GREEN ENERGIES THE SOCIALIST WAY: HYDROPOWER, ENERGY CROPS AND HANDAI LIVELIHOODS ALONG THE RED RIVER, YUNNAN PROVINCE, CHINA

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ABSTRACT

Since the mid-2000s, international and Chinese development policies have made Honghe Prefecture, located in Yunnan Province, China, a new frontier for renewable energy development in the China-Vietnam borderlands. In this dissertation, I investigate livelihood changes occurring for lowland ethnic minority communities inhabiting Honghe Prefecture, along a section of the Red River valley where hydropower dams and energy crop plantations schemes have been recently implemented. Development policies promoting such schemes overlook how these projects trigger exclusion and uneven access opportunities for local populations. My thesis fills this gap by scrutinizing how changes in access regimes are evident within the on-farm and off-farm components of the livelihood portfolios of local Handai households. Doing so, I highlight a range of impacts driven by renewable energy development that remain undocumented in Yunnan.

My conceptual framework combines three main bodies of literature, namely political ecology, environmental policy-making and renewable energy development in China, and livelihood approaches. A contextual examination of ethnicity regimes in the PRC demonstrates that the state is poorly equipped to relate to small ethnic subgroups such as the Handai. Therefore, in order to gain a thorough appreciation of how these people conceptualize themselves and their values, I carried out in-depth ethnographic fieldwork in three villages where Handai populations have been impacted by hydropower dam and jatropha plantation schemes. I utilized both qualitative and quantitative research methods, including participant observation, unstructured interviews, rapid rural appraisals and livelihood surveys.

My results first detail how hydropower dams and jatropha plantation projects in the Red River valley have been framed as contributing to diverse policy objectives, and examine the precise ways that this has facilitated their implementation. I also highlight how various international and Chinese actors have been involved in operationalizing hydropower and energy crop plantation schemes in Honghe Prefecture. Although renewable energy development – hydropower in particular – is a very sensitive topic in Yunnan province, I

report on how I overcame various barriers to accessing information. I also report on the daily operations of the Red River hydropower dams since their recent completion, and on the circumstances that lead to the rapid failure of the jatropha plantations just a few years after inauguration.

Second, I provide nuanced evidence of the livelihood consequences that dams and jatropha plantations have had on local Handai populations. These schemes excluded most of my informants from significant portions of their land, yet affected villagers did receive significant financial compensation. I report on how my informants reorganized the on-farm and off-farm components of their livelihoods as a result. The main changes in local farming regimes include the relocation and intensification of agricultural activities and farming practices. Important off-farm changes encompass increased migration flows, investment in modern houses in the villages, and increasing livelihood pluriactivity.

My analysis reveals that Handai households address the impacts of the renewable energy schemes in a multi-faceted, diverse and pragmatic manner that blanket categorizations such as ‘anti-dam’ and ‘pro-development’ fail to grasp. While villagers often accept committing to important livelihood changes, the importance they allocate to certain assets, including land and homes, systematically moulds their elaborate diversification strategies. Yet policies promoting the implementation of renewable energy schemes in frontier areas such as the Red River valley are conceived in such a way that local, culturally-rooted, socio-economic considerations are not taken into account. Nonetheless, many of these local and culturally-rooted realities persist.

RÉSUMÉ

Au cours de la dernière décennie, des politiques de développement chinoises et internationales ont facilité l'essor de la Préfecture de Honghe, située dans la province chinoise du Yunnan, comme nouvelle frontière pour le développement des énergies renouvelables. Dans cette thèse, je sonde l'évolution des modes et moyens de subsistance de communautés appartenant à un groupe ethnique minoritaire établi sur les rives de la portion chinoise du Fleuve Rouge, et à proximité de barrages hydroélectriques et de plantations énergétiques développés récemment. L'élaboration de tels projets énergétiques accorde une faible importance aux répercussions engendrées à l'échelle locale, notamment l'exclusion et les nouvelles possibilités d'accès qui s'ensuivent pour les populations Handai riveraines. Ma thèse scrute comment les paysans Handai qui contribuent à cette recherche ont réorganisé leurs activités agricoles et non-agricoles pour faire face à de tels changements. Se faisant, ma recherche apporte un nouvel éclairage sur un pan méconnu des impacts du développement des énergies renouvelables au Yunnan.

