach attempts to measure social capital less as the aggregate value of responses to questions on interpersonal trust, and more as something that “inheres in the relations between actors and among actors” (Coleman 1988:98). These studies recognize that political structures and institutions shape the context in which associational activity and personal interactions (which create social capital) take place (Maloney, Smith, and Stoker 2000), and that the utility of—and access to—social capital is context dependent (Foley and Edwards 1999; Woolcock 2004). This conceptualization of social capital focuses more on the quality of relations between and among individuals, groups, associations and government (rather than on the quantity of those groups and associations), distinguishing two related but distinct categories of social capital: *structural* (associational vibrancy), and *cognitive/attitudinal* (trust and reciprocity) (Uphoff 2000; Molenaers 2003)⁴⁶ and focusing on the latter.

This shift in focus is relevant to work in other societies because it distances itself from an *a priori* presumption that a lack of associational activity in a society represents a dearth of “civic-

⁴⁶ I should explain my understanding of the relationship between these two categories of social capital and the three forms of social capital suggested by Woolcock (2000) that were discussed in Chapter 2. The structural and cognitive categories refer to the *source* of the social capital—whether it is generated through networks (structural), or from social norms and expectations (cognitive). These categories are of social capital available in society at large and can be used by individuals to generate Woolcock’s bonding, bridging and linking social capital, which refer more to the *utility* of the social capital.

ness". Associational vibrancy relates only to the structural component of social capital, while attitudinal or cognitive social capital may be a vibrant part of a society that for other reasons lacks the structural component of social capital (Molenaers 2003). In general, service clubs, bowling leagues, unions and the types of formal civic associations generally assumed to generate social capital are very much a Western construct. Indeed, there are few Western-style associations in rural China for many reasons—political, cultural and economic—that may not necessarily reflect a lack of “civic-mindedness”. Informal associations and encounters (or repeated interactions) in Chinese daily life may be more common generators of social capital than formal associations such as sports leagues or service clubs. An apparent lack of the structural components of social capital in China does not necessarily indicate a lack of the trust and reciprocity that characterizes the attitudinal, or cognitive, component.

Social Capital in Rural China

Social capital in China does not seem to be a well-studied phenomenon (Yongming 2000). This lack of research is perhaps attributable to the conceptual difficulties discussed above, coupled with the uniqueness of Chinese culture and some of the striking differences between the contexts in which the recent resurgence of scholarly interest in social capital has taken place. A similar and related concept—civil society in China—has been covered in much more detail (Chamberlain 1998; Ma 1993; White, Howell, and Shang 1996; e.g. Brook and Frolic 1997; Howell 1999; Harrison 2001; He 1999; Ho 2001; Keane 2001; Moore 2001; Paltiel 1999; Solinger 1993), but there is no general consensus even on this well-studied topic (Yang 2004). In many ways, China is a culturally, economically, and politically unique country⁴⁷, which makes the transposition of externally derived concepts such as social capital or civil society fraught with difficulty. The collective experiences of rural Chinese society combined with their relatively unique cultural, economical, and political context will influence how social capital is generated and used in rural China.

Two examples of Chinese cultural contextual factors that might impact the manifestation of social capital are China’s cultural legacy of Confucianism and the prevalence of *guanxi* in Chinese society. The impact of Confucianism—a 2000 year old tradition that remains “the most influential source of non-Western values” (MacIntyre 2004:204) in much of the Asian world—on the

⁴⁷ As regions within China develop at different speeds along different trajectories (Lyons 1991), the picture of China as a whole may not become any clearer. Diverse cultural and ethnic backgrounds throughout China will further muddy the proverbial waters.

transposition of concepts such as social capital from a Western context is not entirely clear⁴⁸. As an example, the Confucian idea of *li* ("rites" or "propriety") holds that every person has a proper place in society and that respect and honour should be accorded to a person commensurate to their station (Taylor 2004). As a result, Chinese society has—when compared to Western society—very strict social roles for social interactions defined by things such as age, social status, guest/host, etc. These defined roles—or social norms—form a type of cognitive social capital that may facilitate the generation of interpersonal trust, especially with distant associates (bridging social capital).

The concept of *guanxi*, (pronounced "gwahn-shee") a Chinese term translated as "connection, relation; relationship" (Berlitz Chinese-English Dictionary 2004), has recently entered English parlance and generated a substantial amount of discussion (cf. Gold, Guthrie, and Wank 2002). *Guanxi* refers to the utility of social networks built from "pre-existing relationships of classmates, people from the same native-place, relatives, superior[s] and subordinate[s] in the same work place, and so forth" (Yang 1988:411). The Chinese see the generation and pursuit of *guanxi* as an art requiring "the skilful mobilization of moral and cultural imperatives such as obligation and reciprocity in pursuit of both diffuse social ends and calculated instrumental ends" (Yang 1989:35). There is considerable debate as to whether *guanxi* is simply the Chinese term for "the personal networks, social capital, and gift economies found in all societies" (Gold, Guthrie, and Wank 2002:3), or whether it is "an essential and defining element of Chinese culture" (Gold, Guthrie, and Wank 2002:3)⁴⁹. Smart (1993) conveys an interesting example of the use of *guanxi* as linking social capital (providing access to key decision-makers in government) allowing would-be entrepreneurs to "grease the wheels" and establish their business much more quickly than might otherwise have been possible.

The integration of the concept of *guanxi* into daily Chinese life, and the length of time the concept has been discussed, manipulated and perpetuated in Chinese culture means that *guanxi* remains a uniquely Chinese phenomena, regardless of whether it is simply the Chinese version of a universal phenomena or distinct to China. Inasmuch as the concept relates to this discussion, *guanxi* can be considered as another form of social capital, but a form that has utility almost exclusively at an individual level. For the purposes of this study, I am more interested in social capital at an aggregate level as a measure of the ability of the community to work together and invest in mutually beneficial projects. Both *guanxi* and other forms of social capital will be

⁴⁸ There are many other Chinese cultural traits which could make the study of social capital in China different than in another context. The legacy of Confucianism is only one example of many possible examples.

⁴⁹ Indeed, the description of *guanxi* presented above (Yang 1988; 1989) seems to essentially describe the creation of bonding, bridging and linking social capital through the norms of obligation and reciprocity associated with cognitive social capital.

generated and maintained in similar fashions—associations, structures and cultural experiences that generate and reinforce trust and mutually shared social norms. Investigating those associations and experiences will relate equally to *guanxi* and other forms of social capital.

China's economy is also different from most of the contexts in which modern research on social capital has been undertaken. In many ways, China is very much a capitalist economy and has many traits commonly associated with economies in democratic countries such as relatively free movement of capital. Contrast this with the fact that China fixes many of the prices of standard inputs such as electricity (until recently) and gasoline, and the Chinese economy may have more in common with other centrally planned economies. Some research has focused on post-communist countries such as East Germany or the former Soviet Union in an effort to discern the link between social capital and democracy (Grix 2001), but many of the qualities found in such societies (e.g. extreme and widespread poverty, social fractures) are not found to the same extent in contemporary China. Francis Fukuyama (1995) suggests that—in general—the level of state interference in the economy is inversely proportional to a country's levels of social capital. This would suggest that levels of social capital in China may be rising as the government eases its influence on the economy. Indeed, environmental activism and other forms of associational activity are beginning to rise—most notably in urban areas—as the economy becomes more free (although this correlation may not indicate any causative link), indicating that sources of structural social capital may be on the rise.

Finally, China's history of revolution and the resulting communist government and their reforms (especially pronounced in rural areas) will affect the transferability of some concepts of social capital that have been developed in societies with a less turbulent recent past. A history of oppression, revolution, and a government that historically has turned people against each other (Unger 2002) could make generalized trust (bridging and linking social capital) hazardous (Uslaner 2003), reducing the potential for the generation of social capital. Conversely though, long-standing communities with strong ties of kinship could see an increase in bonding social capital as a result of these shared tribulations.

Grix asserts that communist societies in general slow the generation of social capital since "the institutional structure of the communist state has left a legacy of hierarchical power relations and a lack of experience in horizontal relations of reciprocity between actors in society" (Grix 2001:205), where—broadly speaking—"the horizontal ties of reciprocity, the hallmark of a vibrant civil society, [are] replaced by hierarchical ties of clientelism between rulers and ruled" (Grix 2001:205). For this reason, associational activity—a classic measure of social capital—may not be as useful as a measure in authoritarian societies since what participation in civic associations exists is "regulated and demanded by the state via state-run associations, clubs, the

workplace, work brigades, and so on⁵⁰ (Grix 2001:205). This situation is changing now, and the daily lives of Chinese citizens are much less controlled by the government than they were a decade ago (personal observations⁵¹). But even as the state withdraws from such detailed control of daily life, western-style associations have not yet filled the void. In the villages I visited in China, the state had begun to withdraw from its previous role in daily life in the form of work brigades, leaving a void in rural life that has not yet been filled with the types of associations such as farmers or women's cooperatives seen in rural areas in other countries (e.g. CADDET 1996; Lauridsen and An 1996). This lack of formal associational activity or structural social capital—which, as discussed earlier, is not necessarily indicative of a lack of social capital⁵²—reduces the utility of many existing means of assessing social capital, methods that focus on assessing the level of participation in civic associations.

From this lengthy discussion it becomes apparent that applying the concept of social capital in China may be contentious for a variety of reasons. This is not to suggest that the concept lacks utility—people in authoritarian states surely must draw on their acquaintances and social networks—but rather that methods of studying social capital in contexts other than a Western-style democracy are under-developed at this time, particularly those that focus on structural social capital. In a Chinese context, more emphasis should be placed on forms of cognitive social capital and the bonding and bridging capital they produce.

3.3.2.2 Effective leadership from local government and local organizations

As discussed in Chapter 2, effective leaders will generally be long-tenured with a history of standing up to authority (Sanders 2000b), have an understanding of local institutions (Mule No Date), and accurately reflect the preferences and desires of the end-users (Isham and Kähkönen 1999). Effective leaders will be accountable to, and representative of, the local population (Muldavin 2000). This representation and accountability can arise in many different ways, but two of the more prominent ways discussed in the literature are through the process of decentralization and through good leadership. Helmsing, reflecting on the role of decentralization in the legitimization of a government, notes that:

it is argued that through decentralisation to and democratisation of local-level government, part of [the socio-political legitimacy of the state in society] may be regained by, for example, the creation of elected and representative local governments, direct election of mayors, the formation of local-government substructures at village and

⁵⁰ The impact of the motivations for associational activity on the generation of social capital is not entirely clear (e.g. are the actual face-to-face encounters with other members of society more important than the reason for attendance?).

⁵¹ In 1993 I spent 6 weeks in China.

⁵² A lack of formal associational activity may indicate a shift to more cognitive forms of social capital such as Woolcock's (2000) bonding capital.

neighbourhood level, and citizen participation in decision making, planning, and budgeting (Helmsing 2002:318).

In contrast to the literature on social capital, the literature on representation and decentralization is drawn from many different contexts that are not exclusively “Western” or “Northern”. Many of these authors draw on experience in developing countries (e.g. Andersson 2004; Helmsing 2002), rural contexts (e.g. Devas and Grant 2003; Bryld 2001), and varying governmental regimes (e.g. Bienen et al. 1990 in Nepal; Booth 2003 in Indonesia)—including China (e.g. Brown and Longworth 1992; Fabre 2002; Hsu 2004).

During the earlier discussion of social capital and its manifestation in Chinese culture, I noted that rural Chinese have a large set of clearly established institutions and social norms based on the concept of rites taken from—among other things—their shared Confucian culture and their more recent history of revolution. In small rural villages, where many generations of families have lived, local institutions and norms are even more firmly established through this shared history. The fact that most rural Chinese villages are relatively ethnically homogenous may also contribute to clarity of the established institutions within rural villages (Uslaner 2003). As discussed in Chapter 2, any organization or government working in such a community will be more representative of the local people (and—as discussed in the last chapter—therefore more effective) if they possess an understanding of these institutions (Mule No Date).

Another Confucian concept that may influence the performance of leaders in China is the concept of a meritocracy. The Confucian concept of a meritocracy—which led to the institution of Imperial Examinations—resulted in Mandarins (government ministers) gaining their positions through merit rather than through birthright or social connections (Yao 2000). Lucian Pye “famously remarked” (Yang 2004:4) that “no people have ever outdone the Chinese in ascribing moral virtues to the state or in deprecating the worth of the individual” (quoted in Yang 2004:4). Like the concept of rites, merit-based government and the virtue ascribed thereto may facilitate the generation of institutional trust, which may help make leaders more effective. However, the survival of this institutional trust—if present—through the communist revolution is unclear. Indeed, China’s history of corruption (Wedeman 2005) may do more to reduce the generation of institutional trust than any remnants of Confucian notions of the virtue of the state do to uphold that trust. Paradoxically, corruption itself may also increase the utility of social capital in Chinese society; a study of Chinese entrepreneurs found that most successful entrepreneurs in China rely “on personal connections with influential officials or organisations” (Yang 2004:15), and that “particular personal relationships continue to be by far the most effective method for affecting political output” (Yang 2004:16) in China.

How representative are local organizations and government in China? The general lack of non-governmental organizations in China has already been noted during the discussion on

social capital, and as such, reflecting on the degree of representation found in local organizations may be irrelevant. Despite this, the question remains: how representative is local government in rural China? Upon raising the topic of government in China, readers' minds may conjure up an image of a strongly centralized political system (Mao's "Red China"), questioning how representative any such government might be at a local level.

Indeed, "a consequence of the scale and nature of the system governing the Chinese people is that there is a significant distance between the central government that formulates and delivers policy and the village where it is implemented" (Plummer 2004:7). Historically, leaders at each level of government have been appointed by higher levels of government. Candidates from within the community were often eschewed in favour of external candidates in the hopes that such a strategy would reduce patronage and nepotism within the political structures of the township (Zhong 2003). This process of top-down selection and importing leaders will reduce the degree of representation of local people within a government when compared with a popularly selected local candidate, resulting in less effective governments at a local level.

Decentralization in China

The directives and instructions handed down through a long chain of command from central government [...] are passed from one level of the government hierarchy to the next and inevitably lose some of their meaning and focus en route. In practice, local levels of government actually exhibit a high degree of autonomy, a quasi-decentralized status brought about only through distance and size. This is often manifest in the way policy is interpreted. (Plummer 2004:7)

As suggested by Helmsing (2002), the direct election of local governments and the formation of local-government substructures at village and neighbourhood levels will generally make local governments more representative than otherwise, especially if the elected officials come from within the community. If decentralized government can be more representative than centralized government, how decentralized are rural governments in China? Although the role of the central state in the lives of its citizens is certainly more pronounced than in more "democratic" countries, China has arguably become relatively more decentralized (e.g. see Tsui and Wang 2004)—politically speaking—since the reform era through the process of power devolution (Hsu 2004). Unfortunately, this process of change has not been immune to problems often associated with decentralization (e.g. Rodrigues-Pose and Gill 2003; McCarthy 2004), problems such as corruption and criminalisation (Fabre 2002), and has often not resulted in positive changes in the quality of service or governance (Tang and Bloom 2000).

Based on his research in Indonesia, McCarthy (2004) suggests that decentralized governments need to be stabilized by a strong central government in order to avoid simply

transferring pre-existing problems from a centralized form of governance to a more decentralized one:

Paradoxically, to avoid shifting a set of problems along a centralized-decentralized axis, decentralization needs to be balanced with centralization, and this necessarily involves the application of political skill locally by a strong central government. (McCarthy 2004:1217)

Similarly, during his study of decentralized forest governance in Bolivia, Andersson (2004) found that it was not so much the degree of decentralization that was important in deciding the outcome of decentralized resource management, but the ability of a governing body to interact with and respond to local users. He suggests that in order for decentralized resource management to function efficiently, both horizontal communication (between users and regulators) and vertical communication (between levels of government) must be present and well established. In his investigation into civil society in China, Yang suggests that in China, a similar balance is needed to avoid corruption at a local level:

what is important is not political decentralisation *per se*, but the equilibrium between central and local powers so that society does not lie exclusively within the bureaucratic purview of any particular level of authority. The phenomenon of *tanpai—ad hoc* fees of dubious legality levied by local authorities—is a telling example of decentralisation running amok. As Wang Shaoguang [(Wang 2000)] points out, weakness at the centre has historically gone hand-in-hand with rampant expansion of local extraction. (Yang 2004:18)

With these two points in mind I suggest that some of the benefits associated with decentralization can still be realized in a state with a strong central government (such as China). Indeed, the benefits may be more quickly and distinctly realized if a strong central government can steer the process of devolving power to a local level away from some of the common pitfalls of decentralized government—pitfalls like capture of power by local elites (McCarthy 2004) and increased corruption (Wang 2000)—while maintaining effective communication channels both vertically and horizontally. Again, it is not the decentralization *per se* that leads to the apparent success of decentralized governance and decentralized management systems, but rather the increased ability of the managing governmental body to recognize and respond quickly and efficiently to the needs of the constituents being governed or systems being managed, and to give those constituents a forum in which to meaningfully participate in the decision making process.

An important component of leadership is the opportunity afforded local constituents to participate meaningfully in the decision-making process through increased interaction (or more linking social capital) with local government or leaders in local organizations. A valid objection would be to question the ability of a local constituent or resource user to meaningfully participate in the decision-making process under this system given the Chinese culture and recent history of

centralized, authoritative government (and the associated lack of powerful non-governmental organizations). In the Chinese context, political participation should be defined as any activity by private citizens that is intended to affect policy output (Huntington 1968; Yang 2004), not only as engagement in the formal political process—engagement which may be beyond the reach of average citizens in a authoritarian regime such as China's. This definition allows a broader scope of research when looking at citizen participation in policy formation.

In actuality, village government in China is largely democratic⁵³, allowing citizens to participate in policy formation through their votes on Election Day. Still, particularly in small villages, citizens surely affect policy output in other ways such as personal communications and interactions with the village leaders, interactions that should be considered as a component of political participation. The degree of democracy and actual representation may vary from village to village, but this is no different from other more nominally democratic areas of the world. Even should an ostensibly democratic election process turn out to be less than ideal, it may be that long established, trusted local leaders can give local constituents the sense that their interests are being represented in the decision making process. In his case studies of seven eco-villages in China, Sanders (2000b) found that long-standing, well-respected and imaginative leadership was an important factor in the success of a venture into Chinese Ecological Agriculture. Interestingly, Sanders does not mention whether these are democratically elected leaders. Sanders' findings lend credence to the importance of good leaders, even in a system that may be nominally less accountable than similar systems in democratic countries.

The accountability of governments contributes a great deal to the institutional trust present in their constituencies. Higher levels of institutional trust will increase the respect of, cooperation in, and compliance accorded to local government initiatives. Local elections can bring accountability, but only to a small degree if they are not accompanied with a transparent and accessible nomination system at a local level. The rule of law and the consistent and visible enforcement of anti-corruption laws are additional ways of enforcing accountability in government. Increasingly, anti-corruption laws are being enforced in China, particularly in the fight against illegal taxation by local officials (Zhang 1999). The success rate of these legal actions has been as high as 89% in some provinces.

Finally, in strong centralized states such as China, township and village enterprises (TVEs) may generate enough income to effectively decentralize local government by giving them

⁵³ The People's Republic of China Organic Law on Village Committees 53 states in Article 11 that local government is to be chosen through elections (IRI, 2001). At the 15th Party Congress in 1997, Chinese president Jiang Zemin announced a new Chinese government policy aimed at extending grassroots democracy (Li 2002). Until then, village elections had been taking place sporadically in China, but now they were to be part of the constitution.

the financial wherewithal to initiate and implement community development projects (Sargeson and Zhang 1999). TVEs have become “the most economically significant portion of rural industry” since decollectivization (Oi 1995). Townships and villages that have successful TVEs often have financial capabilities above and beyond those of other jurisdictions, capabilities that allow them to undertake much more financially demanding projects (see, for example Unger 2002).

From this discussion, a few key points emerge regarding the importance of leadership from local government and local organizations. Because of the lack of non-governmental organizations in China, more emphasis may be placed on the role of effective leadership from local government. Local participation in government and engagement with leaders will increase the effectiveness of local government leaders. In China, this local participation in government is supplied through democratic elections at the village level. Increased prosecution of corruption in government may increase citizens’ confidence in local government, and increased financial resources may allow those governments more effective autonomy than might otherwise be expected in a centralized state like China.

3.3.2.3 Experience with innovation and cooperation, and high levels of technical resources

The applicability of past experience should not change much from one context to another because the focus is on applying the lessons learned (and skills gained) from that past experience to the new project. As the new undertaking is—presumably—occurring in the same context as the past experience, this characteristic tends to (in a manner of speaking) contextualize itself. However, Chinese communities share a relatively unique past experience of cooperation from their days working in collectives. This shared experience may afford them with some resources not available to communities that have not experienced such a history.

Communal Capital

The “assets built up during the communal period [... consisting of ...] social, economic and environmental forms of capital [which] typified local-level economic development under Mao” (Muldavin 1997:580) can be considered as a type of communal capital—resources available to Chinese because of their past history with communism and collectives. Muldavin (1997) introduced the concept of communal capital during his work on the political ecology of Chinese economic reforms. Muldavin also considers the “social and organizational achievements of the communal period which have provided China with the literate, healthy and skilled individuals so attractive today to foreign investors” (Muldavin 1997:581) to be communal capital. In a later study (already discussed in Chapter 2), Muldavin found that a “strong sense of continuity with the organization, technological successes, and knowledge gained during the commune period”

(Muldavin 2000:260) is important in helping Chinese communities succeed on alternate pathways of development in the post-reform era. The existence of stocks of communal capital generated during the pre-reform era in China may have relevance in many areas of research surrounding post-reform China. In its tangible form (assets, equipment and other forms of classic “capital”), communal capital is unlike social capital in that its stocks are drained through use. Muldavin highlights this problem, noting how the booming development of China’s economy is “mining” forms of communal capital. The more intangible social and organizational achievements described above may be a form of cognitive social capital if they serve to foster the networks and bonds of trust that can be drawn upon as might social capital. The shared experiences of members of the collective would certainly add to bonding social capital among them. This type of “capital” arising from past experiences is not unique to China, but the scale and ubiquity of the shared experience makes communal capital an aspect of social life that should be considered in any research in China.

3.3.2.4 Economic perceptions and realities

Under China’s current booming economy (which—as discussed—has increasingly left rural residents behind), China’s increasingly consumerist citizens base many of their decisions on the financial bottom line. During his investigation of seven Chinese ecovillages, Sanders noted that

[h]owever technically feasible and potentially ecologically beneficial a new agricultural practice may be, it won’t be adopted if it does not fit into the extant political relations and promise considerable economic rewards. [...] In the current conditions of the Chinese countryside, for example, only those practices promising to make farmers rich (or at least, a lot richer) stand any serious chance of being voluntarily adopted. (Sanders 2000b:357).

A similar reality will most likely exist for new community energy projects. From the perspective of a local government, financing new energy projects may not be an easy task if no financial help is provided from the centre. Financial autonomy or prosperity will certainly make implementation of a community energy project much easier on a local government. Much has been made recently of the financial success of Township and Village Enterprises (TVEs) in China (Oi 1995), and their impacts on local economies (Sargeson and Zhang 1999) and the coffers of local governments (Walder 1995). However, “[t]here is no doubt that the positive roles of TVEs are not generalisable. The preconditions for TVEs to play such positive roles in the first place (geographic advantages in access to resources, low level of marketization, and policy support from the local states) are not applicable to just any rural area in China” (Wang 2005:184).

Although China's central government has the power to pursue—and a track-record⁵⁴ of pursuing—goals for reasons other than economic benefit (or for long-term economic benefit), at a local level the ability and desire to pursue non-economic or long-term goals may be limited. For these reasons, projects in rural China—indeed in any poor rural area—may have to meet stiffer economic criteria than projects implemented elsewhere.

3.4 Conclusion

This chapter looked at the rationale for choosing China as a study site, and the conceptual and methodological challenges such a choice presented. During this discussion, the Chinese manifestation of four of the five community characteristics discussed in Chapter 2 was examined using literature on Chinese culture and observations from my fieldwork. This examination suggests that, in China, the associational activities often linked to social capital in Western contexts may be reduced in importance relevant to cognitive forms of social capital such as bonding and bridging capital. Similarly, leadership in government may play a more important role than leadership from local organizations in a Chinese context. Furthermore, Chinese communities may possess communal capital as a result of their history of collectives, and this communal capital may provide a relatively unique source of social capital and technical resources. Finally, with China in the midst of an economic transformation, economic incentives for renewable energy projects may play a larger role relative to other incentives such as quality of life or environmental impact. In the next chapter I will describe the research methods to be used in the case study.

⁵⁴ The Three Gorges Dam project provides a stunning example of the Chinese Government's ability to mobilize capital and people to collective ends. Costing \$24 billion, the dam is the largest hydroelectric dam project in the world, spanning nearly a mile as it crosses the Yangtze River at a height of 185 metres. When finished in 2009, its reservoir will have forced the displacement of between one and two million people (Guardian Research 2005).

Chapter 4: Research Methods

4.1 Introduction

Chapter 2 discussed characteristics of communities that are conducive to successful community energy projects. Chapter 3 examined the manifestation of those characteristics in China. In order to examine more closely these community characteristics and how they manifest themselves in China, a case study was undertaken in a rural Chinese village that had successfully implemented a community renewable energy project. This fieldwork was undertaken between October 2004 and January 2005 in Hainan province, China under the auspices of the Ecoplan China project at the University of Waterloo, funded by the Canadian International Development Agency (CIDA). Using the five characteristics developed in Chapter 2 (and contextualized in Chapter 3) as a heuristic to develop the questions, semi-structured interviews were used as the main research technique, along with a questionnaire on sense of community and personal observations. This chapter provides further detail on the research methods used for the case study and the rationale for the choice of those methods.

4.2 Case Study Research

"In general, case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (Yin 2003:1). A case study was an ideal methodology to use for this research as the questions being investigated were "how" and "why" questions (e.g. "How and why did these communities succeed at these projects?"), and the phenomenon under investigation was a contemporary phenomenon in a real-life context over which the investigator had no control.

4.3 Site Selection

Before departing for China, I contacted the Hainan Department of Land and Resources (HDLR) to ask them if they knew of any community renewable energy projects that might fit the criteria outlined for this research. I was looking for a community with an energy project that fit the definitions established in Chapter 2, and that was willing to have me investigate their village over a period of two to six weeks. I hoped to conduct research in at least two communities. An employee at HDLR emailed back a newspaper article outlining a recently completed biogas project in Cang Dong Village, Haikou City. Upon arrival in Hainan, I traveled to Cang Dong and spoke informally with the village leader and the manager of the biogas plant. Cang Dong seemed to satisfy both criteria, with an appropriate energy project and a village leader who was

very enthusiastic to help us (with a great respect for Canadians fuelled by his admiration for Dr. Norman Bethune). Following this visit, I noted that Cang Dong was a possible study site, but before confirming the site selection I spent five weeks visiting other communities and talking with government officials (e.g. Energy and Propaganda⁵⁵ Department officials in Sanya, Haikou and Wuzhishan Cities) in an attempt to find additional study sites. Typically these visits would consist of contacting higher government officials in the area, describing my research needs to them and then visiting the local communities they recommended. I visited five rural villages, three of which (Maoyun Village, Xin Cun Village, and Paana Village) had biogas projects at the household level. In these villages, I would typically talk informally with one or two villagers or the village leader (if available). While these visits were intended specifically for site selection, they also allowed me to gain a better understanding of life in rural Hainan (by exposing me to more villages than just my study sites⁵⁶). The energy projects in the four villages (individual biogas projects at a household level), while obviously a source of pride for the villagers, did not meet my criteria for a community energy project. More specifically, the projects themselves did not have the “capacity to positively impact the entire community” (definition from Chapter 2). As mentioned in Chapter 2, a local government initiative to install renewable energy sources (such as biogas digesters) at a household project would meet the definition of a community renewable energy project; however, in most of these villages a significant investment was required by the families themselves, resulting in the strategy not being taken up by all the villagers. Due to the inability to find another suitable community, the research focused solely on Cang Dong.

4.4 Research Tools

My research methods consisted mainly of informal and semi-structured in-depth interviews. Interviews can be used quite differently in different types of research. Some authors (e.g. Kvale 1996; Holstein and Gubrium 2004; Legard, Keegan, and Ward 2003) suggest that there are two differing views of qualitative-research interviews and the role of the interviewer. Highly-structured questionnaires, surveys, interviews, and focus groups are interview tools that depict respondents as holders of information, with the interview tool designed to help the interviewer extract that data. This type of interview—and the role of the interviewer—has been compared to a mining operation; the “miner metaphor” (Kvale 1996), where

⁵⁵ This is the translation with which I was provided. I believe that the Chinese do not fully understand the negative connotations of this term in the West. A more sensitive (but not necessarily more accurate) translation might be “press bureau” or “public relations”.

⁵⁶ During a brief vacation I took during my time in China, I traveled to the city of Guilin in the province of Guangxi and had the chance to visit two more rural villages, albeit without the aid of a dedicated translator. While these visits did not provide the same rich experience as the more in-depth visits with translators, they did provide me with some additional context.

knowledge is understood as buried metal and the interviewer is a miner who unearths the valuable metal ... The interviewer digs nuggets of data or meanings out of a subject's pure experiences, unpolluted by leading questions. (Kvale 1996:3)

With the interviewer portrayed as a miner, extracting "pure" data, interviewers must take care to avoid changing or spoiling the answers as they "extract" them from the interview subject. To this end, the interviewer attempts to remain neutral and not to use leading questions. In this way the chances of obtaining valid data are increased, with the assumption that the experience of the interview is repeatable; that any other researcher could come along with similar questions and "extract" the same data (Holstein and Gubrium 2004). The ability to replicate interviews conducted in this manner will increase the reliability and validity of the resultant data (Palys 2003). A potential pitfall of approaching interviews in this way is that important information could be missed because the reviewer is unable to ask respondents to consider their experiences from a different point of view, or to challenge the respondent to rethink his or her ideas.

The second metaphorical representation of an interview is the "traveler metaphor" (Kvale 1996), in which knowledge is not given to the interviewer or extracted from the respondent, but is constructed during the interview, which is viewed as a "dynamic, meaning-making occasion" (Holstein and Gubrium 2004:145). When the interviewer is perceived as a traveler, the focus of the interview changes to:

how meaning is constructed, the circumstances of construction, and the meaningful linkages that are assembled for the occasion. While interest in the content of answers persists, it is primarily in how and what the subject/respondent, *in collaboration with* an equally active interviewer, produces and conveys about the subject/respondent's experience under the interpretive circumstances at hand. (Holstein and Gubrium 2004:145, emphasis added)

In this case, answers cannot be expected to be repeatable because the answers themselves are the product of the circumstances of the interview. The validity of the answers "derives not from their correspondence to meanings held within the respondent, but from their ability to convey situated experiential realities in terms that are locally comprehensible" (Holstein and Gubrium 2004:145). One benefit of this type of interview is that—done well—it may allow the interviewer to gain a very detailed knowledge of the subject matter, while exploring many different aspects of the subject matter. Additionally, the respondent may also gain something from this type of an interview; rather than simply having information "extracted" the respondent may actually gain new insights over the course of the interview. This type of interview will require an experienced and skilled interviewer to guide the interview on its "journey", and to ensure validity and reliability by writing (and adhering to) a good study protocol, thereby increasing the chances of

replicability⁵⁷ (Yin 2003). The interviewer must also possess a strong knowledge of the local culture, customs and language in order to fully engage the respondent in their exploration.

My interviews tended to fall into the first, “miner”, classification. While my interview protocols were not highly structured, this lack of structure is more reflective of the exploratory nature of this research than of any desire to embark in a shared journey of mutual discovery. Rather, the informal and semi-structured interviews I used in this research were designed to obtain an in-depth understanding of the implementation and operation of the community energy project and the community’s role in those processes by “extracting” from the respondents their knowledge of, and their experiences with, the energy project. The validity of any results gained from these interviews relies on the resultant data accurately reflecting the experiences and opinions of the respondent. Often when I learned new information I would guide the interview down pathways that I had not anticipated⁵⁸, but those new pathways simply allowed me to “extract” more information about the respondent’s experiences. With this in mind, my interviews were more analogous to the “miner” metaphor described above than that of the traveler. Undertaking interviews that require intensive collaboration between the respondent and the interviewer in order to generate meaning would be risky due to the necessity of working through a translator and the knowledge of the social customs and context required. The length of the field portion of this research (four months) would not have been sufficient to overcome these hurdles.

The themes and questions examined in my informal and semi-structured interviews were derived from the five characteristics identified in the literature review (and contextualized in the last chapter) and from the conceptual model described in Chapter 2, displayed in figures 2.1, 2.2 and 2.3. In figure 2.3, each actor (i.e. the beneficiary and the provider) contributes to two different interactions, one with the other actor and one with the project itself. These two contributions guided the development of the interview themes. Figure 4.1 identifies each entity in the project triangle along with each entity’s two contributions to the interactions described by the project triangle. Below each interaction are themes that could be pursued in the interviews to learn more about the interactions described in figure 2.1. Listed beneath each entity is a list of interview subjects who could be interviewed to learn about the nature of the entity’s

⁵⁷ While the individual answers in surveys may not always be repeatable (because the interview is constructing meaning as it goes), a skilled interviewer who has written a good study protocol will increase the replicability of the study as a whole by increasing the rigour of the case study (Yin 2003).

⁵⁸ Morse and Richards (2002) identify the use of unplanned and unanticipated questions like these as a key characteristic of the unstructured, interactive interview that is commonly used in case study analyses.

contributions to the community project. To help eliminate bias from the response, subjects from one or both of the other entities listed in the project triangle were interviewed about the roles, strengths and weaknesses, and actions of the other entities. A more comprehensive list of general questions for each entity is included as Appendix 1. As this research is exploratory and iterative in nature, the questions were revisited as the research went on. This revisiting was useful in Cang Dong, especially when the research began to focus on the experiences of the villagers (as opposed to members of the government and members of the providing organization). Following the discussions with members of the government and the providing organization, additional questions for villagers in Cang Dong were established to investigate issues that had come up during interviews with government officials. These questions are included in Appendix 2.

Research initially focused on government leaders and members of the implementing organization, as they were the individuals most involved with the energy project. In the later stages of the research, interviews were held with residents of the village, usually over lunch at their house or in a common area of the village. All interviews were semi-structured with mostly open-ended questions. The general goals of these interviews was to learn the history of the biogas project from the interviewee's perspective, and to get their opinions on a number of the questions listed in Appendix 1, as deemed appropriate or relevant during the course of the interview. As mentioned above, these interviews would—in response to the interview subject's responses—often veer down unexpected paths for which no specific questions had been prepared. In cases like these, the discussion continued in an unstructured format to learn more about the respondent's opinions and experiences. Once the new direction had been explored, the interview would return to the previous semi-structured questions.

The first interview was with the leader of the village, and interview subjects within government and the implementing organization were gathered from that point forward using a snowball sample started by asking the leader for recommendations on whom to interview and repeating that process with the next interview subject. The population for this sampling was broadly defined, consisting of people who had been involved in one way or another with Cang Dong's energy project. Snowball sampling can introduce bias by restricting the researcher to acquaintances of the initial interview subject (Palys 2003). In an unfamiliar territory, and in a foreign language, it is often hard to avoid this bias since you may initially have to rely on very few sources. One way to avoid or reduce such problems is to interview as many people in the research population as possible; a large enough snowball sample in a small population will eventually come very close to representing the entire population, thereby minimizing any bias produced by the original source of the snowball sample. Because of the indeterminate nature of

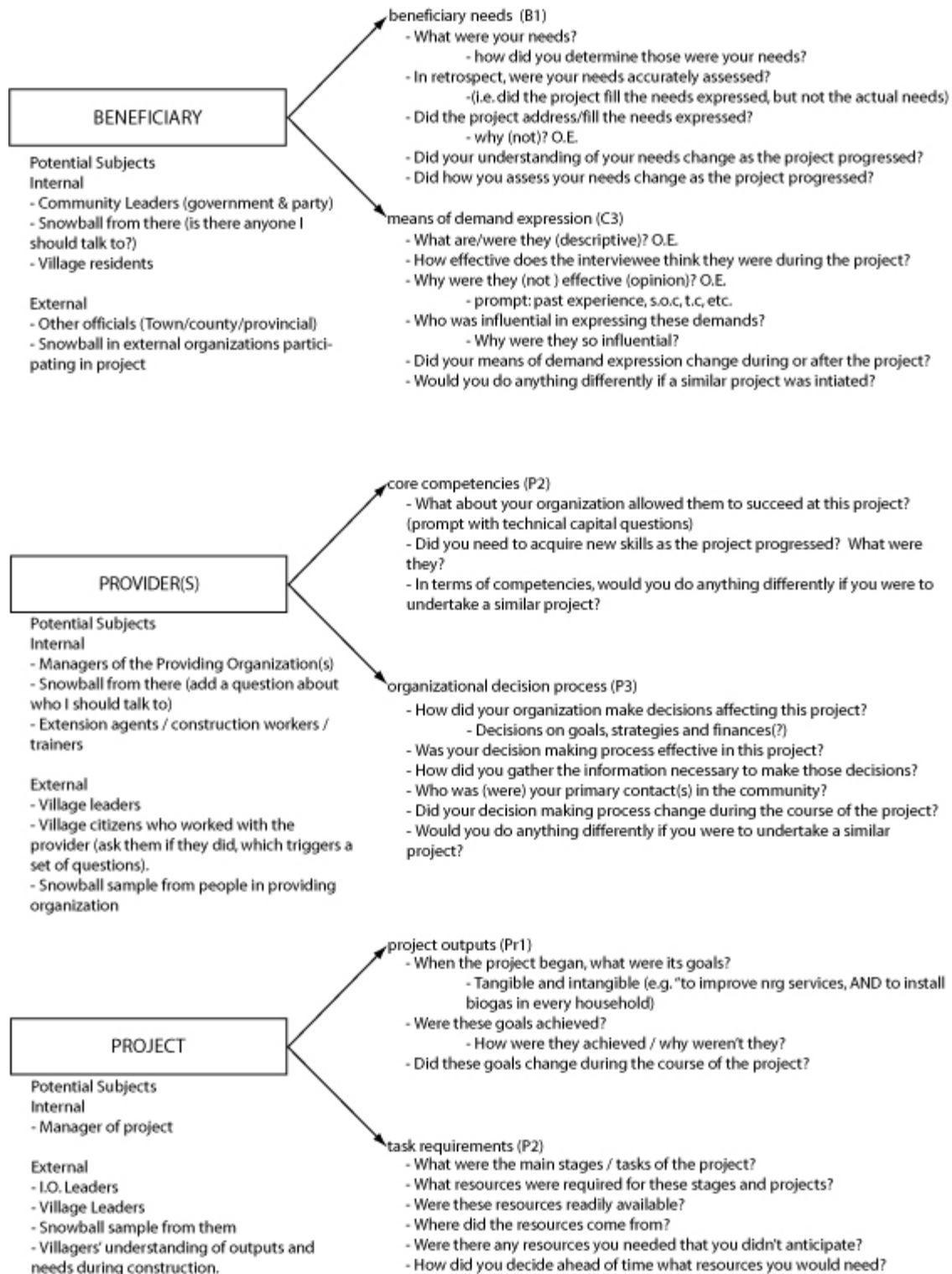


Figure 4.1: Level 1 questions and their respondents

the population (it is hard to determine how many people were “involved” in the energy project) it is hard to judge how close the sample size came to representing the entire population. However, by the end of the case study, all of the potential interview subjects suggested by previous subjects had been interviewed or contacted (and refused an interview). Because those suggestions came from subjects drawn from a variety of organizations and groups associated with the energy project (i.e. not all from one group), I assume that my sampling bias was minimized. For the interviews with villagers—all of whom were involved in the energy project by virtue of living in the village—sampling was undertaken in an opportunistic but random way by visiting every house in the village and asking the residents to participate in a survey (the survey is discussed in more detail below). If survey respondents were willing, a semi-structured interview would be performed after the survey or at a later date. This method of sampling could have a bias if we always visited homes at certain times of the day or in certain seasons when the nature of resident’s work would keep them away from their homes. In an attempt to avoid this bias, the village was visited at many different times of the day on both the weekend and during the week. By visiting the village in this way, we were able to contact all of the households in the village. A potential source of bias exists in that I could only interview and survey those villagers who agreed to be interviewed or surveyed. It is possible that there is some shared characteristic of the villagers willing to participate in this survey that also biases their answers to my questions and their perceptions of the energy project. This type of respondent bias stemming from opinions or characteristics common to villagers willing to participate (when compared to those who refused) in the research is improbable given the relatively large number of participants, but is nevertheless still unavoidable.

Like all the characteristics, conclusions about the importance of sense of community were drawn through interviews and casual interactions with villagers. However (unlike the other characteristics), in order to increase the rigor and construct validity⁵⁹ of any findings on sense of community in Cang Dong, a modified version of Buckner’s Neighbourhood Cohesion Instrument (NCI—attached as Appendix 3) was translated into Chinese⁶⁰ and used to measure the Psychological Sense of Community (PSC). Buckner’s NCI is one of the few sense of community instruments designed to measure a community-level variable through collection of individual-level responses (Puddifoot 1995). The NCI consists of eighteen statements to which the respondent is asked to respond on a five-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree”. Although developed in an urban area, this survey has been used successfully in at least three different cultures - in urban Washington State (Buckner 1988), rural Northern Ontario

⁵⁹ Through the use of multiple sources of data (Yin 2003).

⁶⁰ The translated document is included in Appendix 3.

(Robinson and Wilkinson 1995) and rural Venezuela (Zanetell and Knuth 2004). The use of a World Bank-developed social capital assessment tool (Grootaert et al. 2004) was considered for this study, but was ultimately decided to be too cumbersome and detailed for the purposes of this study. This tool identified six main components of social capital: groups and networks; trust and solidarity; collective action and cooperation; information and communication; social cohesion and inclusion; and empowerment and political action. These different components relate to different types of social capital (e.g. groups and networks to structural social capital, trust and solidarity to cognitive social capital, etc.), and the ways in which social capital is employed in the community (Grootaert et al. 2004). Buckner's PSC tool covered a large number of these components (specifically: trust and solidarity; social cohesion and inclusion; and empowerment and political action), while the other components were visited in the interview foci and themes.

During their research in rural Venezuela, Zanetell and Knuth (2004) assumed that small villages are equivalent to urban "neighbourhoods" and modified Buckner's original survey for village level studies by simply changing the word "neighbourhood" to "village". The same logic is followed here. Robinson and Wilkinson (1995) found that question 16 ("a feeling of fellowship") caused confusion in their pilot surveys in Northern Ontario, and that dropping the question did not make a large difference in the statistical results of the study. Zanetell and Knuth also dropped question 16, but dropped question 6 ("If the people in my village were planning something I'd think of it as something 'we' were doing rather than 'they' were doing.") for no explicitly-stated reason (the question was deemed "inappropriate in this research context" (Zanetell and Knuth 2004:800)). This omission may have occurred because they were investigating community-based management of natural resources and may have thought that this question might interfere with their other questions on specific initiatives. Nevertheless, I initially kept both questions 6 and 16 in my survey, with the intent of re-examining this decision as data collection proceeded.

Some limitations of Buckner's instrument—acknowledged by Buckner (1988)—are that it relies on closed-ended questions, and that it uses individual level responses in an attempt to assess what is arguably a community level construct. Others might argue that sense of community is in its essence individual since "sense of community" can only be held by individuals, and the aggregate sense of the individuals in a community would constitute that community's PSC. Puddifoot (1995) suggests that research on psychological sense of community has identified four underlying dimensions, some of which have attributes associated with them. These dimensions and their corresponding attributes are:

1. Membership
 - a. Boundaries
 - b. Emotional safety

- c. Sense of belonging
 - d. Personal investment
2. Capacity to influence the referent group
 - a. Attraction to the community in which one feels one has power
 - b. Conformity to the community to which one feels belonging
 - c. The need for consensual validation within the community
 - d. Reciprocal and concurrent influence between the individual and community
 3. Collective meeting of need
 4. A shared emotional connection in time and space.

Aspects of these dimensions are captured in the guidelines for the semi-structured interviews as well as in Buckner's questionnaire, and any contradictions or questionable results arising from the limitations of Buckner's instrument should be highly visible.

Glynn's (1981) PSC scale is a comprehensive instrument that includes open ended questions and a 120 question questionnaire (closed-ended). Using this instrument, Glynn found two strong predictors of psychological sense of community: the number of future years respondents expected to live in that community; and the number of neighbours with whom they were on a first name basis. With these findings in mind, open-ended questions on expected length of stay in the village and relationships with neighbours have been included in the semi-structured interview guidelines in order to provide some open-ended discussion on respondents' sense of community. From this approach, any contradictions or questionable results arising from Buckner's instrument should be highly visible.

4.5 Quantitative vs. Qualitative Data

The research tools used in this case study are largely qualitative. Although quantitative tools could have been used, I made the decision to emphasize qualitative data because of the goal of this case study (to describe the community characteristics that influenced the success of the Cang Dong biogas project), and the complex nature of the subject in question (qualities of the community that had positively affected the success of this project). The production of quantitative data to provide a full description of this subject—if possible—would be very time consuming and in the end might fail to provide as rich or detailed a description as qualitative approaches. Sanders cites similar difficulties and notes "the frequent unreliability of published official Chinese statistics and [his] natural suspicions of apparently robust quantitative data obtained in the course of research in rural areas of developing countries" (Sanders 2000b:359) as rationale behind his decision to pursue mostly qualitative research when investigating Chinese Ecological Agriculture.

4.6 Case Study Protocol

One method of increasing the reliability of case study research is to prepare a case study protocol that contains the research instruments as well as the procedures and general rules to be used during data collection (Yin 2003). The case study protocol can be used during the research to ensure that the research stays focused and on track, but can also be used as a training tool for multiple investigators (Yin 2003). As part of this research, I prepared a case study protocol that was used to guide my field research and to train my translators and research assistants. The case study protocol is included in Appendix 5.

A typical interview with a village or government official would be scheduled and would begin with my translator explaining my project and providing the recipient with a translated letter explaining my research and asking their participation. This letter is provided (in English) in Appendix 4. I also provided participants with an official letter from the Hainan government explaining that my research was officially sanctioned. I would then ask the respondent to recount their role in the energy project and their recollections of how the project unfolded. I would then begin asking specific questions as outlined in Appendix 1, and allow the conversation to develop naturally. If the conversation began to address a question that was included in Appendix 1, I would formally ask it to ensure clarity, and if—at the end of the interview—some questions in Appendix 1 had not been addressed I would ask then if time permitted. Interviews with villagers would generally develop from a survey request (door to door canvassing requesting that the occupants fill out a survey) and would often occur over lunch (provided by the villager) or even more frequently (to the point of ubiquity) some sugar cane (which the villagers offered me as a sign of hospitality). These interviews would be much more casual as my translators advised me that asking formal questions or reading off a sheet might intimidate some of the respondents. I would still ask relevant questions (as outlined in Appendix 2), but they would be introduced into the conversation in a much more casual manner. At the completion of the interview, I would give the participant a feedback letter (also in Appendix 4). In the evening after every interview I would transcribe my notes and highlight any themes or answers to specific questions that had come up, while discussing the interview with my translator. Most interviews lasted between 20 minutes and 1 hour, with a few interviews taking more time (with key village leaders or biogas plant managers).

4.7 Cross-Cultural Research Considerations

There are many things that can go wrong in any research project. Interview or survey respondents can misunderstand a question, researchers can misunderstand responses, research instruments can be poorly designed for a given research context, and the interview process itself can unsettle respondents. In cross-cultural research, the potential for such non-sampling related

errors due to cultural misunderstandings, or translation difficulties is amplified (Grenier 1998). When a researcher and respondent do not speak the same language, interview questions and responses both need to be translated, compounding the chances of a misunderstanding, and cultural misunderstandings or miscues may introduce bias into the results. In an attempt to minimize such problems, I discussed (at length) my survey questions with translators and interpreters, in order to get as contextually-sensitive a version as possible while reducing misunderstandings between myself and the translator. I also made sure that the translator understood when I was questioning my understanding of their translation of a response as opposed to questioning the response itself, and took time to review the day's interviews with the translator at the end of the day. Furthermore, before we entered the field with a new translator I took half a day to go through the case study protocol at great length and discuss my research project. All of these measures can help to reduce translator-induced error. Similarly, when translating the written questionnaire, I turned to a professor of English (of Chinese descent) at the local university in an attempt to get the most culturally relevant (yet accurate) translation. He and I had many discussions about the meanings of different words and the intent of any of the questions, and agreed on all decisions that were made.

4.8 Conclusion

This chapter discusses the research methods used for the case study portion of this thesis. In the next chapter I will discuss the results of that case study.

Chapter 5: Case Study

5.1 Introduction

After completing a first draft of the literature review, developing interview questions and obtaining research ethics clearance from the University of Waterloo's Office of Research Ethics, a case study was undertaken in the province of Hainan in the People's Republic of China. The purpose of this case study was twofold: to learn about a successful community renewable energy project in the hopes of gaining insight into the characteristics developed in Chapter 2. Secondly, as part of the iterative research approach described in Chapter 1.5, this case study generated more data on the manifestation of those characteristics in modern Chinese culture, contributing to the discussion in Chapter 3.

The field work began with the search for appropriate study sites. After a month of settling in and visiting many villages in rural Hainan the village of Cang Dong was chosen as an appropriate study site for this research. I then spent approximately three months visiting Cang Dong and learning about the villages' biogas project through interviews with local officials and citizens, and through surveys, as discussed in Chapter 4.

5.2 Cang Dong

Cang Dong is a small rural village in Chengxi Township, Haikou Municipality (Long Hua district) on the outskirts of Haikou, the largest city in Hainan province. Figure 3.1 shows Hainan on a map of China, and figure 5.1 shows Haikou and the approximate location of Cang Dong on a map of Hainan province. With approximately 115 households (interview with respondent #9, 11/16/2004) and 370 residents (IRI, 2001), Cang Dong is a small village with an farming-based economy which, with an average income of ¥3862⁶¹ per year (IRI, 2001), is markedly higher than Hainan's average rural income of ¥2231 (Statistical Bureau of Hainan Province 2003). Villagers rise early and bike out to their small plots of land (where most grow sugar cane or *mushu* (cassava) and some grow peanuts in the early fall), returning for a long lunch and *xiaoshui*—a short nap—before heading back out to the fields. Cang Dong is remarkably clean and organized (relative to other rural villages I visited), but despite the appearance and the promising economic statistics, local residents will tell you that their economy is fraying at the edges as new

⁶¹ All figures are from 2000.



Figure 5.1: Map of Hainan with Haikou and Cang Dong (approximate location) circled at the top (map from <http://www.tourroundchina.com/map/hainan.htm>).

regulations⁶² in nearby Haikou curtail the local farmers' ability to deliver their produce to the city's markets. More recent economic statistics—when available—may provide a more accurate picture of the village's economic reality. Knowledge of the slowing economy only increases the incongruity of such a clean and organized village in the midst of such a dirty and obviously poor landscape.

⁶² According to many of the villagers I interviewed (formally and informally), Haikou (the location of the nearest market) has recently banned three wheeled bicycles—the main mode of transportation for farmer's produce—from the downtown areas.

Cang Dong has a long history of success in various forms. That history is a complex story involving ample doses of both good luck and good planning. Since Deng Xiaoping's introduction of market reforms in 1978, the village has regularly carried out village improvement projects at the rate of about one per year, undertaking community projects such as repairing roads, and building a water tower (Cang Dong Village Party and Committee (translated by Jian Ming) 1998). These projects and the general success of the village have resulted in the village winning numerous awards. In 1991 Cang Dong became a "provincial advanced unit", and in 1993 was recognized by Xinhua district as an advanced unit of the district agricultural system.

In the early 1990s, Anchor Beer was allowed to build a one hundred and sixty mu⁶³ factory on the village's land. The compensation fee for one mu of land was ¥90,000, resulting in a total compensation to the village of over ¥14,000,000. This enormous sum (at 2005 rates, ¥14,000,000 is equal to approximately \$2,200,000 in Canadian dollars) was distributed to the villagers as a one time payment of ¥40,000 per individual (approximately \$6,000 Canadian dollars). To put this into perspective, it is worth noting again that each individual's payout from the beer factory was the equivalent of more than 10 years of an average income (and incomes were almost certainly lower in the early 1990s). Because this payout was per individual, many families with only one or two income earners supporting two or three dependents would have gained 20 to 40 years' worth of salary at once⁶⁴.

With money coming to the village from the beer factory, the village government decided that it was time to implement a new plan that would drastically reshape their village. This plan involved expanding the size of the village, generating new familial housing plots and building a new community centre. The village government had made two previous plans that were never implemented, but with the new money and the persuasive abilities of the village leader, the villagers accepted the plan (interview with respondent #6, 21/11/2004). The city government was skeptical of their plans to allot 300 m² to each household, and advised the local government to reduce the allotment to 120 m² (interview with respondent #7, 19/01/2005). Despite this advice, the village government went ahead with the plan and in 1993 new construction began, building a new village beside the old quarter of small *hutongs* made from local volcanic rock. Ironically (because of the city government's original objections), the new plan for the village was identified as a large factor in the village's recognition as a Haikou City district cultural demonstration village (1996), and later (1997) as a National Cultural Demonstration Village (interview with respondent #7, 19/01/2005). With the new properties allotted to them, many of the villagers used most, if not all, of their money from the beer factory to build incredibly large

⁶³ A mu is a Chinese measure of land that is equal to one-fifteenth of a hectare.

⁶⁴ The beer factory did not actually employ many villagers (I only heard of one or two who work there), seeming to bring workers in from nearby Haikou instead.

houses⁶⁵ (interview with respondent #4, 30/11/2004). Often, the rationale for such large houses was to build a house that could be shared by successive generations (interview with respondent #4, 30/11/2004)—in some cases three households living in one house. These large houses give the visual impression that the village is very wealthy and are certainly incongruous with the poverty seen in the surrounding villages. Enter many of houses though, and you'll find that the exterior picture of wealth is not matched inside (interview with respondent #18, 10/01/2005). Many of the houses I visited used the lower floors as garages for their motorbikes or bicycles, processing areas for their crops, or just left them with unfinished concrete or dirt floors, no windows and no furniture. The upper floors were furnished in a manner typical of houses I had seen in other villages. These observations are not meant as a criticism of the houses or of the village, but rather as evidence that the external image projected by the houses—identified as a large factor in many of the honours conferred on the village—may not accurately portray the situation of the village. This sentiment—of the outward image of the village not matching the reality—was conveyed to me by many of the villagers I interviewed, who noted that “we have big houses, but our education system for the children is not that great” (interview with respondent #4, 30/11/2004). My general impression of villagers' attitudes towards the designation as a cultural village at the national and provincial level was pride, but a pride tinged with a realism asking what real benefits (primarily economic) arose from those designations. One village official (#8, 19/11/2004) told me that the Haikou city government gives them money because of their designation as a national cultural village. This was the only time I was told that there were any material benefits associated with those honours.

Despite villagers' complaints about the lack of real economic benefits associated with their various honours, these honours have obviously conferred some measure of prestige on Cang Dong. During my time there, numerous delegations of village leaders from Hainan and all over China came through the village to see this model of rural development. In 2002 the village's election was observed by an American NGO⁶⁶ who found the election in Cang Dong “to be among the best organized it [had] witnessed over the past decade of observation missions” (International Republican Institute [IRI] 2001:5).

⁶⁵ These houses were large even by Canadian standards, making them huge relative to the small houses I saw during visits to other rural villages. My translators (who had never before been to the village) also commented on how large the houses were.

⁶⁶ During interviews with two respondents in the village government I was told that the United Nations Human Rights Commission had observed the elections, but a newspaper article I obtained (Haikou Daily 2001) indicated that on November 30th, 2001, scholars from the International Republic Institute (an American NGO) had observed elections in Cang Dong.

In 1997 the village began planning to achieve recognition as an ecovillage (which seems to be another translation of a National Cultural Village⁶⁷). Despite the influx of money from the beer factory (most of which was spent on new houses), the village's economy was still largely stagnant (interview with respondent #12, 15/01/2005); the city government suggested to Cang Dong that they invest in a pig farm to boost their mediocre economy (interview with respondent #1, 04/12/2004). The provincial government had identified a shortage of pork in the Hainan market, and Cang Dong was identified as a suitable location for a new pork venture by the food company *Luo Niu Shan*. In 1998 *Wan tou* farm—a 40,000 animal per year pig farm—was established on the village's periphery⁶⁸. In lieu of payment for the land used, the village acquired one million shares in the new venture—approximately 8% of the ownership⁶⁹. Governments at all levels seem to have been very proud of the new partnership between local government and corporations. Talking with the villagers paints a much different picture. Almost every villager I talked to complained that the pig farm had not paid the village any money (dividends or profits) during its six year residence on the village land (e.g. interviews with respondents #4, 30/11/2004; #18, 10/01/2005; #15, 11/01/2005; and #12, 15/01/2005). This was obviously a sore point for many people, and some interview subjects intimated that government corruption was to blame (e.g. respondent #15, 11/01/2005).

The village's pride in this new partnership soon wore off as troubling environmental problems surfaced at the farm soon after it was established. From its inception, the farm had been releasing more than 98% of its waste into the environment untreated (interview with respondent #17, 11/01/2005). Due to the farm's proximity to the local reservoir, after a few years of this practice, the village's water supply was badly contaminated. Similarly, air pollution from the farm caused the village—more than 5 kilometres from the farm—to reek of pig excrement. The villagers and the village government protested with sufficient tenacity that the pig farm was eventually given an ultimatum by the provincial government: solve the pollution problem within two months or close down (interview with respondent #9, 16/11/2004).

⁶⁷ The term "ecovillage" seems ill-defined in Hainan, but it may be a product of poor or inconsistent translation.

⁶⁸ A respondent who worked at the pig farm told me that the farm was established in 1990, but all information from other sources (e.g. interview with respondent #09, 16/11/2004) points to 1998 or 1999, so I believe he was either mistaken or mistranslated.

⁶⁹ The actual percentage of ownership owned by Cang Dong Corp. (the village) varied depending upon who I asked. Farm employees suggested that it was 5% of the total ownership, while two respondents in village government told me 8% and 10%, respectively.

5.3 The Biogas Facility

5.3.1 Pig Farms and Pipelines

In response to this ultimatum, the pig farm contracted Hainan HuaFu Environmental Engineering Company Ltd.—at the suggestion of the central government (interview with respondent #20, 18/01/2005)—to design a water treatment plant to treat the liquid waste flowing from the farm. The engineering firm presented a design that incorporated the creation of biogas during the treatment process. Although biogas is not new to the Chinese agricultural sector⁷⁰, its use at this scale was not common (interview with respondent #20, 18/01/2005). In another innovative twist, biogas produced during treatment would be used to generate electricity for the pig farm's consumption. During the planning stage and initial phases of operation, the plant operators realized that they would have more biogas than they could use to generate electricity (the plant generates 800m³ of gas per day, but can only use 600m³ for electricity production). This surplus was offered to Cang Dong village for use as cooking gas (the traditional use of biogas), provided that the village government could build a pipeline from the treatment plant to the village.

The village government took on this challenge, and was sufficiently interested to start investigating possible sources of financing for the ¥270,000 cost of the proposed pipeline. The Chinese government offers ¥1200 subsidies to households wishing to implement biogas systems, ¥800 of which comes from the province and ¥400 from the city or county (interview with respondent #20, 18/01/2005). Traditionally, these subsidies have gone to households implementing a household biogas system to generate cooking gas from the waste from two to six pigs, crop residues and human waste (personal observations and informal interviews with biogas users in other villages). With 107 households in Cang Dong eligible (location was the major limiting factor of ineligible houses—pipes could not be extended to some houses in the old quarter) to receive biogas from the proposed pipeline, Cang Dong's government pooled each household's subsidy for a total of ¥128,400⁷¹. The village government approached the *Wan tou* farm for help with the remaining ¥141,600 and struck a deal for a loan that would be paid back

⁷⁰ The Chinese (and many other developing countries) have a long and relatively successful history with household level biogas digesters, a history which is beyond the scope of this thesis. For more information on biogas in China, refer to Daxiong et al (1990) and Chen (1997). For information on biogas in general, or in places other than China, see Gustavsson (2000); Lauridsen and An (1996); Barnett, Pyle and Subramanian (1978); and FAO (1996).

⁷¹ Each household seems to have had little input into the local government's decision to pool what was arguably each household's subsidy (interviews with respondents #10, 17/01/2005; #11, 15/01/2005; and #12, 15/01/2005).

by the village's profits from their shares in the pig farm (interview with respondent #9, 16/11/2004).

With the financing in place, construction was started on the pipeline on August 12th, 2004. By September 22nd, a 7.1 kilometre pipeline was completed, providing gas from the waste treatment plant to 107 of the 115 households in the village (Fu Yuan 2004). Since the plant started treating the farm's waste, pollution from the *Wan tou* farm has dropped precipitously (interview with respondent #1, 4/12/2004), with odours now noticeable only within approximately 100 metres of the treatment facility and farm (personal observations). One official I talked to expressed concern that the water contamination problems had not been fully resolved (interview with #3, 01/12/2004), but I found no evidence of similar concerns from the provincial environmental department or anyone in the village.

The Cang Dong biogas project has been widely touted by higher levels of government as a new model of rural development (interview with respondent #20, 18/01/2005), and another similar plant has been built in mainland China emulating the so-called "three point" model of rural development used in Cang Dong (Fu Yuan 2004). The three "points" of the model are:

1. an animal farm to generate the waste,
2. a biogas factory to generate biogas and use it for electricity, and
3. the villagers using the gas.

5.3.2 Definitions

Does the Cang Dong biogas project fit the definition of a successful community renewable energy project stated in Chapter 2? First we must establish whether Cang Dong fits the definition of "community" that was established in Chapter 2⁷². During my time in Cang Dong, I often observed what appeared to be *gemeinschaft* type interactions, with old women assisting neighbours with agricultural tasks and the offering of sugar cane to visitors as two examples. As discussed in Chapter 2, McKnight (1992) suggests three types of interactions that "express and create communities" (McKnight 1992:58): formal associations such as service clubs or bowling leagues, less formal clubs such as groups of neighbours who socialize together, and finally local businesses and offices where members of a community interact and converse with one another. In Cang Dong I saw little evidence of service clubs or formal associations other than those that function as part of the government (see discussion in Chapter 3). Discussion with my translators

⁷² "For the purposes of this study, communities can be identified as geographic locations such as villages or areas of villages in which the inhabitants interact predominantly through what Tönnies describes as *gemeinschaft* type relationships. Locales with inhabitants interacting in this way may demonstrate two or more⁷² of the three types of the associations defined by McKnight (1992)."

and Chinese friends revealed that service clubs or formal associations (such as sports leagues) are not common in rural China. There was plenty of evidence of less formal clubs or gatherings that will be described later, and two small stores that were regularly frequented by locals talking or playing Mah-Jongg. By displaying these two types of interactions, and through the evidence of *gemeinschaft* type relationships, Cang Dong fits the definition of a community.

The Cang Dong project fits the definition of a renewable energy project as defined in Chapter 2 (any endeavor that results in the provision of some form of energy derived from a renewable resource) as it uses pig waste⁷³ to provide thermal energy to the residents of Cang Dong and electrical energy to the pig farm. The project also fits the definition in that it clearly has the capacity to positively influence a majority of the community by reducing energy costs to each household connected to the pipeline (107 out of 115 is a large majority).

Finally, we must judge whether Cang Dong's community renewable energy project meets the definition of a successful energy project. In Chapter 2, four goals a renewable energy project should achieve in order to be judged successful were established:

1. improve the quality of life of the members of the community,
2. maximize or significantly increase the use of renewable resources in that community,
3. create or enhance sustainable livelihoods in the community, and
4. function long enough to ensure a full payback of initial capital cost.

As mentioned in Chapter 2, judging the achievement of these goals is a subjective decision. A practical way to make such a subjective decision is to rely primarily on the opinions of the community members (for a good summary of subjective approaches to measurement - in this case, quality of life - see Myers and Diener 1995) and to apply any other opinions or perspectives as required if input from community members is indecisive or contradictory. I now consider each of these four goals in turn.

Improvement of Villagers' Quality of Life

As discussed in Chapter 2, the concept of quality of life—and its measurement—have many competing schools of thought. In Chapter 2 the impact of an energy project on the quality of life in a community was defined as judged by its observed effect on social indicators such as levels of crime and health, community residents' subjective opinions on the change in their lives,

⁷³ Some readers may question whether pig waste is indeed a renewable resource. In a biogas system the solid residue from the biogas digestion process is used as fertilizer on nearby fields. The crops grown in those fields (in the case of Cang Dong—mushu) are often used to feed the pigs. In this sense, pig waste is a renewable resource in that it can be harvested without directly reducing the supply.

and a project's impact on the economy of the community. The scope of this project was such that I did not collect data on social indicators such as levels of crime or health so cannot comment on any predicted or observed changes in those indicators. However, most members of the community I met with indicated that the project had improved their lives in general, either through a reduction of the smell from the pig farm (respondent #1, 04/12/2004; respondent #12, 15/01/2005; respondent #11, 15/01/2005), a reduction in costs associated with purchasing cooking fuel (respondent #4, 30/11/2004; respondent #18, 10/01/2005; respondent #11, 15/01/2005), or an increase in convenience (respondent #18, 10/01/2005; respondent #13, 13/01/2005; respondent #11, 15/01/2005). One respondent in the village government suggested that the project was a success because it had made "everyone in the village [...] very happy" (interview with respondent #8, 08/11/2004). Finally, the biogas project does seem to have the potential to positively impact the economy of Cang Dong, which may affect the quality of life of its citizens. The biogas plant is predicted to cover the cost of construction (through savings in electricity costs to the pig farm) within ten years (respondent #5, 24/11/2004), and the cost of the pipeline borne by the village will be paid back through savings in average fuel expenditures (approximately ¥720/household/year = ¥77,040 per year, for a payback time—without interest—of three and a half years). With the reduction in costs for the villagers associated with savings in cooking gas costs, and a total recovery of costs by all parties involved predicted within ten years, the biogas project certainly has the potential to positively affect the economy of the village, which will hopefully result in an improvement of the quality of life of the villagers.

I do not want to overstate the importance of economic factors on villagers' quality of life by devoting too much space to discussions of the economy (although the poor state of the village's economy was the number one complaint I heard from all villagers), but I do want to highlight that the true impact of this project on the economy will ultimately only be seen as time passes. The impact of the biogas plant on the village's economy will depend on whether people continue to use the biogas, and whether the reductions in costs are permanent. The leader of the village stressed that there were two important clauses in the village's contract with the biogas plant: a clause that the villagers have the use of the biogas forever, and one stating that that if the farm or the project stops or goes bankrupt within five years, one half of the village's money must be returned. Despite the leader's optimism, other members of the village expressed worry as to whether or not the gas would stay free, and whether the plant would stay functional long enough (10 years) to pay back the original cost (#04, 30/11/2004). When I left the village, the biogas plant was considering installing meters at every house and charging villagers if they "used too much gas" (interview with respondent #19, 06/01/2005). Some villagers I interviewed expressed concerns that this metering would eventually become a pay-per-use scheme (interview

with respondent #18, 10/01/2005). The true impact of this project on Cang Dong's economy (and—by extension—villagers' quality of life) should become more clear as time passes and the project unfolds.

Maximized or Significantly Increased Use of Renewable Resources

Prior to the biogas project, most villagers used bottled propane to fuel their cooking stoves. A few villagers cooked on firewood they gathered around the village. Neither firewood (when gathered locally as opposed to when biomass is grown specifically for fuel) nor bottled propane is a renewable source of energy. The biogas from the pig farm is now used as the energy source for the same energy service (cooking). By supplanting the use of these non-renewable energy sources with a renewable energy source, Cang Dong's biogas project has significantly increased the use of renewable resources in the community.

The Creation or Enhancement of Sustainable Livelihoods in the Community

The last two goals in the definition of a successful energy project (creating or enhancing sustainable livelihoods, a full payback of initial capital cost) are harder to gauge at this point in the project. While talking to villagers, it became clear that Cang Dong is currently facing a problem in terms of providing long-term livelihoods for its residents. As mentioned before, most residents are dependent on agriculture—usually sugar cane—for their livelihoods. The market for unprocessed sugar cane in Hainan is relatively saturated (personal communications and observations), and new regulations prohibiting the use of three wheeled bicycles in the nearby city of Haikou have cut into the retail markets available for most of Cang Dong's farmers. While the biogas project has had an effect on villagers' daily lives, its impact on their livelihoods is harder to determine at this early stage. Similarly, the long term economics of the project are hard to determine at this stage.

As discussed in Chapter 2, Chambers and Conway (1991) defined three goals that are furthered by sustainable livelihoods: capability, equity and sustainability. Capability referred to the ability of individuals to perform certain basic and necessary functions, the goal of equity referred to a relatively equal distribution of and access to income, assets, capabilities, and opportunities, and the goal of sustainability represented the ability of a livelihood to be self-supporting.

Does the biogas project in Cang Dong create or enhance sustainable livelihoods in the community? This question is difficult to answer since, with the exception of the two villagers who work at the biogas plant, no long-term livelihoods *per se* were provided by the biogas project. Despite this, spill-over effects from the biogas project may affect livelihoods in ways other than their direct provision. In terms of capability, free cooking fuel in the form of biogas

enhances villagers' capability to perform the basic function of cooking food, and the increased speed with which the food can be cooked⁷⁴ increases the amount of time villagers can spend with friends and family. While this increased capability does not contribute directly to a livelihood, it does relieve some financial pressure from existing livelihoods by reducing the daily costs of preparing food. Through this logic, the increased capability provided by the biogas can be said to make villagers' existing livelihoods more sustainable. A similar argument can be made for the biogas project's impact on equity. Because of the biogas project, access to cooking fuel (an asset) in Chang Dong is almost⁷⁵ uniformly equitable. Similarly, by supplanting other sources of energy and increasing the speed with which food can be cooked, the biogas project has reduced these costs, increasing gender equity in the village, as the labour costs associated with cooking (or gathering fuelwood) generally fall most heavily on women and children (Cecelski 2000). Again, this equity is not directly associated with a livelihood in particular, but contributes to equity in general throughout the community.

Full payback of initial capital cost

As mentioned earlier, the biogas plant is predicted to have been paid back within ten years, and the cost of the pipeline borne by the village will be paid back through savings in average fuel expenditures in three and a half years. Barring any major malfunctions or unpredicted costs, this project should meet the final criteria of a successful energy project.

Thus, the biogas project in Cang Dong does qualify as a successful community renewable energy project according to the definitions provided in Chapter 2. Now I will discuss the results of the case study using the five characteristics of a community that were developed in Chapter 2 (and contextualized in Chapter 3) as a heuristic to guide the discussion on what characteristics of the community influenced the success of the Cang Dong biogas project.

5.3.3 Conceptual Model

The first step in such a discussion is identifying the scope of this project and the actors involved and aligning them with the conceptual model developed in Chapter 2. The project is clearly broken into two phases: the construction of the biogas plant, and the ensuing construction of the pipeline bringing the extra gas to the village. The village's contribution to the first phase was relatively minor, consisting only of voicing their complaints loudly enough that higher level governments mandated that the plant must be built. Other than this involvement, the village was only peripherally involved (the provision of one or two labourers, etc.). In the

⁷⁴ The heat from the biogas flame is hotter than that from propane, allowing villagers to cook more rapidly than before the biogas project (interview with #9, 16/11/2004).

⁷⁵ One or two households do not have biogas due to difficulties in connecting to their houses.

second phase the village was much more involved, providing project leadership and financing for the construction of the pipeline.

In both phases of the project, the village assumes the role of a beneficiary (the sole beneficiary in the second phase, and one of two—shared with the pig farm—in the first), and Cang Dong and *Wan tou* farm each take up the role of the financier (*Wan tou* for the first phase, and Cang Dong and *Wan tou* for the second phase). The *Huafu* environmental company assumes the role of the provider for both phases. Hoddinott (2002) defines providers as the actors that “deliver the intervention” (p.149), but does not define to whom the intervention (the energy project) is being delivered. In the second phase of the project, the energy project is being delivered by *Huafu* company to the local government who is delivering it to their constituents. In this way, both the contractor and the government assume roles of the provider, albeit in different ways.

5.4 The Characteristics in Cang Dong

While in Cang Dong, I completed 20 interviews with members of the village, township and county governments, employees of the pig farm and employees of the engineering company which built and operates the biogas plant. I also had many informal discussions and exchanges with villagers during my time in the village. Fifty-four villagers also participated in a neighbourhood cohesion survey (as discussed in Chapter 4). As discussed in Chapter 4, the interviews themselves did not directly address the five characteristics *per se* (if any of the characteristics came up during an interview they were investigated), but rather explored the history of the village and the energy project, the relationships between actors involved in the biogas project, and factors that influenced the success of the energy project. From these interviews and surveys emerged a picture of what characteristics of Cang Dong were influential in the success of the biogas project.

In general, my interviews revealed that the success of this project was largely driven by a few key aspects of the project. In the first phase of this project, leadership in the village played a key role starting the whole project when they voiced the concerns of the villagers over pollution from the pig farm and demanded that it be addressed. The village’s reputation as an award-winning ecovillage may have helped lend credibility to these complaints. During the design and implementation of the biogas plant, the expertise and innovation of the *Huafu* environmental agency was a key factor in the project’s success. In the second phase of the project, as the pipeline was being built, the financial incentives available to the village from higher levels of government impacted the success, as did the innovation of Cang Dong’s government in pooling those subsidies and leveraging their investment in the pig farm to fund

the project. These contributions are discussed in more detail below with specific reference to the five characteristics discussed in Chapters 2 and 3.

5.4.1 A Large Stock of Social Capital and a Strong Sense of Community

As discussed in Chapter 2, social capital and a sense of community are important to community development projects because they provide an indirect measure of the community's ability and desire to work together. This ability to cooperate will surely help in projects requiring community inputs in the form of labour or capital. On projects like Cang Dong's biogas project that don't require these types of community inputs⁷⁶, social capital and sense of community are still important because they help to foster effective leadership in a community, leadership that can help communities build consensus and common understanding on issues surrounding the project. Based on the results of my surveys, interviews, and general interactions and observations in the village, Cang Dong seems to have a high sense of community and social capital; in many interviews, local officials—when asked why the community had been so successful in general—attributed much of the community's success to their sense of community (e.g. #1, 4/12/2004 – “[the village] people [are] very close to each other”) and their ability to work together (e.g. #4, 30/11/2004; #10, 10/01/2005).

The discussion of the Chinese context in Chapter 3 suggested that structural social capital may be less important in the Chinese context than forms of cognitive social capital such as bonding and bridging social capital build through less formal interactions and shared experiences. Indeed, in Cang Dong there was not much evidence of structural social capital in terms of Putnam's (1995) bowling leagues or other formal community associations, but other forms of social capital were clearly present. Every time I visited Cang Dong—with few exceptions—I found groups of senior citizens, mostly women, sitting in the town square. Sometimes these groups were just keeping warm by a fire⁷⁷, other times they were simply chatting, but often they were involved in some collective agricultural processing operation such as shredding and drying *mushu* (for pig feed) or shucking sugar cane tips for planting. I was struck by the number of women working on a given task. Twice I inquired who had hired them all, or whose products they were processing, expecting that all the women were related in some way. Both times it turned out that the women were just helping other—usually younger—women from the village. It seems that any woman who wanted help with her processing chores could bring them to the

⁷⁶ Although the pipeline did require villagers' capital (in the form of their share of the central government's subsidy), as the government apparently didn't need community members' agreement, this resource cannot really be considered as a contribution from the community.

⁷⁷ While Hainan is a tropical island, I was there during a short cold snap where temperatures dropped to four or five degrees Celsius—quite cold for people with clothing and housing suited to a tropical climate.

town square and the older women would help her out. The help provided by these women—for no apparent monetary gain—is an example of social capital at work. The help provided is a physical manifestation of the intangible bonds and connections that form the networks among community members.

Similar evidence of social capital and networks could be found in the Mah-jongg games played almost every day I visited the village. In either one of two village stores⁷⁸, villagers would gather to either play at one of the three Mah-jongg tables or to watch others play. These gatherings would foster lots of conversation, gossip and laughter, which I, not speaking Chinese, found very hard to follow, although the emotions and spirit of the conversations were easy to understand.

As noted in Chapter 2, different forms of trust all contribute to the creation of social capital. This important role of trust necessitates examination of the origins of different types of trust and the processes involved in maintaining those trusts. Associations, interactions and networks formed in ways such as shared agricultural processing and regular Mah-jongg games can create and maintain trust in spite of the absence of formal associational vibrancy. The daily Mah-jongg games will foster interpersonal trust, and social solidarity, building bonding social capital (Woolcock 2000), while the shared agriculture processing will foster social solidarity, and general norms of reciprocity (Jean Cohen, cited in Grix 2001). Both of these activities, and others like them, will transmit cultural traditions, patterns, and values, building sources of cognitive social capital (Uphoff 2000). The “idle talk” and gossip that arise in these situations are “powerful process[es] in the politics of everyday life” (Emler 1994:138), and can play an important role in fostering bonds of trust and a sense of community. Communication of societal values and norms through gossip and idle talk allows greater participation and representation than more formal methods of communication such as the mass media (Post 1994), especially in rural areas where access to mass media may be limited, and in countries like China where the topics and perspectives presented by the media are politically limited (Farrer 2002). As discussed in Chapter 3, the type of trust generation and maintenance, and the reinforcement of social norms created through the informal associational activities described above will generate cognitive social capital in Cang Dong despite the lack of formal associations (a standard source of structural social capital).

⁷⁸ It was hard to discern whether there were any divisions in the community represented by the two venues for Mahjong. One of the two stores was more often filled, and seemed to be consistently filled by the same people, but I did not spend enough time in the other store (it was open less frequently) to discern whether there were two distinct groups of Mah-jongg players.

Sense of Community Survey

As discussed in Chapter 3, an adjusted version of Buckner’s Neighbourhood Cohesion Instrument (see Appendix 3) was administered to 54 villagers in an attempt to gain another perspective on the sense of community present in Cang Dong. Every house in the village was visited multiple times in an attempt to contact someone in the house. I had hoped to sample as many adults in the community as possible, but a common sentiment was that there was no need to answer the survey if someone else at the same address had already filled out a survey (e.g. “I think the same as them, so you don’t need to talk to me”). I tried a few times to explain that if many people felt one way, I needed multiple responses to indicate that a large number of people had this opinion, but the concept did not seem to be understood, or—if it was understood—did not serve to change their minds. Many of the villagers could not read; to survey these villagers, my translator would read the survey to them and record their answers. I repeatedly discussed the importance of neutrality and the need to avoid influencing respondents during the dictation, and I feel that my translators clearly understood this concept.

Table 5.1: Results of the Neighbourhood Cohesion Survey (n=54), most common answer in bold.

		Response				
Question #		1	2	3	4	5
	1	0%	0%	4%	39%	57%
	2	0%	11%	11%	48%	30%
	3	4%	19%	20%	35%	22%
	4	0%	2%	11%	56%	31%
	5*	22%	48%	11%	17%	2%
	6	6%	24%	19%	43%	6%
	7	2%	13%	22%	48%	13%
	8	0%	13%	24%	48%	15%
	9	0%	6%	7%	61%	24%
	10	0%	4%	7%	65%	22%
	11	0%	0%	13%	52%	35%
	12	0%	7%	11%	56%	26%
	13	0%	0%	6%	50%	44%
	14	2%	0%	9%	65%	24%
	15*	20%	24%	19%	31%	4%
	16	0%	4%	41%	31%	24%
	17	0%	11%	20%	31%	35%
18	0%	6%	13%	44%	37%	

*negatively coded

Table 5.1 summarizes the 54 responses to the survey, with the most common answer shown in bold face, while table 5.2 summarizes the demographic characteristics of the respondents. It is difficult to ascertain the exact population size in order to understand what

proportion of the population the 54 respondents represent. In Bucker's original study, the survey was sent to an adult in every household in the community, and he calculated his population as percentages of households who answered. A different sampling population is used in Robinson and Wilkinson's (1995) study using Buckner's instrument when they sample as many adults in the population as possible without regard for households. Neither study discusses their population assumptions to any great degree, but if the survey is meant to be representative of the adult population of the community as a whole (as opposed to simply being representative of households in that community), then sampling as many adults as possible would be the least biased way of sampling (Buckner's household sampling implicitly assumes that all members of the household are represented by the responses of one adult member). Cang Dong has approximately 115 households (interview with respondent #09), but when administering the survey it was occasionally difficult to determine household divisions as some families will share residences with close family, resulting in more than one household per home. Assuming that there are 115 households in Cang Dong, my sample size represents approximately 47% of households⁷⁹. There are 257 registered voters in Cang Dong, of which 250 voted in the 2001 village election (IRI, 2001). This may be the most reliable indicator of the population size of adults in Cang Dong village. A small number of the villagers I interviewed were only renting land in Cang Dong and would not have been included on the voter's list, despite being part of the community for the purposes of this instrument (measuring the feeling of community in the village). These respondents were by far the exception rather than the norm, so a reasonable estimate of the population for my survey would be approximately 260 adults in Cang Dong. Taken from that perspective on population size, my sample represented 20.7% of the adult population.

Table 5.2: Summary of Respondent Demographics in Cang Dong (n=53⁸⁰)

	Count	Percent	Mean	Standard Deviation
Age				
10-19	5	9%		
20-29	3	6%		
30-39	16	30%		
40-49	17	32%		
50-59	6	11%		
60-69	3	6%		
70-79	3	6%		

⁷⁹ Although I was trying to collect responses from as many of the adult members of the community as possible, I rarely was able to survey more than one member of a household, and as a result, the 54 respondents represents approximately 54 households.

⁸⁰ One survey respondent's demographic information was not gathered.

	Count	Percent	Mean	Standard Deviation
Gender				
M	29	55%		
F	24	45%		
Marital Status				
Married	46	87%		
Single	7	13%		
# of Children			2.0	1.2
# of Dependents			2.6	2.0
Years lived in community			32.0	18.6
Years expected to stay				
unsure	9	17%		
10 or less	1	2%		
no plans to leave	41	77%		
Occupation				
farmer	40	75%		
aquaculture	2	4%		
student	3	6%		
other	7	13%		
Education level				
No answer/unspecific	10	19%		
none	1	2%		
primary school	8	15%		
junior middle school	21	40%		
senior middle school	9	17%		
post-secondary	4	8%		
Income Range				
No response	10	19%		
0-2000	24	45%		
2000-4000	7	13%		
4000-6000	4	8%		
6000+	8	15%		
Residence				
No response	7	13%		
Own Home	44	83%		
Rent	2	4%		
Length of Ownership			13.3	10.9
Part of Village				
No response	3	6%		

	Count	Percent	Mean	Standard Deviation
Old	6	11%		
New	44	83%		

The Neighbourhood Cohesion Index (NCI) for Cang Dong as measured by Buckner's Survey is 3.91 (SD = 0.46). This number is unitless and represents the overall mean of the mean scores of each individual respondent, with the negatively-coded questions recoded. This number is relatively uninformative (with a minimum and maximum possible scores of 1 and 5 respectively, 3.91 is above the median, representing a higher level of cohesion) unless looked at in relation to other villages. Ideally I would have had the time and resources to investigate other villages, but unfortunately I did not. However, when compared with the NCI means from previously published studies, the NCI in Cang Dong is the highest recorded⁸¹. The validity (and hence the utility) of this comparison is unclear and would be strengthened by further research or comparison with other, similar measures.

Figures 5.2 and 5.3 show the central tendencies and variance in the answers to all questions. Figure 5.2 consists of 18 histograms showing the frequency of each answer for each question. Figure 5.3 shows similar information in a different way with 18 boxplots—one for each question. The boxplot—originally described by Tukey (1977)—is a graphical way of depicting the central tendency of, and variation within, a population (in the case of figure 5.3, the population represented by each boxplot is the 54 answers to each question). The left and right edges of the box represent the 25th and 75th percentile of the data set respectively, meaning that 50% of the responses are within the boundaries of the box (if no box is shown, as in questions 14, 10, and 9, the 25th and 75th percentiles are at the same point on the x-axis, meaning that at least 50% of the population chose that answer). The lines extending from the box represent the minimum and maximum values data values in the population, while a line in the box represents the median.

⁸¹ In Buckner's (1988) study, the neighbourhood selected as having a "high" amount neighbourhood cohesion (Old Greenbelt) scored a 3.89 (SD = 0.57), while the neighbourhood thought to have low cohesion scored a 2.85 (SD = 0.5). In Robinson and Wilkinson's study (1995), Elliot Lake had a NCI of 3.75 (SD = 0.65), and was thought to be high. Zanetell and Knuth (2004) did not calculate the NCI, using instead individual scores as a measure of the sense of community at an individual level.

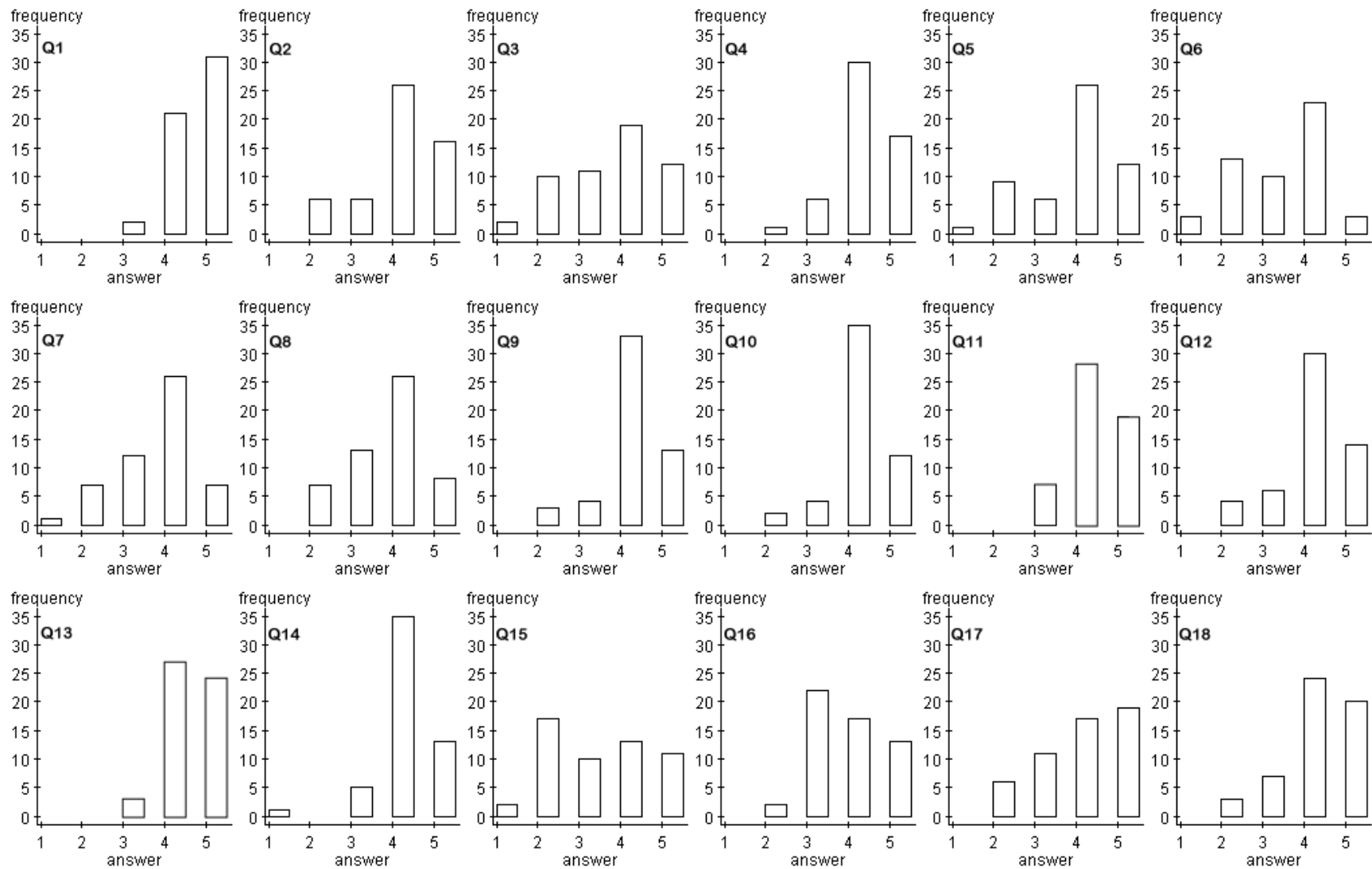


Figure 5.2: Histograms of the answers to survey questions (answers to questions 15 & 5 have been reverse-coded)

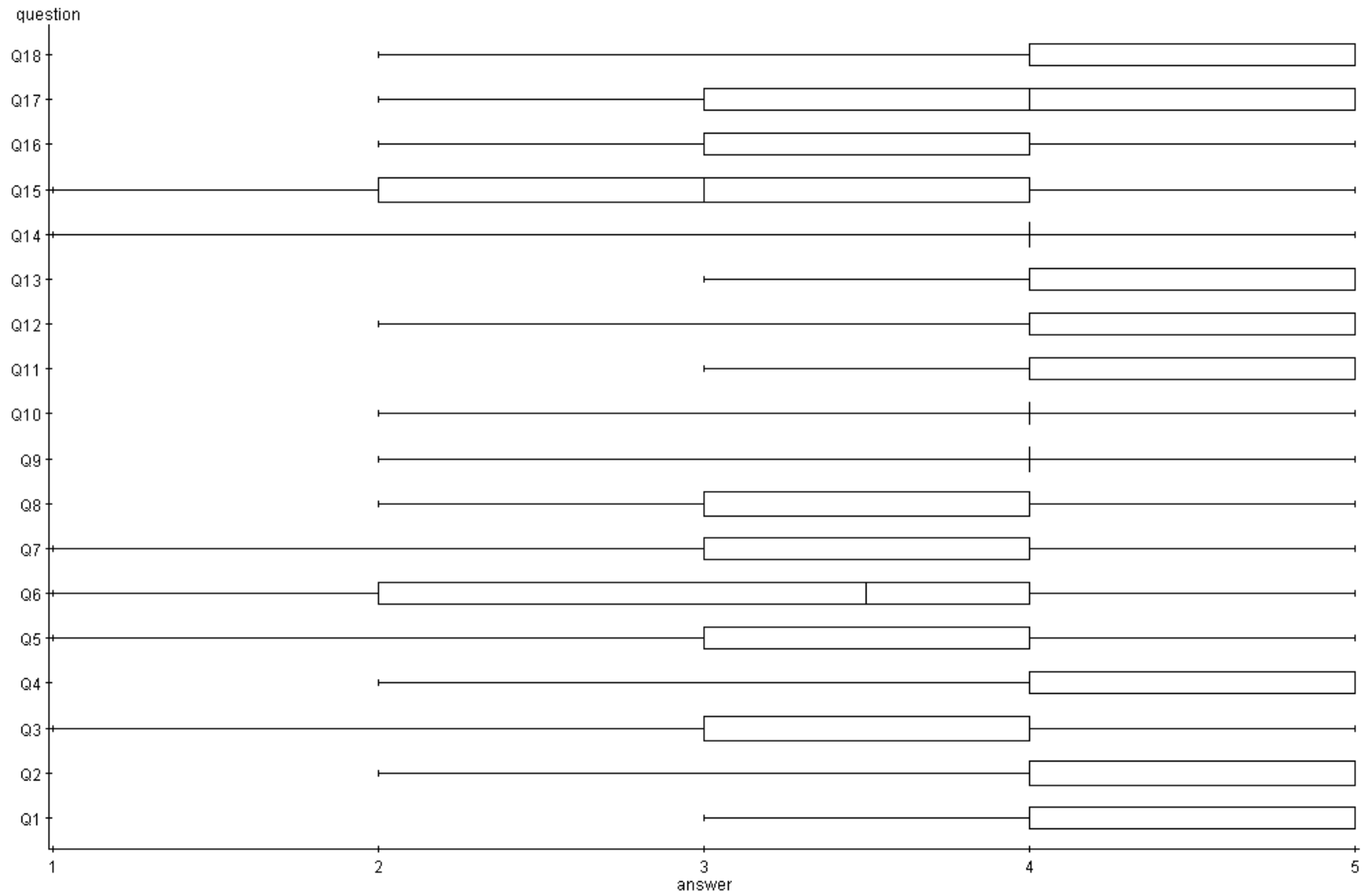


Figure 5.3: Boxplot of answers to survey questions (answers to questions 15 & 5 have been reverse-coded)

In Chapter 3 I noted that other studies measuring Buckner's NCI had dropped questions 16 and 6 from the questionnaire. The reason given for dropping question 16 ("A feeling of fellowship runs deep between me and other people in this village") was that the term "feeling of fellowship" was confusing to the respondents (Robinson and Wilkinson 1995). Figure 5.2 and table 5.1 show us that question 16 was the only question to which the most common response was "neither agree nor disagree". This result could mean that people in the village are ambivalent about "feelings of fellowship" in their community, or it could indicate a lack of understanding of the concept "feelings of fellowship", with the choice of "neither agree nor disagree" their way of indicating that they do not know or do not understand. Alternatively, these results could also indicate that my translators (when they were reading the survey to respondents) were marking down "neither agree nor disagree" if the respondent said they didn't know or didn't understand. To the best of my knowledge, this was not the case, but the language barrier provided so many opportunities for misunderstandings that the possibility cannot be discounted. Although these results might be consistent with Robinson and Wilkinson's (1995) finding that question 16 was confusing for respondents, I have still included Question 16 in my calculation of the NCI (Robinson & Wilkinson removed Question 16 from their calculations). Removing question 16 raises the NCI only marginally (not visible when rounded to two digits). That increase might not reflect the "true" NCI within the sample, and I am more comfortable with the potential for a lower NCI due to the inclusion of a misunderstood question than the potential of having an artificially higher NCI due to the exclusion of a well-understood but contentious question.

As shown in figure 5.2, questions 5, 6 and 15 all have large degrees of variance in their samples. Figure 5.2 shows that the answer distribution to these three questions is divided into two peaks, a pattern not seen in the answers to the other questions. This observation may be due to a number of different factors. For some people who answered in the negative, Question 5 ("Given the opportunity, I would like to move out of this village") may have been understood in a literal sense, but not viewed as a realistic option available to the respondent and as such many answered "strongly disagree" while laughing or shaking their heads in astonishment. While this reaction could have indicated a strong desire to stay in the village, it could also reflect that—in a country where residency restrictions have only just been relaxed (Liu 2005)—people are not used to the concept of just picking up and moving simply because they do not like the community. In rural China, moving out of the village is a much bigger undertaking—socially, financially and culturally—than it might be in the West. During oral survey administration, some respondents seemed to interpret the question as "given the chance to escape poverty, I would", and quickly said "of course". This response is also somewhat biased by the context since the design of the survey assumes that leaving the village means you do not like the village, not considering that

the decision to leave the village might be driven by factors other than dissatisfaction with the community. Rural emigration in China is largely driven by financial or educational opportunities (Liu 2005), and as such a desire to leave the village may reflect these drivers more than a lack of sense of community in the village.

With regards to question 6 ("something 'we' were doing rather than 'they' were doing"), the double peak seen in this question may be attributable to the presence of two main political factions in the village (IRI, 2001) (discussed later in this section). These two factions may have different feelings on certain survey questions, particularly question 6. The double peak seen could be due to confusion, but in my opinion the question does not seem any more confusing than the other questions, and none of my translators or literature (Zanetell and Knuth 2004; Robinson and Wilkinson 1995; Buckner 1988) using this tool suggested that question 6 was confusing (recall that Zanetell and Knuth removed question 6 for unclear reasons). It strikes me as more likely that the supporters of the governing group think of the village as "we", while those who have been excluded from the political process see a group of villagers involved in a joint undertaking in the village as "they".

In contrast, the large variance and double peak seen in question 15 ("I rarely have neighbours over to my house to visit ") may be more attributable to confusion. Through discussions with respondents and my Chinese translator (who grew up in a rural Hainan village), I found out that Hainan villagers do not often visit their neighbours at their homes as we might in the West. Rather, villagers meet and socialize in the town square or in the local Mah-Jongg parlour. While removing question 15 from the calculation raises Cang Dong's NCI to 3.94, the same arguments (discussed above) for keeping question 16 in the calculation apply here. Future studies in the Chinese context would be well advised to consider changing this question to a more contextually appropriate version, or to drop this question from the survey altogether.

In Chapter 4 I discussed how comparing data gathered in the interviews with data gathered using Buckner's instrument would allow me to highlight any limitations of Buckner's instrument. With the previously discussed exception of question 16, data from Buckner's NCI survey largely corresponded with my interview data. The response to question 6 supported my observations and those of my translator and the IRI election report (IRI, 2001) that there are two political factions in the village. These findings may suggest that sense of community could be different depending on how you define the community. The translations of the survey all referred to the community as Cang Dong, but it may be that members of each of the factions have a greater sense of community with their political allies than with others. My research did not investigate this any further as it only became apparent near the end of the research (and was not the main focus of my research).

The role of this case study was to examine which characteristics of the community led to the success of the community energy project. While the survey results, interview data, observations and comments detailed above regarding the role of social capital in the community support the claim that there is social capital and a strong sense of community in Cang Dong, they do not directly link the presence of social capital and a sense of community to the success of this energy project. There clearly is a correlation—a high sense of community and evidence of social capital are present in a community with a successful project, similar to what was suggested in the literature reviewed in Chapter 2—but there is no clear evidence of causation. Indeed, the pipeline project undertaken by the community was run almost solely by the government, with no evident need for or use of this social capital. Many of the villagers I interviewed told me that they were unaware of the biogas pipeline until a work crew showed up to hook it up to their home, and the village's involvement in the physical project seemed to be limited to footing the bill and participating in some equipment purchasing trips⁸².

Initially the lack of evidence of a direct role for social capital in the pipeline and biogas plant project led me to conclude that social capital may not have played a large role in this project. However, the sense of community and the social capital present in the community was identified multiple times as a key component of earlier successes in the community (winning awards, etc.). The repercussions from these earlier successes in the form of greater trust in the government, or a good reputation for the town may have been influential on the implementation of this energy project. Indirect influences such as this are much harder to clearly document, but suggest that a correlation should not be ignored despite the lack of any evidence of specific causation.

5.4.2 Effective Leadership from Local Governments and Local Organizations

As discussed in Chapter 2, leadership is an important part of any community renewable energy project at both the project and the community level. Cang Dong was fortunate to have very good leadership at both of these levels, which contributed to the success of this project.

Leadership from Local Government

In Chapter 2, I discussed characteristics of effective government leaders and characteristics of communities that fostered effective leaders in government. From the literature I drew examples of effective leaders who held legitimacy within the local population, worked within

⁸² The village leader recalled a meeting of the community to decide which houses would receive the biogas, but this meeting was not brought up by any of the villagers I interviewed. I am not suggesting that the meeting did not happen, rather that it was not perceived by many villagers as participation in the biogas project.

some type of framework that held them accountable, and enjoyed high levels of trust from their constituents (fostered through an effective democracy, and/or the involvement of local people in the decision-making process). I also identified the decentralization of power or some other form of effective transfer of authority to the local level as being particularly important to the creation of effective leaders. These characteristics speak to two main qualities of effective leaders: they must understand and represent the local people (reflect local institutions), and they must possess the authority and resources to act in accordance with the insights they gain from that knowledge.

If local governments are more effective leaders because they have a better understanding of local institutions than external actors, the same logic suggests that it will be very hard for an external researcher to ascertain those local institutions and to make a judgment on how clearly those institutions are reflected in local government. Institutions and social norms are often complex, drawn from shared experiences and beliefs rooted in shared geographical and cultural histories. Often even long-time residents (who presumably understand local institutions and social norms) will find it hard to articulate things that they “just know” in a conversation with someone who does not share the same culture and history. For any external observer, especially one who is working through translators, as I was, a thorough examination resulting in a complete understanding of these institutions and norms is—practically speaking—an impossible exercise. With this difficulty in mind, no attempt was made to assess or measure local institutions. Instead, the capacity of the government to understand those institutions and norms and to incorporate them into government actions was indirectly investigated by looking at the track record and quality of leadership, and the local perceptions of village leadership (which speak to both legitimacy and trust).

As discussed in Chapter 2, Sanders (2000b) identified three main characteristics of quality leaders: long tenure, a history of success, and a history of standing up to authority. The leadership in Cang Dong certainly possesses these characteristics. Cang Dong’s leader is Zhou Dingzhong. Mr. Zhou has lived in the village his entire life (with the exception of a brief stint in the army), and during my field research period, he was elected to his third term of three years—making him the only leader to be elected since the village began elections in 1998. Mr. Zhou had also served as the village’s leader prior to the introduction of elections, beginning in 1986. At the end of his new term, Zhou Dingzhong will have led Cang Dong for 21 years. This lengthy tenure as leader has endowed Mr. Zhou with a good deal of linking social capital (Woolcock 2000), as evidenced by the high regard in which Mr. Zhou appears to be held by higher levels of governance (personal observations). Mr. Zhou—and the village government in general—has a history of success, ranging from attracting the beer factory to the town, through organizing the village to undertake village improvements, to winning the numerous awards and honours mentioned earlier in this chapter. Finally, Mr. Zhou and the local government have stood up to

higher authorities a number of times, when implementing the new village plan against the advice of higher government (interview with respondent #7, 19/01/2005), and more recently when protesting loudly about the pollution from the pig farm (interview with #9, 16/11/2004). Interviewees in every organization (business or government) involved in this project identified Mr. Zhou as the key contact for their organization (interviews with respondents #5, 24/11/2005; #19, 06/01/2005; #17, 11/01/2005; #20, 18/01/2005). The findings from Cang Dong seem to be consistent with the qualities of a successful Chinese leader as identified in Sanders (2000b).

There are other factors besides an understanding of the community and experience in government that make for a good leader. A leader—and a government in general—must be trusted by the populace in order to breed the confidence that will allow the government to act as a representational body of the community at large. While a familiarity with the village's customs and norms may help generate this trust, it alone is not necessarily sufficient. During my interviews with the villagers of Cang Dong, there were insinuations of corruption in the government. Many villagers were unsatisfied with the explanations given for the lack of profit from the village's investment in the pig farm. Many respondents implied that the village government was embezzling those profits. Two respondents explicitly accused government officials—particularly the village leader and the village accountant—of embezzling profits from the pig farm enterprise (among other accusations). One respondent (#15, 11/01/2005) noted that the village accountant served as the accountant for both the pig farm business and the village (implying that perhaps he had something to do with the fact that the pig farm had reported no profits), while another broke down the leaders "extravagant" lifestyle (i.e. how much he drives, how many packs of cigarettes he smokes) and compared the cost of this lifestyle to the leader's publicly disclosed salary (interview with respondent #12, 15/01/2005). Others insinuated that the leader had bought votes in the past, as well as during the recent election. Still others suggested that favoritism ran rampant in the village, with supporters of the leader garnering choice positions at the nearby factories. I gathered no proof of any of these accusations during my research (although that was clearly not my research focus), and as such these allegations can not be conclusively corroborated or repudiated. On the other hand, one interview subject from the village government suggested that the village was so successful because of the fact that the village leader *was not* corrupt (interview with #6, 21/11/2004).

Regardless of the truth of these allegations, their mere existence suggests that the level of trust in the government could be higher. The allegations may also reflect a more understandable political divide that exists in Cang Dong. Political tensions were evident in the village with two apparent factions. During my first interview with the village leader I asked if a voter's list existed, with the hopes of getting a copy in order to randomly select survey respondents. He responded that he didn't want to give me one because he was afraid that I

would talk to people who had opposed him in the recent election and they would tell me bad things about him. One of my translators (whose knowledge of the subject I trusted because he had grown up in a very similar village in Hainan) clearly felt the political divide during our interviews and became hesitant to ask questions that might bring up this divide. After I explained to him that these questions were important he did ask them, but remained clearly uncomfortable. Chinese rural villages are often distinguished by the presence of only a small number of surnames, and these familial divisions can often fuel political tensions (Unger 2002). In Cang Dong, the two most predominant surnames are Zhuang and Huang. In 2001, 40% of the village residents belonged to one of these two families (International Republican Institute [IRI] 2001). Zhou Dingzhong won the election in 2001 with only 57% of the vote, less than might be expected of a well established leader with a history of success. He was running against Zhuang Wenzhong⁸³, indicating that familial allegiances may be influential in the village. Every election held in Cang Dong has seen Zhou Dingzhong and Zhuang Wenzhong contesting the leader's position (interview with #9, 06/01/2005). Based on this evidence, there is a strong possibility that the tensions observed in the village are a result of the repeated contests between Zhuang Wenzhong and the village leader. These tensions may be augmented by family allegiances to Zhuang Wenzhong.

The suggestions of corruption and the apparent presence of familial tensions in Cang Dong may indicate an environment in which trust in the leadership is not as high as it could be. Without longitudinal studies including other similar villages, it is impossible to determine whether the indicators of government distrust in Cang Dong are typical or atypical for the area (and as such whether they might be related to the village's atypical successes). However the findings from Cang Dong may corroborate Sanders' (Sanders 2000b) findings; Mr. Zhou certainly has a long tenure, a history of success, and a history of standing up to authority, regardless of any allegations or insinuations of corruption.

A local government with a clear understanding of local needs and institutions, legitimized by the trust of local people cannot affect the success of a project unless they also have the authority and the resources to make and implement key decisions surrounding the project, regardless of the role they might play in the project. Political and financial autonomy in local government are therefore crucial to realizing the benefits of decentralization. By leveraging the village's investment in the pig farm into funding for the pipeline, and by taking the innovative step of pooling the household biogas subsidies, the village government in Cang Dong was exercising both financial and political autonomy. The household subsidies came from central

⁸³ Chinese names are presented with the surname first, meaning that Zhuang Wenzhong's surname is Zhuang.

government, but the political decision to pool these subsidies indicates that the central government has allowed the local government a substantial degree of political autonomy to make these decisions. Similarly, when discussing the role of county and district⁸⁴ officials in the project with a representative of that government, it was made clear that the county government saw its role largely as an enabler (see Helmsing 2002) for local government initiatives.

Based on my interviews, Cang Dong seems to have a fair degree of political autonomy, and this seems to have contributed to the success of the biogas project. Of course, a true test of the village's political autonomy would occur if the local government attempted a project that was against the wishes of higher levels of government. In the case of the pipeline project, higher levels of government seem to have been eager to see it succeed (the biogas solution was suggested by the central government (interview with #20, 18/01/2005)) and as such may have afforded the local government more autonomy than if the project was less attractive. Despite these cautions, it is worth noting that in the case of the village plan, the local government went against the wishes of higher levels government (assigning larger building plots to residents than the higher government thought was appropriate) with no apparent penalty. Similarly, the local government seemed to carry some clout when it voiced complaints over the pollution from the pig farm. In light of these observations, it may be that the political autonomy observed is in fact established in the system of government. As discussed in Chapters 2 and 3, this political autonomy will augment the capacities of already effective leaders, allowing them to have an even greater impact upon the success of community renewable energy projects.

Political autonomy may be relatively useless if a government does not have the funds to implement and support their decisions. In Cang Dong, the financial autonomy arising from their investment in the pig farm (which in turn arose from their ownership of land) allowed the local government to secure funding for more than half of the pipeline project on its own. Similarly, the local government had enough political autonomy that it was allowed to use the household subsidies in the way that it saw fit—namely to pool all the household biogas subsidies into one large payment for a communal pipeline, also providing increased financial autonomy (although this time it was afforded by higher levels of government allowing them to pool the subsidies).

Once again, with this type of exploratory research, it is hard to conclusively establish causative links, even in the light of an apparent correlation. However, in the case of decentralized governance and strong leadership it is much easier to discuss possible or probable causal links based on observations in the field. The apparent autonomy of the Cang Dong village government over their financial affairs and the political power to undertake their own decision

⁸⁴ Cang Dong is in Haikou county, and is part of the Long Hua district within that county (and Cheng Xi township within that district).

making on community projects (enabled and supported by the county and township governments) played a direct role in the success of this project. The village government's innovative decision to pool the household subsidies and leverage the village's investment in the pig farm into funding for the pipeline without having to turn to higher levels of government for special funding demonstrates their ability to make political and financial decisions autonomously. Mr. Zhou's quality of leadership—praised by those in higher government and by the company involved in the biogas project—also played a part in the success of this project by giving the village an authoritative leader who could make and implement decisions.

Leadership from Local Organizations

In Chapter 2 I discussed how in order for local organizations to provide effective leadership, they—like government—will need to have a clear understanding of local institutions, needs and concerns. In Chapter 3, a review of the Chinese context suggested that a lack of local non-governmental organizations would result in a relatively higher importance being placed on the leadership of government. Indeed, in Cang Dong, the only local organization (other than government—as discussed above) involved in the biogas project was the *Huafu* environmental company, based in nearby Haikou. I found no evidence that the *Huafu* environmental company held a particularly clear understanding of local institutions, needs and concerns. While the expertise of *Huafu* clearly played a role in the success of the Cang Dong biogas project (discussed in more detail below), it is not clear that this apparent lack of awareness of local institutions was in any way a barrier to the success of this project. In many of the cases discussed in Chapter two, local organizations were leading the community or working on a project that was much more involved with the community, requiring community members to contribute to labour or maintenance of the project. In contrast, Cang Dong's energy project was largely a response to a pollution problem, and did not require much input from the villagers. *Huafu's* interface with the local community was primarily through the leader. The fact that this interface was largely mediated by the leader may have resulted in a reflection and knowledge of local institutions being less important in this case than in others that required cooperative work with local people.

Of course, the understanding of local institutions is a relative phenomenon; *Huafu* surely has a greater understanding of local social norms and customs than—for example—an international organization might have had because the organization is Chinese. The fact that the organization is Hainanese may have given *Huafu* an advantage over Chinese organizations from other provinces. The origins of *Huafu* and the assumed understanding of national and provincial social norms could have helped during the negotiations with the local leader. Unfortunately, in

the absence of data regarding the experiences of other organizations in Cang Dong, it is very hard to gauge the extent to which this might be true.

Similarly, because *Huafu* was hired by the government and the pig farm to deliver this project (the biogas plant and the pipeline respectively), the company clearly had the authority needed to complete this project. However, this authority was not vested in them through any local participation or trust.

5.4.3 Experience with Innovation and Cooperation, and Access to Technical Resources

As discussed in Chapter 2, past experience with innovative projects or projects requiring collective action will increase the chances of success on similar projects by reducing risk aversion, building technical competencies in the actors, and increasing the availability of important technical resources.

Experience with Innovation and Cooperation

Cang Dong certainly has a reputation for succeeding where other similar villages have not, as attested by its numerous awards and distinctions. The people of Cang Dong also have been described as being open to innovation and change; an official with a higher level of government described the villagers of Cang Dong as “eager to change and learn” (interview with respondent #3, 01/12/2004). This success may be partly attributed to innovation (the new village plan), and also to cooperation within the community (respondents’ identification of community projects and the ability to work together as influential on the community’s success). Standing up to authority and voicing concerns over the pollution from the pig farm may also have been an unusual step in rural China, which sometimes seems to lack an embedded environmental ethic (Ho 2001). Could the complaints have been financially driven? The question of whether those same objections would have been raised had the pig farm been profitable is hard to answer, but if it could be answered, it would shed some light on how innovative a step it was to lodge the complaints. Although there was ample evidence of village residents’ dissatisfaction with the pollution from the pig farm, the lack of financial benefits flowing from the pig farm was never cited as part of the pollution problem, nor did it seem to affect the intensity of the complaints I heard. Government literature (Cang Dong Village Party and Committee (translated by Jian Ming) 1998) certainly holds Cang Dong up as a model for other villages, praising their community cooperation on projects such as road building and the erection of a water tower.

Like the sense of community and social capital observed within the community, the impact of the community’s past on the current project is hard to determine. No immediate causative link could be established, but—as in the case of social capital and sense of

community—the past successes may have influenced this success in circuitous and indirect ways that are not readily apparent. Interview respondents were generally indecisive when asked what impact they thought the villages' past successes had had on the success of the pipeline and biogas project. Although admittedly a hard question, respondents usually had a firm opinion on this question. Some responded that they did not think it had any impact—any village could implement a similar project (e.g. #07, 19/01/2005)—while others thought that it had had an impact, albeit one that was hard to describe.

Similarly, the history of successes experienced by the *Huafu* Environmental Engineering Company⁸⁵ (which built the biogas plant) led to them being recommended by the central government to Cang Dong and the *Wan tou* farm for this project (interview with respondent #20, 18/01/2005). Their history of past successes and innovation clearly had an influence on being hired for the project, and their technical expertise and knowledge clearly contributed to the successful outcome of this project. Both the leadership of Cang Dong and the *Huafu* Environmental Engineering Company possess know-how that contributed to the success of this project. In Chapter 2, know-how was defined (in the context of community projects) as “the ability to leverage political and managerial resources, local knowledge, and external support in linking local talent, technology and capital in community undertakings”. The leadership of the *Huafu* Environmental Engineering Company seems to have been able to leverage their reputation for innovation and technical competency into recommendations from the Chinese central government to link their technological expertise with community undertakings. The president of the *Huafu* Environmental Engineering Company is the secretary of the renewable energy society in Hainan (interview with #20, 18/01/2005); this type of visibility will surely aid the company with the promotion of its services, increasing the demand. In a similar way, the leadership of Cang Dong was able to leverage their political resources to generate a response to the pollution problem in their village. Both actors clearly used different types of know-how: technical and business in the case of the *Huafu* Environmental Engineering Company; political and financial in the case of the government of Cang Dong.

Technical Resources

The *Huafu* Environmental Engineering Company has a reputation as an innovative, technically proficient company (interview with respondent #19, 19/01/2005; interview with respondent #17, 11/01/2005). The innovative nature of the biogas plant is further evidence of their worthiness of such a reputation. Respondents from within the company and in various

⁸⁵ While the Engineering Company is not strictly part of the “community” of Cang Dong, they are a local firm (headquartered in Haikou), and as such the easy access to their resources is a characteristic of Cang Dong.

levels of government told me that the company is well respected for its innovative work and technical skill (interviews with respondents #5, 24/11/2004; #2, 1/12/2004; #19, 06/01/2005; #17, 11/01/2005; #20, 18/01/2005). The ability of the village to gain access to such a skilled and innovative company clearly contributed to the success of this project.

As discussed in Chapter 2, the technical resources required for a project will need to be increasingly closer to the project site as the scale of the project decreases. For a reasonably small-scale project like the biogas plant and pipeline in Cang Dong, the proximity of a source of skilled technical capital (like the Huafu Environmental Engineering Company) certainly helped the project succeed.

Communal Capital

In Chapter 3 I discussed the possibility of Chinese communities possessing communal capital stemming from China's history of collectives. During my time in Cang Dong, I did not encounter any physical communal capital (e.g. agricultural equipment left over from the collective era, etc.), but the social capital, sense of community and history of past successes may stem from the villagers' shared history of collective experiences before decollectivization (especially the old women helping out with the agricultural processing). As such, these intangible assets could be considered a form of communal capital. However, without further research into the villagers' experiences and the impact past events have had on social interactions today, it is hard to determine whether these characteristics could be considered a form of communal capital.

5.4.4 Economic Perceptions and Realities

One of the key reasons that Cang Dong village was willing to invest their share of the pig farm profits into this project was the real economic benefits provided to the community. Use of biogas as a cooking gas allowed village households to save close to ¥800 per year in gas supplies. Similarly, the fact that the biogas-driven generation of electricity was predicted to pay for itself in electricity savings within 10 years made it an attractive option to the pig farm when investigating water purification options.

The Chinese central government has recently placed a good deal of emphasis on the use of biogas technology in rural development (interview respondent #3, 1/12/2004; Fu Yuan, 2004). This emphasis, especially as manifested by the subsidy provided by higher levels of government (two thirds from the province, one third from the city (interview with #20, 18/01/2005)) clearly had an impact on the success of this project. This subsidy was a major factor in determining the feasibility of such a project by giving the local government the ability to finance the pipeline to the village. Since 2000, the provincial government has encouraged energy conservation and demonstration projects of new technology dealing with environmental issues such as water

pollution from agribusinesses (e.g. aquaculture operations or livestock farms) (interview with #05, 24/11/2004). Like the biogas subsidy, initiatives like this, if coupled with appropriate economic policy initiatives can have an impact on the success of rural environmental projects.

5.4.5 Biophysical Resources Appropriate to the Technology Used

Especially in the case of Cang Dong, this characteristic is almost too obvious to examine. The success of the biogas project in Cang Dong clearly hinged on the availability of large quantities of organic waste from the pig farm. Any community undertaking a similar biogas project without first securing a large and stable supply of organic waste would be sure to fail. The need for appropriate biophysical resources becomes much less obvious when dealing with energy sources such as wind or solar energy, where the resource may be present but not in sufficient quantities. In the case of Cang Dong, there were appropriate amounts of an appropriate resource. The climate of Hainan may also have played a role, but in conversations with the designer of the plant, he seemed to think it would work in colder climates such as Canada.

5.5 Challenges and Limitations

5.5.1 Translators

As discussed in Chapter 4, language is often a large barrier in cross-cultural research projects. Even very skilled translators can only partially bridge the divide between research subjects and the researcher. During my research in China I had many difficulties with translators⁸⁶, employing seven different translators over the course of the research. Those difficulties were discussed in more detail in Chapter 4. An underlying problem that was less obvious but still affected my research was the way that language affects the thought processes of research subjects, researchers and translators. Unfortunately I was not able to afford translators trained in research methods and translation, and as a result I lost a lot of the control over language that I would have had had I been working in my native language (English) or with translators trained in research methods.

Early in this research the importance of good translators became clear. Over the course of this research I used seven different translators. The initial translator provided to me by the Hainanese Ecoplan project partners was not always available and had no experience as a translator or a researcher. Her English was perfectly fine for conversations but began to break

⁸⁶ I deliberately use the term “translator” instead of “interpreter” I asked my translators to translate what I say and what the subject responds rather than to interpret it. I certainly drew on my translator’s interpretive skills (i.e. their knowledge of the culture, of local idiom, etc.), but encouraged them to translate first and then interpret the translation for me.

down when more in depth discussion was required (as in an interview). After an extensive search yielding few candidates, I hired a young college student whose English seemed very well developed. After one interview it became clear that although he was very proficient at spoken English, his listening and comprehension skills were not nearly as well developed. My next translator was a tour guide who would have worked out very well had he not been too busy with his better-paying job as a tour guide to come to the village with me as often as I needed. I finally found a teacher at a local English institute who was available for two weeks while on vacation. Her English—spoken and comprehension—was excellent, and she clearly understood the role of a translator in this type of research (see the case study protocol in the appendices). Unfortunately this translator's vacation time was soon up and I was forced to find a new translator. Within a week, a friend I had made earlier in the trip—employed at an English training institute in Sanya—fortuitously (for me) quit his job and agreed to work with me for the remainder of my research. Zeban proved to be an invaluable asset due to his proficiency in English and his knowledge of rural Hainanese culture (having grown up in a rural village near Sanya). Zeban and I shared a hotel room and ate together for almost a month which allowed me to discuss concepts and ideas with him and to gain a greater understanding of Chinese and Hainanese culture through those discussions.

Ideally I would have worked with the same translator through the course of the research. This would have allowed the translator to gain an understanding similar to mine of the research as it progressed. With new translators I would have to brief them on what the research had revealed until then so that they would understand the context of my questions and the responses of interview subjects. A longer term working relationship similar to the one I had with Zeban (working and boarding together) would have allowed me to gain a greater understanding of the culture and to fully discuss the research and double check all the interview notes with someone who had heard the responses in the original language. This type of double-checking and discussion would have enabled a much fuller understanding of the research project. Additionally, the added comfort that came from more time spent together might help the translator feel confident telling me things that they think I may not want to hear, a problem that often occurs with translators (and for which I was always wary).

5.5.2 Site Selection

As discussed in Chapter 1.5, conclusions from inductive research grow stronger as more evidence is accumulated. This fact is arguably true with all types of science, but particularly with inductive, qualitative research. With this thought in mind, the ideal scenario for this research project would have been to perform case studies in more than one village. More case studies of successful community renewable energy projects would provide a greater depth of data and

would help strengthen conclusions drawn from this research. Extra case studies would also identify whether Cang Dong is an atypical situation. A few limitations (budget, time, availability of study sites, etc.) precluded the possibility of undertaking more case studies for this research. Had a study site been established before traveling to China, this study could have been carried out over a longer period of time (saving me the month of site selection⁸⁷) and in greater detail (by allowing me to prepare for the specific project before arriving in China). Unfortunately, the infrastructure did not exist in China to complete such a process before departure. Similarly, my funding through EcoPlan China—which constrained me to working with the project partners of Hainan Province, Dalian City or Nanjing City—limited the geographic range from which prospective communities could be chosen. Most funding will come with some conditions, and given that I could not have undertaken this research at all without the financial assistance provided to me by EcoPlan China, the latter limitation is not unduly severe. However, in an ideal world it would have been useful to be able to consider communities over a broader area in order to find more communities that are truly innovative and successful in their community energy projects, or perhaps two similar communities with differing levels of success in their energy projects.

5.6 Conclusion

This chapter introduced the Chinese case study of the biogas plant in Cang Dong village. The biogas plant in Cang Dong fits well into the definition of a successful community renewable energy project presented in Chapter 2. This exploratory research on Cang Dong and the biogas project reveals that many of the characteristics of successful communities discussed in Chapter 2 were found in Cang Dong and may have contributed to the success of this project. I discussed the difficulties I encountered during my research and discussed how those difficulties may have impacted this research. In the next chapter I will look at the relevance of this research and discuss possible avenues for further research.

⁸⁷ As noted, the month of visits to other rural villages was an educational experience itself that shaped my views of Cang Dong and gave me a little more experience upon which to draw when doing my research.

Chapter 6: Discussion and Conclusion

6.1 Introduction

This thesis asks what characteristics of a community are conducive to the successful implementation of community renewable energy projects. The thesis began with a review of the literature surrounding community development projects in general, looking for lessons that might be learned from those projects in general and from community renewable energy projects specifically. From that discussion five general characteristics of communities were highlighted as being particularly important to community energy projects. Those characteristics were then used as a heuristic to guide the case study of a successful biogas project in Cang Dong, a rural Chinese village.

From the results of this research, an initial general framework is developed upon which further examination of community renewable energy projects can proceed. This framework is still only an initial step. More work will need to be done to flesh it out to the point where it can be confidently used to help communities succeed with their community renewable energy projects. This concluding chapter summarizes and discusses the results of the research, discusses any limitations of the research and identifies possible directions for future research.

6.2 Characteristics of Cang Dong that contributed to the success of the biogas project

6.2.1 Supportive characteristics

In Cang Dong, the success of the community's biogas project was directly influenced by four main factors: the general economic environment in Cang Dong and the availability of financial support for the second phase of the project (the construction of the pipeline to Cang Dong); the proximity of and ease of access to the skilled people and technology (technical resources) needed to implement the innovative solution; strong leadership for the community of Cang Dong; and the presence of a relatively stable and abundant source of organic waste to fuel the biogas digester.

The economic environment in Cang Dong was such that alternative energy sources for the same energy service (cooking) were more expensive than the energy source supplied by the biogas plant. The fact that the biogas in Cang Dong is supplied directly to the homes of users at no charge makes this point obvious, but the principle is still true. Similarly, the financial support for the second phase of the project came from two key government sources, higher levels of government (the household biogas subsidy), and the local government (a loan secured against their interest in the pig farm). Without this support, the project would not have progressed

through the second phase. The loan from the pig farm was available because of a characteristic of Cang Dong—their investment in the pig farm. The availability of financial support from higher levels of government, while not a result of anything done by the community *per se*, is a characteristic of the community nonetheless—the larger macro-economic environment in which the community is situated.

In the same way, the *Huafu* environmental company was identified multiple times as a key factor in the success of the project. Their skills and innovation resulted in a novel type of biogas project in Cang Dong. Their innovation and foresight associated with recognizing the value of the extra biogas (originally a marginal concern compared to the waste treatment, the initial issue) to the village initiated the second phase of the project. The fact that the community had access to this resource (i.e. it was in close proximity, was interested in their problem, and was relatively affordable) is a key characteristic of the community that has contributed to the success of their community renewable energy project.

The strong leadership provided by the village government in Cang Dong and their readiness to voice environmental concerns to higher levels of government initiated the whole biogas project. At the beginning of the second phase of the project, the village government showed their openness to new ideas when they recognized the value of the proposed pipeline to the village despite the lack of real financial incentives (the pipeline provides no economic benefit to the government other than the savings of villagers on cooking fuel). Once this value was recognized, the village leader took the lead in negotiating a contract with the provider, and went on to arrange the innovative funding structure for the entire phase. This characteristic of the community (strong and effective leadership) directly impacted the success of the project at many different points.

Finally, the presence of a stable, abundant, and cheap (free) supply of fuel (the waste from the pig farm) enabled this project to succeed by reducing the costs associated with the energy generation, and ensuring that the energy project will have a source of fuel for years to come. If this source of fuel were removed the repercussions on the outlook of the Cang Dong biogas project would be grave.

6.2.2 Ambiguous Characteristics

The impacts of some characteristics of the community on the success of the Cang Dong biogas project were not entirely clear; in some cases there were suggestions that these characteristics had impacted the success of the energy project, but the data are not sufficient to draw firm conclusions, or their impact is entirely unclear (neither good nor bad).

The role of social capital or sense of community in the success of this project is unclear. In Chapter 2, I discussed how much of the literature suggests that social capital and sense of

community in a community will enable successful community projects in part because they enable cooperative action and community participation. The nature of the biogas project in Cang Dong was such that it did not require any cooperative action and the participation of local residents—in terms of financial support, labour, or group decision-making—was not needed, limiting the potential impact of these characteristics on the success of this project. As such, even though my data indicate that Cang Dong enjoys a wealth of social capital and a strong sense of community, it is hard to see how this impacted the success of the project. This finding may only be due to a low number of case studies - the nature of this particular community renewable energy project may be such that these characteristics cannot play a meaningful role. Additional case studies would reduce the replication bias⁸⁸ that may have affected the data on this characteristic by restricting the research to a single project. More research differentiating between types of projects and the role of social capital and sense of community in the success of projects of each type would also help to clarify this issue.

However, social capital's apparent lack of influence on the success of Cang Dong's community energy project is not entirely as unambiguous as the preceding paragraph might suggest. As discussed in Chapter 5, Cang Dong's sense of community and stocks of social capital were repeatedly identified by interview respondents as having played a key role in the previous successes of the village. The impact of these previous successes on this project is hard to quantify, but certainly played some role in producing such an effective leader, as well as enhancing the village's (and its government's) reputation. This reputation may have given the village more autonomy than other, less successful villages (e.g. being allowed to pool the household biogas subsidy).

The literature reviewed in Chapter 2 also suggested that high levels of social capital and a strong sense of community will increase levels of trust in the community. Such trust will enable leaders to act more effectively. The past successes of Cang Dong (also impacted by the social capital in the village) will also increase villagers' trust in their leadership as well, further enabling the local leader to effectively represent the village. As such, the high stocks of social capital and strong sense of community in Cang Dong may have—paradoxically—reduced their own utility in this project by imbuing the leadership with trust such that they did not need to return to group

⁸⁸ Yin (2003) takes great care to differentiate between the replication logic used in case studies and the sampling logic used in surveys. Sampling logic requires a statistical procedure to select a specific subset (e.g. random or stratified samples) of the "universe" of potential respondents, and the resulting data are assumed to represent the entire "universe". In contrast, replication logic views each case as a whole study, in which "convergent evidence is sought regarding the facts and conclusions for each case; each case's conclusions are then considered to be the information needing replication by other individual cases" (Yin 2003:50).

decision-making processes requiring local participation. To be clear, my data do not support this hypothesis either, but it remains a possibility that may warrant further investigation.

In the preceding paragraphs I have raised the impact that the village's history of cooperation, innovation, and success may have had on the success of the energy project. Similarly, the province's familiarity with biogas solutions from China's three decade history of biogas use likely played a role in generating the skill demonstrated by the local consulting company, or in educating them on the possibilities of biogas for this type of project. This legacy also played a role in higher government's decision to provide subsidies for biogas provision. Again, this legacy—while not a part of Cang Dong's history or a result of anything done by the community *per se*—is a characteristic of the community nonetheless as it is part of the greater social context in which the community is situated.

6.2.3 Unsupportive Characteristics

No characteristics of the community that negatively impacted the success of the energy project were revealed by my data. This does not necessarily mean that such characteristics do not exist. By the time I was finished my research, the biogas project was still relatively new and was generally considered to have been a resounding success. Part of these findings could have been a courtesy bias (perhaps the respondents were trying to tell me what they thought I wanted to hear, and as such did not relate negative aspects of the biogas project to me). Another, perhaps more likely, possibility is that the project has not been running long enough to show any serious problems that might arise. As problems inevitably arise in the biogas project more characteristics in the community—with both positive and negative impacts—will begin to show their importance to the project.

6.2.4 Summary

My research results suggest that four key characteristics of Cang Dong contributed to the success of the energy project; appropriate macro-and micro environments, high levels of technical resources, effective leadership, and a reliable source of appropriate biophysical resources. Other characteristics such as social capital, sense of community and past successes may be important, but my data were not able to clearly link those characteristics with the success of the Cang Dong community renewable energy project.

6.3 The Characteristics in a Chinese Context

6.3.1 A high degree of social capital and a strong sense of community

In chapter 3 I suggested that in a Chinese context, more emphasis should be placed on forms of cognitive social capital and the bonding and bridging capital they produce. In Cang Dong, as expected, I found a lack of associational activity that might generate different forms of structural social capital. Cognitive forms of social capital were present, with bonding and bridging social capital readily evident in the form of shared agricultural processing and social interactions at the local Mah-jongg parlours.

6.3.2 Effective leadership from local government and local organizations

The discussion in Chapter 3 revealed that, because of the relative lack of non-governmental organizations in China, more importance might be placed on the role of effective leadership from local government. These leaders would have long tenure, a history of standing up to authority, and a history of innovation. Local participation and engagement with leaders, in the form of democratic elections or some other form of engagement would also increase the effectiveness of local leaders. I noted that China now mandates elections at the village level. In Cang Dong I found that strong leadership from local government had in fact impacted the success of the community renewable energy project. Furthermore, Cang Dong's leader had a long tenure, a history of standing up to authority and—with the village—a history of innovation and success.

Of course, leadership can only impact local development and projects if they have the ability to meaningfully act on their decisions. Acting in such a way requires a certain degree of political and/or financial power. In Cang Dong, the government was afforded a measure of financial autonomy through their investment in the pig farm which they leveraged into the loan to finance the pipeline. Similarly, representatives of higher levels of government told me that they saw themselves as enablers, there to help Cang Dong with their project rather than running it for them. This evidence of decentralization of power indicates that the Cang Dong government has some degree of political autonomy.

In Chapter 3 I also talked about China's history of corruption and noted that this history may hinder the generation of governmental trust in citizens. In Cang Dong I did hear many rumours of government corruption, but was unable to conclusively confirm or refute them. Investigating these rumours was clearly not within the scope of this thesis, but their mere presence suggests that trust in the government was not as high as it could have been.

6.3.3 Experience with innovation and cooperation and high levels of technical resources

In Chapter 3 I discussed the concept of communal capital: social, economic and environmental forms of capital that were available to Chinese communities because of their past history with communism and collectives. Cang Dong had little (or no) tangible communal capital (e.g. capital equipment or farming tools), and their intangible social communal capital was likewise hard to discern. With decollectivization beginning in 1978, almost 27 years had passed before the biogas plant was built. An expectation that some forms of capital (physical or social, tangible or intangible) might remain may be optimistic. However, the current leader of Cang Dong has led the village since 1986. This means that, although he was not leading the village during the collective era, he has lived in the village all his life (with the exception of a brief stint in the army), including through the collective period. This experience—shared with many other members of the community—might increase the bonding social capital he shares with them, increasing their trust in him, enabling him to work more effectively as a leader.

Similarly, certain manifestations of bonding social capital such as the shared agricultural processing I described in Chapter 5 may be norms developed years ago in the collective period that have persisted to this day. Those norms of action still serve to generate and perpetuate social capital in the Cang Dong.

6.3.4 Economic perceptions and realities

In Chapter 3 I reviewed literature on the current financial mindset in rural China, noting that “only those practices promising to make farmers rich (or at least a lot richer) stand any serious chance of being voluntarily adopted” (Sanders 2000b:357). I certainly encountered this mindset in Cang Dong, with multiple interview respondents complaining about the economy and asking whether my research was going to do anything to help the village make more money.

Also in Chapter 3 I discussed the role that township and village enterprises (TVEs) can play in enhancing the financial autonomy of rural Chinese communities. Cang Dong did not have any TVEs, nor did Cheng Xi township. From informal discussions I held with interview subjects and research assistants, it seems that Hainan does not have very many TVEs—they tend to be clustered in the South East nearer to Hong Kong and Shanghai, where the economic reforms have really exploded.

6.4 A General Framework

In Chapter 2 I reviewed the literature on community renewable energy projects to discover what literature exists regarding the role of a community in the success of such projects. This review revealed that there is a dearth of literature in this area, and as a result I turned to

literature on the nature of successful community renewable energy projects themselves (as opposed to the role of the community), and other, similar community development projects to gain an understanding of the characteristics of a successful community development project. Drawing heavily on Uphoff, Esman and Krishna's (1998) work on the nature of successful community development projects, I used literature on various aspects of communities to suggest characteristics of communities that may impact the success of community renewable energy projects. As a result of this exercise, I ended the chapter with five characteristics of a community that—according to relevant literature—may have the capacity to influence the success of community renewable energy projects. The first three of these characteristics are thought to directly contribute to the development of characteristics of successful projects as identified by Uphoff *et al*, while the final two impact the ability of the community to receive the project with a suitable economic environment and sufficient physical resources. These five characteristics are:

1. A large stock of social capital and a strong sense of community,
2. Effective leadership from local government and local organizations,
3. Experience with innovation and cooperation, and access to technical resources
4. Appropriate macro- and micro-economic environments, and
5. Sufficient stocks of biophysical resources appropriate to the technologies being used.

Chapter 3 focused on contextualizing these characteristics for the Chinese context. This phase of the research resulted in some important conclusions and directions for the case study research, including emphasizing the prevalence of cognitive social capital over structural social capital in China, the role of democratization and decentralization in the legitimization of effective Chinese leaders, the concept and utility of communal capital drawn from collective experiences in communist China, and a better understanding of the current economic environment in rural China.

In the subsequent case study, I investigated a community with a successful community renewable energy project. This investigation was not intended to test the characteristics as hypotheses, but rather to gain a thorough understanding of the energy project and its development and then inductively draw conclusions from those results. The characteristics are used as a "loosely connected 'heuristic framework' of concepts" (Kelle 1997:4.4) in order to guide the research and ensuing analysis.

From this case study I found support for characteristics 2, 3, 4 and 5. Support for characteristic 1 (a large stock of social capital and a strong sense of community) was ambiguous in this case study. This ambiguity may be due to a theoretical bias (discussed in the biases section) towards projects that require cooperation and participation from villagers. Uphoff, Esman and Krishna's (1998) work on the nature of successful community development projects discusses many projects that—unlike the biogas project in Cang Dong—require large amounts of

community involvement. Further differentiation of different types of community energy projects (e.g. with respect to the required amount of community involvement) would help to clarify this issue and may allow more research into what characteristics are important in different types of community energy projects, and which characteristics of communities are more important to success for each type of project.

6.5 Implications

Even though the capital costs of renewable energy projects vary widely depending on the technology used, renewable energy projects require significant investments of capital, labour, and time. With such an investment, decision makers and financiers will welcome any tools that can improve the chances of success. This exploratory research provides a good starting point for further development of a framework to assess the suitability of communities for community renewable energy projects. I do not feel that these characteristics have been researched in sufficient depth to use them immediately for such a purpose, but that—with further replication and investigation providing such depth—a framework could be developed.

While this research project predominantly addressed community renewable energy projects in rural areas, there is no reason that the results could not be applied—with few adjustments—to urban communities. The results could be used to increase the chances of successful future demonstrations projects. Well-publicized, successful demonstrations of renewable energy technologies in rural areas could drive more widespread adoption in both rural and urban areas, contributing to community and economic development while decreasing environmental degradation and increasing energy security.

6.5.1 Development Projects

In development projects, the provision of affordable and reliable energy supplies may be an important first step in other objectives such as establishing a health clinic, schools, or processing centres for local agricultural products. Or energy provision itself may be the goal of the development project, with the aim of ultimately delivering any number of the many benefits linked with a reliable and affordable energy supply, benefits discussed in Chapter 1 such as increased quality of life, the creation of new economic activities, and the stimulation of existing economic activities. Any long term development plans that include the need for a local energy source—renewable or not—may be interested in these characteristics and working on capacity building before any money is invested into the energy-related portion of the development project.

6.5.2 Energy Researchers

Individuals investigating similar projects will find this research useful as a source of comparative data. Researchers working in China may be especially interested in this research as it could provide a source of comparative data to which they could compare their research findings. Such research would help to strengthen the conclusions drawn here through replication and adjustment.

As discussed in Chapters 1 and 3, China is experiencing an energy crisis due to their booming economic growth. Clean sources of energy are vital to easing this crisis without further exacerbating existing environmental problems. Opportunities for improving the quality of life in rural China are also of key importance to the Chinese government. As mentioned, the project in Cang Dong is being promoted as a new model for economic development in rural China (Fu Yuan 2004). This research may be of interest to practitioners and researchers attempting to address these problems.

6.5.3 Carbon Credit Markets & the Clean Development Mechanism

With the ratification of the Kyoto Protocol by 141 countries, and the treaty's recent entry into force, a market for carbon credits has been created. The United Nations' Framework Convention on Climate Change also sets out mechanisms whereby signatories can earn or trade carbon credits that can be used to offset their allowed domestic emissions (if restricted). Some signatories (such as Russia and other former Eastern Bloc countries) have emission limits above their current production levels and can trade their extra emission credits to other nations. Other mechanisms like the clean-development mechanism (CDM) allow countries to claim emissions reductions as a result of development projects in developing countries. When investing in a community energy project with the aim of using any emissions reductions against domestic emissions limits, investing countries will want to ensure that the project has the greatest chance of succeeding in order to ensure that those emission credits are actually generated.

6.6 Contribution

In this thesis I am not intending to suggest that the five characteristics mentioned are the only important factors of a successful energy project. Indeed—any or all of these characteristics may not be either sufficient or necessary for a successful community energy project. It is conceivable that there are certain factors that will make a community renewable energy project succeed in the absence of any of any of these characteristics, just as it is conceivable that there are other factors that would doom a project to failure despite the presence of all of these characteristics in the local community. Instead, these characteristics are broad characteristics that will—in general—positively influence the success of a community energy

project. All other things being equal, the presence of any of these characteristics should increase the chances of success of a community energy project, but the presence of any or all of them will not guarantee such a success.

The main contribution of this research is to address a gap in the literature exploring the characteristics of a community that can positively impact the success of a community renewable energy project. While this exploratory research leaves much work left to be done and many questions unanswered, I hope that it will initiate a dialogue on this topic.

This thesis also contributes to the broader literature on community development projects, of which community renewable energy projects are a subset. The examination in Chapter 3 on how various ideas would manifest in Chinese society also addresses a gap in much of the (English) sociological literature with regards to the manifestation of various concepts and theories in modern Chinese culture. While this was not the main focus of the project, the research done addresses some issues that are not comprehensively addressed in great detail elsewhere.

Finally, the conceptual model proposed in Chapter two (consisting of the definition of terms, actors, and interactions in a community renewable energy project) may be useful to researchers looking at similar topics. The framework is not completely original—it borrows heavily from the work of others in similar areas. I hope that another researcher will continue this tradition and borrow heavily from my work to further advance these areas of inquiry.

6.7 Limitations and Further Research

As discussed in Chapter 1.5, the conclusions of inductive research are only as strong as the evidence on which they are based. This research, being cross-cultural and (relatively) time and resource constrained, is not sufficient for firm conclusions. This research is exploratory and more work needs to be done to add support to these conclusions. The research contains some unavoidable biases that need to be addressed.

6.7.1 Pitfalls of Cross-Cultural Research and Other Potential Biases

As discussed in Chapter 4, there are many potential pitfalls related to cross-cultural research, research in a different language and social setting. The potential for errors related to misunderstandings, poor translation or biases specific to cross-cultural research (discussed below) is greatly increased.

In a qualitative research project such as this, it is important to identify any biases the researcher may hold (Janesick 1998). There are many biases that may occur in qualitative research projects, and some that may occur exclusively in research into poverty or international research. General biases that must be examined in all research projects include conceptual, theoretical, and normal biases. Cultural biases specific to international or cross-cultural research

must be considered, as must anti-poverty biases (Mitchell 2002) when researching areas that include or affect poor people.

Conceptual bias can be defined as bias “caused by the classification of data under preconceived concepts” (van Leusen 2002: p. 4-5) and mutually exclusive classes, as well as by the tendency of researchers to only study parts of the situation that they believe is interesting or relevant. These biases are hard to eliminate completely as when tackling a broad question some direction and classification is needed (Kelle 1997), but it is important to acknowledge them at the onset. I attempted to approach my literature review with an open mind. However, once the five characteristics emerged, I chose to risk some conceptual bias in my research in order to focus this research on areas that the results of my literature review suggested might be important.

The theoretical biases present in this research stem from the theories on which this research is based. The adoption of Uphoff, Esman and Krishna’s (1998) characteristics of successful projects as a framework for the literature review may have introduced some bias, as might the adoption of the theories used to inform my conceptual model. Again, this is largely unavoidable, but it is important to acknowledge that such a bias may exist.

Normative biases will arise from the preconceptions and beliefs held by the researcher that the implementation of renewable energy is a desirable goal, and that rural communities can benefit from this process. Due to my background in a largely democratic Western culture, this project may contain some cultural biases regarding the importance and role of democracy and participation in community development initiatives that might conflict with ideas of officials and planners in China.

Mitchell (2002) identifies five biases as anti-poverty biases commonly held by Western researchers⁸⁹: *spatial biases*, where research focuses on areas that are easily accessible or near urban areas; *temporal biases*, where research is usually performed at times of year when weather is most comfortable for the researcher (i.e. in the dry and cool seasons); *people biases*, where researchers focus specifically on officials and elites rather than the poor, and on men rather than on women; *project biases*, where research is focused on officially supported and recognized activities rather than informal activities; and *diplomatic biases*, where outsiders avoid examining issues that are deemed to be offensive or sensitive to officials of the host country.

All of Mitchell’s biases apply to this study to varying degrees. Because of the constraints imposed by the terrain and transportation network in Hainan, my research focused by necessity on areas that were close to urban areas. Temporal biases do apply, but more as a result of the schedule of the Masters program at the University of Waterloo than any weather-related

⁸⁹ These biases seem to be dangers in any international research, so I have chosen to discuss them here despite the fact that my research does not focus on poverty.

phenomena. The fact that I only visited Cang Dong's biogas project for a period of three months immediately after it opened may introduce a slight temporal bias to my results. A people bias was a risk, but I ended up with a fairly representative distribution of officials and villagers, and relatively equal gender distribution (55% Male, 45% Female). As my research focused on a government project, I believe that I avoided most sources of project bias, but this is hard for me to determine. Finally, as a guest in another country, diplomatic bias can sometimes be hard to avoid. However, the project in Cang Dong was a demonstration project for the local government (and therefore not likely to be deemed sensitive), and I did not purposefully avoid investigating any issues because I deemed them sensitive or offensive.

6.7.2 Directions for Future Research

The exploratory case study described in this thesis only begins to examine the broad question of what influences the success of a community renewable energy project. Replication through the investigation of additional case studies—including unsuccessful community renewable energy projects—would continue to shed light on this topic. I do not believe that the application of this research is confined to the Chinese context, and future studies in different cultural contexts would enhance the generaliseability of these findings.

On a different topic, during a break in my field work I spent two weeks at Christmas on an island in Southern Thailand. On Boxing Day, 2004 Southeast Asia was rocked by a tsunami, wreaking devastation along the coastline of the Pacific Rim nations. Thankfully the island I was on was in the Gulf of Thailand, sheltered from the waves by the Thai/Burmese Peninsula. As the weeks and months passed since the tsunami, international aid has flowed in and communities have pulled together to repair the damage done and to rebuild their shattered lives (AP, 2005c). It struck me that in times of recovery from major traumatic events like tsunamis or conflict many of the characteristics of communities that are conducive to successful community energy projects may be augmented. Sense of community and the value of social networks (social capital) often grows (Shaw and Goda 2004); capital that may otherwise not be available will suddenly become available in the form of international aid, the donation of equipment, and even the presence of technical experts who are contributing to the rebuilding process. I am not suggesting that we view these disasters as strokes of good luck, but rather that—in the recovery after traumatic events like the tsunami of December 2004, when energy infrastructure such as electricity networks may need to be rebuilt or replaced—the conditions may be ripe for successful decentralized community renewable energy projects. Rather than repairing or rebuilding the old infrastructure, a more efficient (and sustainable) method of providing energy services to those areas may be to invest in community renewable energy facilities that would provide local users with the energy services previously provided by the old energy system. This approach may also

have the advantage of being faster to implement, and would also ensure that any revenue generated from the sale of the energy services would remain in the local economy (rather than going to the centralized energy generator), thereby speeding the recovery of the local economy. An interesting avenue of future research would be to examine the relative importance of the community characteristics proposed in this thesis in the implementation and continuance of rebuilding operations following some form of disaster.

6.8 Conclusion

As renewable energy technologies fight to gain wider market acceptance, their modular and relatively environmentally benign nature make many of these technologies ideally suited for economically competitive deployment in remote or rural areas. If renewable energy projects can succeed and compete with conventional alternatives in rural or remote areas, their cause in less rural and less remote areas can only be helped. At the same time, energy provision in rural areas can improve the quality of life for residents and boost economic development. In countries like China, community-scale renewable energy projects have the potential to address two pressing concerns (rural/urban inequity and worsening environmental conditions). As the carbon emissions reductions required by the Kyoto Protocol come into effect, many countries will be looking to invest some of their official development assistance in community renewable energy projects that meet the guidelines of Kyoto's clean development mechanisms. All of these reasons for pursuing successful community renewable energy projects could be well served by a fuller understanding of the characteristics of a community that help those types of project succeed. That understanding is what this thesis seeks. The five characteristics discussed in this thesis—while not an exhaustive list—have the capacity to positively influence the success of community renewable energy projects as was demonstrated in Cang Dong.

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Appendix 1

Interview questions for Community Members

1. Tell me about yourself (reminder of confidentiality)
 - 1.1. Name, Age, Ethnicity (if appropriate), Marital Status
 - 1.2. Do you have any children?
 - 1.2.1. Do they live with you in the home (dependents)
 - 1.3. Years in community & years expected to remain in community
 - 1.4. Occupation
 - 1.5. Level of education
 - 1.6. Yearly income (range)
 - 1.7. Do you own your home?
 - 1.8. Are you involved in any community associations or clubs?
 - 1.9. Did you vote in the last election?
 - 1.10. Please tell me about your community:
 - 1.10.1. Buckner's scale of community cohesion (for villagers, not leaders)...
 - 1.10.2. Has your community done any communal or cooperative projects in the past?
 - 1.10.2.1. Do you feel that your experience with those past projects helped with this one?
 - 1.10.3. Has your community had any experience with innovation (technical and otherwise)?
 - 1.10.3.1. Do you feel that your experience with those past projects helped with this one?
 - 1.11. How long do you expect to remain in this community?
 - 1.12. How are your relationships with your neighbours?
 - 1.12.1. First name basis?
2. Please tell me about your community's energy project.
 - 2.1. Desired information:
 - 2.1.1. Identify actors (Community, Implementing Organizations, Project)
 - 2.1.2. What was your role (if any)?
 - 2.1.3. Where (from whom? what organization?) did the idea for this energy project arise?
 - 2.1.4. Who motivated and spearheaded the implementation of this project?

- 2.1.5. How many households have been affected?
- 2.1.6. How were the energy services provided by the renewable energy project provided before the project was implemented? How has that changed since implementation?
- 2.1.7. What has been the effect (if any) on the local environment?
- 2.1.8. What was the cost, what is the income (or savings in other costs) associated with the project?
- 2.1.9. How has the project affected the community's economy?
- 2.1.10. Do community members believe that their input on the planning and implementation of this project was sought out, seriously considered and used? Why or why not?
- 2.1.11. What institutions / organizations / individuals were influential or important in this project (any stage)?
 - 2.1.11.1. Why do you think they were important.
- 2.2. Do you feel it has been a success?
 - 2.2.1. What criteria do you use to decide whether it has been a success?
 - 2.2.1.1. Prompts: Economic? Social? Environmental?
- 3. Questions from P1:
 - 3.1. When the project began, what were its goals?
 - 3.1.1. Tangible and intangible (e.g. "to improve nrg services, AND to install biogas in every household)
 - 3.1.2. Do you feel these goals reflected the needs of your community?
 - 3.2. Were these goals achieved?
 - 3.2.1. How were they achieved / why weren't they?
 - 3.3. Did these goals change during the course of the project?
- 4. Questions from P2:
 - 4.1. What were the main stages / tasks of the project?
 - 4.2. What resources were required for these stages and projects?
 - 4.3. Were these resources readily available?
 - 4.4. Where did the resources come from?
 - 4.5. Were there any resources needed that weren't anticipated?
 - 4.6. Were there any resources that were unexpectedly helpful (even if not necessary)?
 - 4.7. How did you decide ahead of time what resources you would need?

5. Questions from C1:
 - 5.1. What were your community's needs?
 - 5.1.1. How did you determine those were your needs?
 - 5.2. In retrospect, were your needs accurately assessed?
 - 5.2.1. (i.e. did the project fill the needs expressed, but not the actual needs)
 - 5.3. Did the project address/fill the needs expressed?
 - 5.3.1. why (not)? O.E.
 - 5.4. Did your understanding of your needs change as the project progressed?
 - 5.5. Did how you assess whether your needs changed as the project progressed?

6. Questions from C2:
 - 6.1. Did you express the needs of your community to the I.O.
 - 6.2. How did you express the needs of your community (descriptive)? O.E.
 - 6.3. How effective does the interviewee think the methods of expressing your needs were during the project?
 - 6.4. In your opinion, why were those methods (not) effective? O.E.
 - 6.4.1. prompt: past experience, s.o.c, t.c, etc.
 - 6.5. Who was influential in expressing these demands?
 - 6.5.1. Why were they so influential?
 - 6.6. Did your means of demand expression change during or after the project?
 - 6.7. Would you do anything differently if a similar project was initiated?

7. Questions from I1:
 - 7.1. In your opinion, how did [implementing organization] succeed at this project? (prompt with technical capital questions)
 - 7.2. Did [implementing organizations] have all the skills and knowledge they needed before the project began, or did they need to acquire new skills and resources as the project progressed? What were they?
 - 7.2.1. Prompt with tasks outline in section 4
 - 7.3. Would you do anything differently when interacting with [implementing organization] if you were to undertake a similar project?

8. Questions from I2:
 - 8.1. Who was your community's primary contact in [implementing organization]?
 - 8.2. Who in the community was the primary contact for the [implementing organization]?
 - 8.3. From your knowledge, how did [implementing organization] make their decisions?

- 8.4. Do you feel that [implementing organization]'s decision-making process was effective in this project?
 - 8.5. Do you feel that that decision-making process took your community's needs and opinions into account?
 - 8.6. Did the decision making process change during the course of the project?
 - 8.6.1. Why?
 - 8.7. If you could, would you have changed anything about the decision-making process of [implementing organization]?
-
9. Snowball sampling
 - 9.1. Can you think of anyone I should talk to in relation to this project?

Interview questions for Members of Implementing Organizations

1. Tell me about yourself (reminder of confidentiality)
 - 1.1. Name, Age, Ethnicity (if appropriate), Marital Status
 - 1.2. Occupation / Position in Organization
 - 1.3. Level of education
 - 1.4. Please tell me about your organization
 - 1.4.1. How many offices, employees, etc.
 - 1.4.2. Would you describe your organization as a small-, medium- or large-sized organization?
 - 1.4.2.1. What criteria do you use to make that description?
 - 1.4.3. Has your organization worked on any similar (village level) projects in the past?
 - 1.4.3.1. Do you feel that your experience with those past projects helped with this one?
 - 1.4.4. Has your organization had any experience with innovative projects (technical and otherwise – e.g. community level, first large scale biogas digester, first use of new technology, etc.)?
 - 1.4.4.1. Do you feel that your experience with those past projects helped with this one?
2. Please tell me about the energy project.
 - 2.1. Desired information:
 - 2.1.1. Identify actors (Community, Implementing Organizations, Project)
 - 2.1.2. What was your role (if any)?
 - 2.1.3. Where (from whom? what organization?) did the idea for this energy project arise?
 - 2.1.4. Who motivated and spearheaded the implementation of this project?
 - 2.1.5. How many households have been affected?
 - 2.1.6. How were the energy services provided by the renewable energy project provided before the project was implemented? How has that changed since implementation?
 - 2.1.7. What has been the effect (if any) on the local environment?
 - 2.1.8. What was the cost, what is the income (or savings in other costs) associated with the project?
 - 2.1.9. How has the project affected the community's economy?

- 2.1.10. Do community members believe that their input on the planning and implementation of this project was sought out, seriously considered and used?
Why or why not?
- 2.1.11. What institutions / organizations / individuals were influential or important in this project (any stage)?
 - 2.1.11.1. Why do you think they were important.
- 2.2. Do you feel it has been a success?
 - 2.2.1. What criteria do you use to decide whether it has been a success?
 - 2.2.1.1. Prompts: Economic? Social? Environmental?
- 3. Questions from P1:
 - 3.1. When the project began, what were its goals?
 - 3.1.1. Tangible and intangible (e.g. "to improve nrg services, AND to install biogas in every household)
 - 3.1.2. Do you feel these goals reflected the needs of the community?
 - 3.2. Were these goals achieved?
 - 3.2.1. How were they achieved / why weren't they?
 - 3.3. Did these goals change during the course of the project?
- 4. Questions from P2:
 - 4.1. What were the main stages / tasks of the project?
 - 4.2. What resources were required for these stages and projects?
 - 4.3. Were these resources readily available?
 - 4.4. Where did the resources come from?
 - 4.5. Were there any resources needed that weren't anticipated?
 - 4.6. Were there any resources that were unexpectedly helpful (even if not necessary)?
 - 4.7. How did you decide ahead of time what resources you would need?
- 5. Questions from C1:
 - 5.1. What were the community's needs?
 - 5.1.1. How did you determine those were the community's needs?
 - 5.2. In retrospect, were their needs accurately assessed?
 - 5.2.1. (i.e. did the project fill the needs expressed, but not the actual needs)
 - 5.3. Did the project address/fill the needs expressed?
 - 5.3.1. why (not)? O.E.
 - 5.4. Did your understanding of your needs change as the project progressed?

- 5.5. Did how you assess whether their needs changed as the project progressed?
6. Questions from C2:
- 6.1. Did the community express their needs to your organization?
- 6.2. How did they express their needs (descriptive)? O.E.
- 6.3. How effective were the community's method expressing their needs?
- 6.4. In your opinion, why were those methods (not) effective? O.E.
- 6.4.1. prompt: past experience, s.o.c, t.c, etc.
- 6.5. Who was influential in expressing these demands?
- 6.5.1. Why were they so influential?
- 6.6. Did the community's means of demand expression change during or after the project?
- 6.7. Would you want anything different from the community if a similar project was initiated?
7. Questions from I1:
- 7.1. In your opinion, how did your organization succeed at this project? (prompt with technical capital questions)
- 7.1.1. i.e. What about your organization allowed them to succeed...(don't ask, but answer it...)
- 7.2. Did your organization have all the skills and knowledge they needed before the project began, or did they need to acquire new skills and resources as the project progressed? What were those skills?
- 7.2.1. Prompt with tasks outline in section 4
- 7.3. In terms of competencies, would you do anything differently if you were to undertake a similar project?
8. Questions from I2:
- 8.1. Who was your primary contact in the community?
- 8.2. Who in your organization was the primary contact for the community?
- 8.3. How did your organization make their decisions?
- 8.4. Do you feel that your organization's decision-making process was effective in this project?
- 8.5. Do you feel that that decision-making process took the community's needs and opinions into account?
- 8.6. Did the decision making process change during the course of the project?
- 8.6.1. Why?

8.7. If you were to do it again, would you change anything about the decision-making process of your organization?

9. Snowball sampling

9.1. Can you think of anyone I should talk to in relation to this project?

Appendix 2

Interview questions for Villagers (January, 2005)

1. What were your community's needs when the biogas project started?
2. Do you feel that the project addressed any of these needs?
3. How has (Has?) the project had any effect on the local economy?
4. What was your role (if any)
5. Who motivated or spearheaded the implementation of this project / the complaints about the pollution? What individuals or organizations were influential in this project?
6. Do you think that villager's input about this project was sought out, considered and used?
7. What has been the role of the local government (City, township, and village) in the successes of the village?
8. Tell me about the election in October
9. How do the governments communicate with you?
10. (If necessary) What do you think about the quality of government in this village?

Appendix 3

Adjusted Buckner Neighbourhood Cohesion Instrument (Buckner 1988)

Please identify how strongly you agree with the following statements on a scale of 1 to 5, where 1 indicates that you strongly disagree with the statement, and 5 indicates that you strongly agree:

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree
	1		2		3		4		5
1. Overall, I am very attracted to living in this village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
2. I feel like I belong in this village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
3. I visit with my neighbours in their homes.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
4. The friendships and associations I have with other people in my village mean a lot to me.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
5. Given the opportunity, I would like to move out of this village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
6. If the people in my village were planning something I'd think of it as something "we" were doing rather than "they" were doing.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
7. If I needed advice about something I could go to someone in my village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
8. I think I agree with most people in my village about what is important in life.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
9. I believe my neighbours would help me in an emergency.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
10. I feel loyal to the people in my village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
11. I borrow things and exchange favours with my neighbours.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
12. I would be willing to work together with others on something to improve my village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
13. I plan to remain a resident of this village for a number of years.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
14. I like to think of myself as similar to the people who live in this village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
15. I rarely have neighbours over to my house to visit.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
16. A feeling of fellowship runs deep between me and other people in this village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
17. I regularly stop and talk with people in my village.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
18. Living in this village gives me a sense of community.	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Translated Buckner Neighbourhood Cohesion Instrument

Unfortunately, University regulations do not allow the submission of an Environmental Studies thesis with a Chinese language section. For this reason, the translated Buckner Neighbourhood Cohesion Instrument is not included in this appendix. If you would like a copy of the translated instrument, please contact the author.

Appendix 4

Recruitment Letter:

November, 2004

Dear Community Resident:

I am a Masters student in the Department of **Environment and Resource Studies** at the University of Waterloo in Canada conducting research under the supervision of Professor ***Ian Rowlands*** on successful community renewable energy projects. Specifically, I am interested in why your community has succeeded with their biogas digester. As you know, renewable energy is an increasingly viable method of rural electrification, as ecovillages in rural Hainan have demonstrated. As a resident of one such ecovillage, your opinions and recollections may be important to this study. I would appreciate the opportunity to speak with you about your experience on this topic.

With the permission of your village leader, I plan to conduct this research as an informal interview in your village on the _____ at approximately _____. If this time is inconvenient for you, I would be happy to arrange another time. Your involvement in this interview is entirely voluntary and there are no known or anticipated risks to participation in this study. If you agree to participate, the survey should not take more than one to two hours. Participants are free to withdraw from the study at any time. The questions are general questions about your perception of your community and your experiences with the community energy project. You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and will be grouped with responses from other participants. Further, you will not be identified by name in any thesis, report or publication resulting from this study. The data collected will be kept for a period not longer than 5 years in my office at the University of Waterloo in Canada.

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact Professor ***Rowlands*** at 1-519-888-4567, Ext. 2574.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics. However, the final decision about participation is yours. Should you have comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at 1-519-888-4567, Ext. 6005 (Email: ssykes@uwaterloo.ca).

Thank you in advance for your interest in this project.

Yours sincerely,

Ben Greenhouse
University of Waterloo
Faculty of Environmental Studies
Canadian Number: 001-519-780-2172
Local Number: 13118968709
bcgreenh@fes.uwaterloo.ca

Participant Feedback Letter:

Dear community member,

I would like to thank you for your participation in this study. As a reminder, the purpose of this study is to examine characteristics of communities which have successfully implemented community energy projects.

The data collected during interviews will contribute to a better understanding of the characteristics of communities that increase the likelihood of a successful community renewable energy project. This information can help investors, planners and designers in the design and implementation of new renewable energy projects.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or if you have any questions or concerns, please contact me at either the phone number or email address listed at the bottom of the page. If you would like a summary of the results, please let me know now by providing me with your email address. When the study is completed (predicted for the summer of 2005), I will send it to you.

As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at 1-519-888-4567, Ext., 6005 (Email: ssykes@uwaterloo.ca).

Thanks again for your participation.

Sincerely,

Ben Greenhouse

University of Waterloo
Department of Environment and Resource Studies

001-519-888-4567, ext. 2789
13118968709 (in Hainan)
bcbgreenh@fes.uwaterloo.ca

Appendix 5 - Case Study Protocol

Overview of the project

Project Objectives

The objective of this project is – at the largest scale - to complete the research requirements towards the completion of a Masters of Environmental Studies at the University of Waterloo. At a smaller and more relevant scale, the objective of this project is to investigate what characteristics of a community and area are conducive to successful implementations of community energy projects. The project is being undertaken in Hainan province, China with funding provided by Ecoplan China, a project sponsored by the University of Waterloo, the Canadian International Development Agency (CIDA), and the Hainan Department of Lands, Environment and Resources (HDLER).

Successful implementations of community renewable energy projects are in many ways similar to other community development projects such as rural development projects focused on agriculture (e.g. irrigation projects, green revolution extensions, etc.), or community health initiatives (e.g. establishment of a new clinic). Like these development projects, community implementations of renewable energy will require a strong degree of cooperation in the community, and strong leadership from within the community to facilitate that cooperation and represent the community to external actors such as central government or international NGOs (if applicable). Additionally, the implementation of community energy projects – depending on the energy technology used – may require the adoption of new technologies or ideas. In many ways this process of adoption is similar to the transition of agricultural practices that occurred in many rural communities during the green revolution. If the adoption of new technologies or ideas is required, then – as in the green revolution – the success of the project will depend on the acceptance of those technologies and ideas by the community. What characteristics of a community can foster these enabling qualities, qualities such as high levels of community cooperation, strong leadership, and ease of adoption of new innovations? Answering this question will require a thorough examination of the practical and theoretical literature in the fields of community development, political ecology, and diffusion of innovations, among others.

The result of such a review – documented more thoroughly in Chapter 2 of the thesis – reveals that there are five broad characteristics of communities that can foster successful implementations of community renewable energy projects. These characteristics are presented below (in no particular order of importance), along with the more concrete characteristics that operationalize the broader concepts:

1. A large stock of social capital and a strong sense of community;
2. Effective leadership from local government and local organizations;
 - a. Degree of decentralization (local power)
 - b. Quality of Leadership & Institutions
 - c. Community Values

3. Experience with innovation and cooperation, and a high level of technical resources;
 - d. Community History of Innovation and Cooperation
 - e. Technical capital (skilled people, education opportunities and levels)
4. Appropriate macro- and micro-economic environments;
 - f. Price of alternative source of energy services
 - g. Governmental policies around infrastructure/community development programs
 - h. Incentives for cleaner energy development (local, national or international)
5. Biophysical resources appropriate to the technologies being used.

Maximizing the “fit”

The aims of community development projects are often diverse. Some projects emphasize economic development, others technological improvement, and still others focus on improving social inequities in a community. These various aims are all united by their common goal of improving the quality of life in a community. Regardless of its aim, any project’s chances of success in a given community will depend on the relationship between the project’s implementing organization and that community. Figure 1.1 identifies the two main actors (the community, and the implementing organization) in community development and how they interact with each other and the development project itself. Community development projects will succeed more often if they seek to maximize the “fit” of three important interactions (Korten 1980):

4. the fit between the needs of the community and the benefits delivered by the program (#1 in figure 1.1),
5. the fit between the project itself and the competencies of the implementing organization (#2 in figure 1.1), and
6. the fit between the means by which the community expresses their needs and the process by which the implementing organization makes their decisions (#3 in figure 1.1).

The three interactions identified above each depend on different qualities of the two actors and the characteristics of the project itself. Broadly speaking, the character of the community will affect the first and third interactions, while the second interaction will be largely affected by the nature of the specific project and the make-up of the implementing organization. If – as in many cases – the project is being implemented by a community organization or local government, the character of the community will also have an effect on the character of the implementing organization. Although the relationships between the actors and the project are relatively clear, the exact nature of a community, project or organization that would be conducive to a successful project is not a static, clearly definable entity. Each one is contextual and relative, changing as the others change; what is important is how the actors and the project interact and relate. While noting the shifting nature of characteristics of communities, organizations and projects conducive to successful rural development, Korten (1980) suggests that successful projects will be implemented by organizations that are able to embrace mistakes, learn from them, and adapt the project

to reflect lessons learned during the course of implementation. Korten calls this approach of identification, assessment and adaptation the “learning process” approach.

This project will use Korten’s concept of “maximizing the fit” as a starting point from which to investigate the specific characteristics of communities that make them successful at energy projects. Interviews will proceed with key members of each of the two actors displayed in figure 1.1, and key people involved in the project who do not belong to either of the two actor organizations. Questions will probe the nature of the interactions between these actors and the project with the specific aim of discovering whether any of 6 characteristics described above were seen as important through the eyes of people involved in the project.

Field Procedures

Presentation of Credentials / Paperwork

See attached letter from HDLER.

Access to the Sites

Ideally the researchers will stay at the site, otherwise we will arrange with the village leaders the protocol we should observe when arriving at the village (do we check in with him or her, can we just go on in, etc.).

General Sources of Information

In general we will be looking for information directly from people who have experience with the energy project. This includes (theoretically) all residents of the village, village leaders, and any outside individuals (e.g. county/city government, township government, technical specialists, etc.) who have played a role in the project. Other sources may include government records, newspaper/media reports, and visual observation.

During our interviews we will rely on interviewees to provide us with names of other people who might be helpful to our study. This technique is referred to as *snowball sampling* since we gather interviewees as we interview people – like a snowball rolling down a hill gathers more snow as it rolls, that snow gathers more snow, and so on. This is much more important at the government levels, although the village citizens may direct us to people of interest who were not pointed to by the government (e.g. critics or people who opposed the project). When interviewing residents of the village, we will strive to pick a random sample out of the total population in the hopes that that sample is representative of the population as a whole. To clarify this concept, you may want to refer to the Palys textbook (Palys 2003), which Ben can provide. In order to do a proper random sample, we will require a list of all the people in the village, called a *sampling frame*. The most likely source of this information is be the village leader, and may be in the form of voter records. **Obtaining such a sampling frame is one of our earliest tasks and priorities.**

Transect Walks

To gain a sense of the village and how it is perceived by actors in the village, we will take transect walks with the village leader and one or two other actors (ideally at least one other village resident, and maybe a person involved in the construction of the energy project).

Procedural Reminders

Schedule

The fieldwork in Chang Dong will be undertaken in the last two weeks of November, 2004, and in January, 2005. Although the schedule must be flexible in order to allow for unexpected discoveries leading to new interviews, the general schedule is to interview government and project leaders and officials in November, and to focus on village residents and their perceptions in January. It is important that we have the flexibility to explore new areas of interest that turn up as a result of our previous investigation, so we may end up interviewing (or re-interviewing) some of the officials in the township or village in January. A tentative schedule for the fieldwork is included in the Appendix.

Paperwork

All paperwork generated from interviews and fieldwork in general should be given to the lead researcher (Ben Greenhouse). If you wish to keep your copies you must discuss this with Ben. The paperwork will be filed according to a numbering scheme that identifies the respondents only through the use of a participant table that Ben will keep stored in his field notes, separate from the paperwork. After each interview, the paperwork will be gathered and placed in one folder along with all relevant ethics forms and field notes. A checklist (see appendix) should be referenced to ensure that all details are addressed.

Anonymity & Ethics

In the ethics letters provided to each participant, we have guaranteed each respondent that their identity will be kept anonymous throughout the study. Any research assistants or translators should have signed a confidentiality agreement and are bound by that agreement. In order to maintain anonymity, we will assign each respondent a number and that number will be attached to all data or responses emanating from them. Ben will keep the identification tables (relating names to numbers) on his person (separate from the collected data), and will ensure that they are kept confidential and destroyed at an appropriate time (as detailed in the ethics forms). It is crucial that anonymity is maintained throughout the research process, even if the respondents seemingly have no desire for anonymity. Certain respondents – such as the village leader – will be virtually impossible to keep anonymous, but all effort will be taken, and the position of people in recognizable positions will not be mentioned in the final report unless it is deemed absolutely necessary. Similarly, we have assured each respondent that they can refuse to answer any questions which they do not wish to answer. It is very important that you respect

their wishes if they refuse to answer a question. This importance does not mean that we should not encourage the interviewee to remember events or to answer more completely, but if they clearly indicate that they do not wish to answer a question, that wish should be immediately respected.

Role of the Translator

It is important that the role of the translator is properly understood. The translator is a key actor in the research process as they act as the “ears” of the researcher. Because of their knowledge of the culture, they will often act as the “eyes” as well, helping the researcher to interpret or understand on a deeper level the significance of items and actions that may be observed. While not diminishing the intelligence or perception of the individual acting as translator, it is important that the translator remember that it is the researcher who is doing the research and all questions and observations must come from the researcher. If the translator believes that something important is being overlooked, they should mention that to the researcher and the researcher can decide what course to take, either through discussion with the translator or on their own. In my experience, translators often assume that they know what the researcher is trying to find out (and in most cases they surely do), and will question the interviewee to clarify answers before translation. I have had experiences where translators will talk with an interviewee for close to ten minutes before a 2 minute translation. Despite the best of intentions on the part of the translator, this situation is not acceptable. The researcher must be the person asking for clarification, or at least know what the original response was and why clarification was requested or needed. Often subtle comments or strange answers hold important clues for the researcher that may only be apparent to the researcher or even only after more research has been conducted. For this reason (among others) it is important that the researcher know as many details of the answer as is practical. The translator should not act as an “interpreter” (i.e. interpreting what the person is meaning to say), but as a translator, translating verbatim (or as close as possible) what the respondent is saying. If the researcher needs help interpreting the answer, he or she can ask for such interpretation.

If an interviewee is taking a long time to answer a question, it is very appropriate for the translator to politely interrupt in order to translate the answer given so far before allowing the response to continue. Good translators are able to manage the conversation in such a way as to keep the respondent engaged in answering the question, but allowing the researcher to follow along as the answer is given.

If possible, the translator should take notes as the answer is given, both to help with the translation, and to provide a written record of the interview. The researcher will be taking notes of the translation, but it is ideal to also have a written record of the actual answer in its original language for future reference.

The translator is the most critical actor in a research project conducted in a language other than the researcher’s own. Given that the translator will be working in a foreign language, there inevitably will arise situations where the translator misunderstands or doesn’t understand the researcher. If the

translator has a question or needs clarification on a point or question made by the researcher, it is crucial that they feel comfortable asking and keep asking until they fully understand what the researcher is saying or asking. Keep in mind that the researcher has had many months (even years!) to think about and reflect on issues that may be new to the translator. Asking for clarification is not a sign of ignorance or lack of intelligence, but a sign that the translator is striving to do the best work possible. It is preferable that the translator asks too many questions and understands the material rather than asking fewer questions while not fully understanding.

Case Study Questions

The central research question of this study asks “what characteristics of a community are conducive to the successful implementation of community energy projects”? As described above, several characteristics of communities that have had success with community projects have been derived from the literature and are hypothesized to be of importance in the case of community energy projects. In order to structure our inquiry into whether these hypotheses are true, I have assumed that Korten’s (1980) schematic representation of the relationships between actors in a community development project (Figure 1.1) is an accurate representation of the relationships in such projects, and that the relationships between the three need to “fit” as well as possible. Our questions therefore probe the nature of these relationships and why the respondents believe that the relationships were “well-fitted” or not. My hope is that respondent’s answers to these questions will clarify whether the 6 proposed characteristics were indeed influential in determining the success of the community energy project.

Level 1

Level 1 questions are the questions we will ask of specific interviewees (Yin 2003). These questions are represented in figure 1.2 along with potential interview subjects. In addition to those questions shown in figure 1.2, we will ask basic demographic questions about the respondent (age, gender, time spent in village, etc.) and the energy project. The appendices contain guidelines for interviews with community members and members of the implementing organization (respectively), and contain these more specific questions. Finally, a small questionnaire will be administered to all community residents (orally if they are not literate) to roughly gauge the sense of community in the village. That questionnaire is attached in the appendices.

Level 2

Level 2 questions are questions asked of the individual case – what we are striving to answer when we look at this particular case (Yin 2003). These questions include:

1. Was this energy project a success?
2. Why do people think it was a success?
3. What is it about the community that made the project a success?

4. What was the nature of the working relationships between the community, the implementing organization and the project itself?
5. What was it about those relationships that made the project successful?
6. What about the community helped those relationships succeed?

Other Data Collection Devices

Table 1.1 is a “table shell” that allows researchers to check off areas that they think have been covered in the interviews. This is not a definitive response (i.e. they may believe they have covered a topic but later realize they did not), and as such we should strive to have at least 3 or 4 different sources addressing that characteristic before research is concluded. If 3 or 4 sources cannot be found, the team should look at revising their expectations and attempting to see what different conclusions are emerging from the collected data and whether those new directions should be incorporated into the interview questions. Researchers can use table 1.1 for each interview, but should remember to keep one for the entire study (one interview cannot reasonably be expected to touch on all the theoretical points).

Tables & Figures

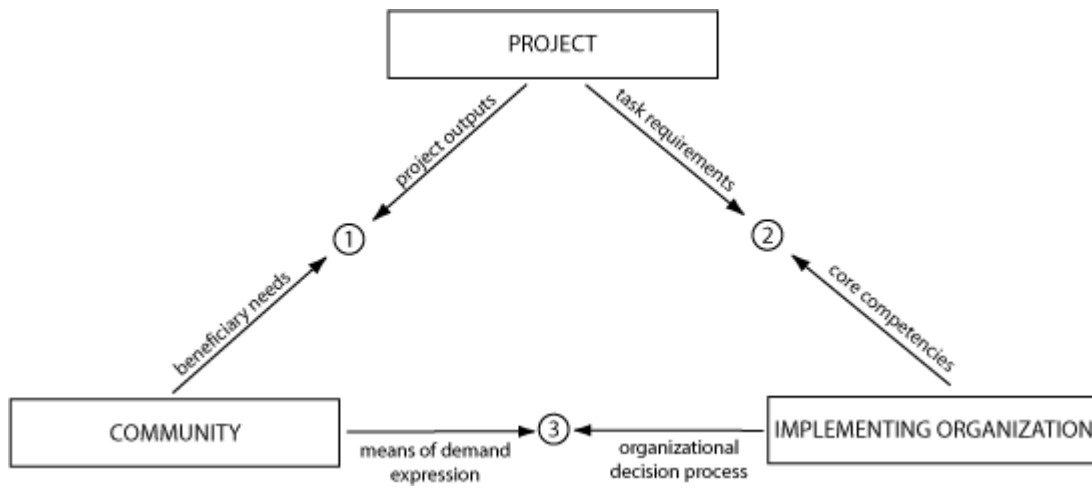


Figure 1.1: Schematic Representation of Fit Requirements (Adapted from Korten 1980:495)

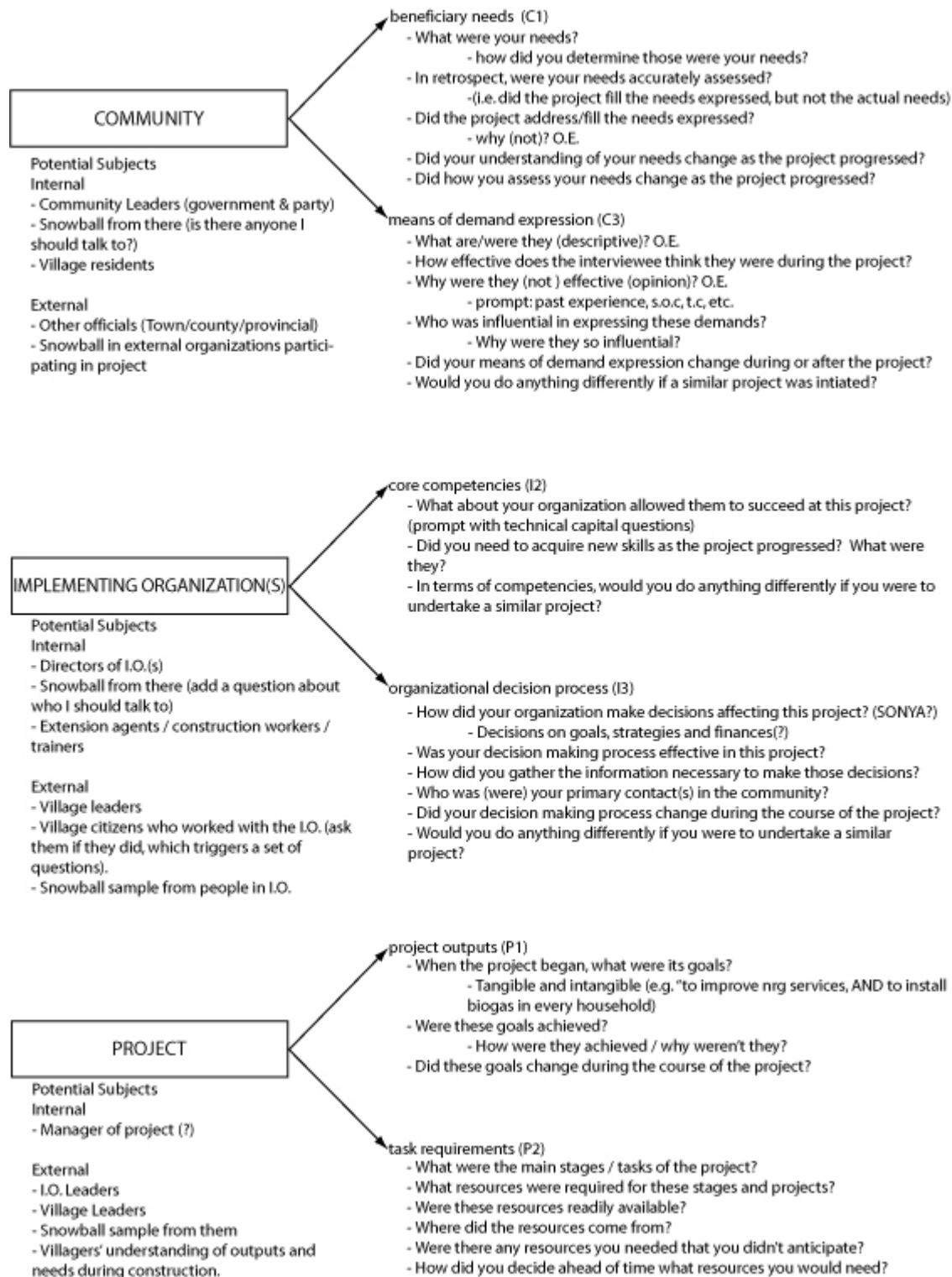


Figure 1.2: Level 1 questions and their respondents

Table 1.1 Table Shell for Data Collection

	Social Capital and Sense of Community		Clearly established and shared community values and norms; and government and institutions that represent those values and norms			Experience with innovation & cooperation, technical capital		Appropriate biophysical resources	-Appropriate economic environments
	Social Capital	Sense of Community	Decentralization	Leadership / Institutions	Community Values	Innov. & Coop. / Community History	Technical Capital		
Objectives / Themes									
Primary Data									
Secondary Data									
Observations									

Appendix 1

Demographic Data Sheet

Respondent ID: _____

Age: _____

Gender: _____

Ethnicity (if Applicable): _____

Marital Status: _____

Children: _____

Dependents: _____

Years in Community: _____

Years expected to remain in Community: _____

Occupation: _____

Level of Education: _____

Yearly Income: Y 0-2000 | Y 2000-4000 | Y 4000-6000 | Y 6000 +

Home Ownership: _____

Length of Home Ownership: _____

Appendix 2

Data Collection Checklist

Please make sure that all the boxes are checked before closing a file.

Location of Interview: _____

Date & Time of Interview Date: _____ Time: _____

Duration of Interview: _____

Interviewee ID: _____

Ethics letters displayed/given:	<input type="checkbox"/>
Name taken and interviewee code noted:	<input type="checkbox"/>
Demographic Datasheet:	<input type="checkbox"/>
Interview notes (or note the page numbers in field log):	<input type="checkbox"/>
Data Table:	<input type="checkbox"/>
Follow up letter sent/given:	Y / N
Copy of report requested?	Y / N
Copy of report sent?	Y / N
File Closed? (NB All boxes must be checked!):	<input type="checkbox"/>

Notes:

Appendix 3

Interview questions for Community Members

10. Tell me about yourself (reminder of confidentiality)
 - 10.1. Name, Age, Ethnicity (if appropriate), Marital Status
 - 10.2. Do you have any children?
 - 10.2.1. Do they live with you in the home (dependents)
 - 10.3. Years in community & years expected to remain in community
 - 10.4. Occupation
 - 10.5. Level of education
 - 10.6. Yearly income (range)
 - 10.7. Do you own your home?
 - 10.8. Are you involved in any community associations or clubs?
 - 10.9. Did you vote in the last election?
 - 10.10. Please tell me about your community:
 - 10.10.1. Buckner's scale of community cohesion (for villagers, not leaders)...
 - 10.10.2. Has your community done any communal or cooperative projects in the past?
 - 10.10.2.1. Do you feel that your experience with those past projects helped with this one?
 - 10.10.3. Has your community had any experience with innovation (technical and otherwise)?
 - 10.10.3.1. Do you feel that your experience with those past projects helped with this one?
 - 10.11. How long do you expect to remain in this community?
 - 10.12. How are your relationships with your neighbours?
 - 10.12.1. First name basis?
11. Please tell me about your community's energy project.
 - 11.1. Desired information:
 - 11.1.1. Identify actors (Community, Implementing Organizations, Project)
 - 11.1.2. What was your role (if any)?
 - 11.1.3. Where (from whom? what organization?) did the idea for this energy project arise?
 - 11.1.4. Who motivated and spearheaded the implementation of this project?
 - 11.1.5. How many households have been affected?
 - 11.1.6. How were the energy services provided by the renewable energy project provided before the project was implemented? How has that changed since implementation?

- 11.1.7. What has been the effect (if any) on the local environment?
- 11.1.8. What was the cost, what is the income (or savings in other costs) associated with the project?
- 11.1.9. How has the project affected the community's economy?
- 11.1.10. Do community members believe that their input on the planning and implementation of this project was sought out, seriously considered and used? Why or why not?
- 11.1.11. What institutions / organizations / individuals were influential or important in this project (any stage)?
 - 11.1.11.1. Why do you think they were important.
- 11.2. Do you feel it has been a success?
 - 11.2.1. What criteria do you use to decide whether it has been a success?
 - 11.2.1.1. Prompts: Economic? Social? Environmental?
- 12. Questions from P1:
 - 12.1. When the project began, what were its goals?
 - 12.1.1. Tangible and intangible (e.g. "to improve nrg services, AND to install biogas in every household)
 - 12.1.2. Do you feel these goals reflected the needs of your community?
 - 12.2. Were these goals achieved?
 - 12.2.1. How were they achieved / why weren't they?
 - 12.3. Did these goals change during the course of the project?
- 13. Questions from P2:
 - 13.1. What were the main stages / tasks of the project?
 - 13.2. What resources were required for these stages and projects?
 - 13.3. Were these resources readily available?
 - 13.4. Where did the resources come from?
 - 13.5. Were there any resources needed that weren't anticipated?
 - 13.6. Were there any resources that were unexpectedly helpful (even if not necessary)?
 - 13.7. How did you decide ahead of time what resources you would need?
- 14. Questions from C1:
 - 14.1. What were your community's needs?
 - 14.1.1. How did you determine those were your needs?
 - 14.2. In retrospect, were your needs accurately assessed?
 - 14.2.1. (i.e. did the project fill the needs expressed, but not the actual needs)

14.3. Did the project address/fill the needs expressed?

14.3.1. why (not)? O.E.

14.4. Did your understanding of your needs change as the project progressed?

14.5. Did how you assess whether your needs changed as the project progressed?

15. Questions from C2:

15.1. Did you express the needs of your community to the I.O.

15.2. How did you express the needs of your community (descriptive)? O.E.

15.3. How effective does the interviewee think the methods of expressing your needs were during the project?

15.4. In your opinion, why were those methods (not) effective? O.E.

15.4.1. prompt: past experience, s.o.c, t.c, etc.

15.5. Who was influential in expressing these demands?

15.5.1. Why were they so influential?

15.6. Did your means of demand expression change during or after the project?

15.7. Would you do anything differently if a similar project was initiated?

16. Questions from I1:

16.1. In your opinion, how did [implementing organization] succeed at this project? (prompt with technical capital questions)

16.2. Did [implementing organizations] have all the skills and knowledge they needed before the project began, or did they need to acquire new skills and resources as the project progressed? What were they?

16.2.1. Prompt with tasks outline in section 4

16.3. Would you do anything differently when interacting with [implementing organization] if you were to undertake a similar project?

17. Questions from I2:

17.1. Who was your community's primary contact in [implementing organization]?

17.2. Who in the community was the primary contact for the [implementing organization]?

17.3. From your knowledge, how did [implementing organization] make their decisions?

17.4. Do you feel that [implementing organization]'s decision-making process was effective in this project?

17.5. Do you feel that that decision-making process took your community's needs and opinions into account?

17.6. Did the decision making process change during the course of the project?

17.6.1. Why?

17.7. If you could, would you have changed anything about the decision-making process of [implementing organization]?

18. Snowball sampling

18.1. Can you think of anyone I should talk to in relation to this project?

Appendix 4

Interview questions for Members of Implementing Organizations

1. Tell me about yourself (reminder of confidentiality)
 - 1.1. Name, Age, Ethnicity (if appropriate), Marital Status
 - 1.2. Occupation / Position in Organization
 - 1.3. Level of education
 - 1.4. Please tell me about your organization
 - 1.4.1. How many offices, employees, etc.
 - 1.4.2. Would you describe your organization as a small-, medium- or large-sized organization?
 - 1.4.2.1. What criteria do you use to make that description?
 - 1.4.3. Has your organization worked on any similar (village level) projects in the past?
 - 1.4.3.1. Do you feel that your experience with those past projects helped with this one?
 - 1.4.4. Has your organization had any experience with innovative projects (technical and otherwise – e.g. community level, first large scale biogas digester, first use of new technology, etc.)?
 - 1.4.4.1. Do you feel that your experience with those past projects helped with this one?
2. Please tell me about the energy project.
 - 2.1. Desired information:
 - 2.1.1. Identify actors (Community, Implementing Organizations, Project)
 - 2.1.2. What was your role (if any)?
 - 2.1.3. Where (from whom? what organization?) did the idea for this energy project arise?
 - 2.1.4. Who motivated and spearheaded the implementation of this project?
 - 2.1.5. How many households have been affected?
 - 2.1.6. How were the energy services provided by the renewable energy project provided before the project was implemented? How has that changed since implementation?
 - 2.1.7. What has been the effect (if any) on the local environment?
 - 2.1.8. What was the cost, what is the income (or savings in other costs) associated with the

project?

- 2.1.9. How has the project affected the community's economy?
- 2.1.10. Do community members believe that their input on the planning and implementation of this project was sought out, seriously considered and used? Why or why not?
- 2.1.11. What institutions / organizations / individuals were influential or important in this project (any stage)?
 - 2.1.11.1. Why do you think they were important.
- 2.2. Do you feel it has been a success?
 - 2.2.1. What criteria do you use to decide whether it has been a success?
 - 2.2.1.1. Prompts: Economic? Social? Environmental?
3. Questions from P1:
 - 3.1. When the project began, what were its goals?
 - 3.1.1. Tangible and intangible (e.g. "to improve nrg services, AND to install biogas in every household)
 - 3.1.2. Do you feel these goals reflected the needs of the community?
 - 3.2. Were these goals achieved?
 - 3.2.1. How were they achieved / why weren't they?
 - 3.3. Did these goals change during the course of the project?
4. Questions from P2:
 - 4.1. What were the main stages / tasks of the project?
 - 4.2. What resources were required for these stages and projects?
 - 4.3. Were these resources readily available?
 - 4.4. Where did the resources come from?
 - 4.5. Were there any resources needed that weren't anticipated?
 - 4.6. Were there any resources that were unexpectedly helpful (even if not necessary)?
 - 4.7. How did you decide ahead of time what resources you would need?
5. Questions from C1:
 - 5.1. What were the community's needs?
 - 5.1.1. How did you determine those were the community's needs?
 - 5.2. In retrospect, were their needs accurately assessed?
 - 5.2.1. (i.e. did the project fill the needs expressed, but not the actual needs)
 - 5.3. Did the project address/fill the needs expressed?
 - 5.3.1. why (not)? O.E.
 - 5.4. Did your understanding of your needs change as the project progressed?

- 5.5. Did how you assess whether their needs changed as the project progressed?
6. Questions from C2:
 - 6.1. Did the community express their needs to your organization?
 - 6.2. How did they express their needs (descriptive)? O.E.
 - 6.3. How effective were the community's method expressing their needs?
 - 6.4. In your opinion, why were those methods (not) effective? O.E.
 - 6.4.1. prompt: past experience, s.o.c, t.c, etc.
 - 6.5. Who was influential in expressing these demands?
 - 6.5.1. Why were they so influential?
 - 6.6. Did the community's means of demand expression change during or after the project?
 - 6.7. Would you want anything different from the community if a similar project was initiated?
7. Questions from I1:
 - 7.1. In your opinion, how did your organization succeed at this project? (prompt with technical capital questions)
 - 7.1.1. i.e. What about your organization allowed them to succeed...(don't ask, but answer it...)
 - 7.2. Did your organization have all the skills and knowledge they needed before the project began, or did they need to acquire new skills and resources as the project progressed? What were those skills?
 - 7.2.1. Prompt with tasks outline in section 4
 - 7.3. In terms of competencies, would you do anything differently if you were to undertake a similar project?
8. Questions from I2:
 - 8.1. Who was your primary contact in the community?
 - 8.2. Who in your organization was the primary contact for the community?
 - 8.3. How did your organization make their decisions?
 - 8.4. Do you feel that your organization's decision-making process was effective in this project?
 - 8.5. Do you feel that that decision-making process took the community's needs and opinions into account?
 - 8.6. Did the decision making process change during the course of the project?
 - 8.6.1. Why?
 - 8.7. If you were to do it again, would you change anything about the decision-making process of your organization?
9. Snowball sampling

9.1. Can you think of anyone I should talk to in relation to this project?

Appendix 5

This survey has been used successfully in at least three different cultures - in urban Washington State (Buckner 1988), Northern Ontario (Robinson and Wilkinson 1995) and rural Venezuela (Zanetell and Knuth 2004). Zanetell & Knuth assumed that small villages are equivalent to urban “neighbourhoods” and modified Buckner’s original survey for village level studies by simply changing the word “neighbourhood” to “village”. I have followed the same logic here. Robinson and Wilkinson found that question 16 (“a feeling of fellowship”) caused confusion in their pilot surveys, and found that dropping the question didn’t make a huge difference. Zanetell & Knuth also dropped question 16, but dropped question 6 for unclear reasons. I believe it was because they were investigating community-based management of natural resources and thought it might interfere with their other questions. I plan to keep both in, but will drop question 16 if it becomes a source of confusion.

Adjusted Buckner Neighbourhood Cohesion Instrument (Buckner 1988)

Please identify how strongly you agree with the following statements on a scale of 1 to 5, where 1 indicates that you strongly disagree with the statement, and 5 indicates that you strongly agree:

	Strongly Disagree			Strongly Agree	
	1	2	3	4	5
19. Overall, I am very attracted to living in this village.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I feel like I belong in this village.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I visit with my neighbours in their homes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. The friendships and associations I have with other people in my village mean a lot to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Given the opportunity, I would like to move out of this village.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. If the people in my village were planning something I’d think of it as something “we” were doing rather than “they” were doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. If I needed advice about something I could go to someone in my village.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. I think I agree with most people in my village about what is important in life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. I believe my neighbours would help me in an emergency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. I feel loyal to the people in my village.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. I borrow things and exchange favours with my neighbours.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. I would be willing to work together with others on	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

something to improve my village.

- | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 31. I plan to remain a resident of this village for a number of years. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32. I like to think of myself as similar to the people who live in this village. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33. I rarely have neighbours over to my house to visit. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34. A feeling of fellowship runs deep between me and other people in this village. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 35. I regularly stop and talk with people in my village. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36. Living in this village gives me a sense of community. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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