Mon cadre conceptuel mets l'accent sur trois corpus théoriques, soit : l'écologie politique, la littérature documentant l'élaboration de politiques environnementales et la promotion des énergies renouvelables en Chine, et celle sur les modes et moyens de subsistance. Ma thèse émane d'une recherche de terrain ethnographique menée au sein de trois communautés villageoises. Ma méthodologie de recherche allie des méthodes qualitatives et quantitatives telles que l'observation participative, les entrevues conversationnelles, les évaluations rurales rapides et des sondages.

Les résultats de ma recherche démontrent premièrement comment les projets énergétiques développés dans la Préfecture de Honghe ont été promus au sein de politiques centrées sur des objectifs divers, et en quoi cela a facilité le développement desdits projets. Je retrace aussi les différents acteurs internationaux et chinois impliqués dans le déploiement de barrages et de plantations énergétiques dans la vallée du Fleuve Rouge.

Deuxièmement, j'explore l'influence des projets énergétiques développés dans la vallée du Fleuve Rouge sur les modes et moyens de subsistance de mes informateurs Handai. Je démontre

que ces projets ont eut comme impact d'exclure la plupart des villageois d'une portion importante de leurs terres, en contrepartie de quoi des compensations financières importantes ont été distribuées. Mes informateurs initièrent subséquemment de réorganiser les composantes agricoles et non-agricoles de leurs modes et moyens de subsistance. Dans les champs, les paysans Handai ont déplacé et intensifié leurs activités agricoles. Les principaux changements non-agricoles ont trait à un recours croissant à la pluriactivité, à une intensification des flux migratoires et aux investissements dans des maisons modernes.

Ma thèse démontre que les paysans Handai abordent les impacts induits par les projets énergétiques ci-dessus de façon d'abord et avant tout pragmatique. Ainsi, les étiquettes usuelles telles que 'anti-barrages' et 'pro-développement' sont inadéquates pour cerner comment les villageois perçoivent et expérimentent ces impacts. Dans la vaste majorité des cas, mes informateurs acceptent sans broncher de diversifier les activités sur lesquelles leurs modes et moyens de subsistance reposent. Néanmoins, leurs décisions témoignent systématiquement de l'importance qu'ils octroient à certaines ressources, notamment foncières. Par ailleurs, les politiques internationales et chinoises qui catalysent le développement du secteur des énergies renouvelables dans la vallée du Fleuve Rouge sont conçues de façon telle que ces priorités locales ne peuvent en aucune façon être prises en compte. Malgré ceci, ma recherche démontre comment les villageois Handai ont su, dans bien des cas, en assurer la pérennité.

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A pass in the mountains,
A horse and a mule,
In the distance the shelves
rode three shadows of blue

And the riverbank talks
of the waters of March,
It's the promise of life
in your heart, in your heart

- Antonio Carlos Jobim

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ACRONYMS

CAS: Chinese Academy of Sciences

CDM: Clean Development Mechanism

CER: Certified Emission Reduction

CPC: Communist Party of China

CPIC: China Power Investment Corporation

DfID: Department for International Development (UK)

DNA: Designated National Authority

EIA: Environmental Impact Assessment

EPB: Environment Protection Bureau

GHDPI: Guangdong Hydropower Planning and Design Institute

GHG: Greenhouse gas

GMS: Greater Mekong Subregion

GW: Gigawatt

HA: Hectare

ICOLD: International Commission for Large Dams

IOSCPRC: Information Office of the State Council of the People's Republic of China

IPCC: Intergovernmental Panel on Climate Change

IPP: Independent Power Producer

KHIDI: Kunming Hydroelectric Investigation & Design Institute

kWh: Kilowatt hour

MW: Megawatt

MWH: Megawatt hour

NBS: National Bureau of Statistics

NDRC: National Development and Reform Commission

NGO: Non-governmental organization

NPC: National People's Congress

NTFP: Non-timber forest product

PDD: Project Design Documents

PRA: Participatory Rural Appraisal

PRC: People's Republic of China

PSB: Public Security Bureau

RRA: Rapid Rural Appraisal

SDPC: State Planning and Development Commission

SEZ: Special Economic Zone

SEPA: State Environmental Protection Agency

SETC: State Economic and Trade Commission

SPCC: State Power Corporation of China

SSI: Semi-structured interview

TCE: Tonne of coal equivalent

UNEP: United Nations Environment Programme

UNFCCC: United Nations Framework Convention on Climate Change

WCD: World Commission on Dams

WCED: World Commission on Environment and Development

YBS: Yunnan Bureau of Statistics

NOTES

Citations

All interviewees quoted in this thesis are cited using an anonymous system. References are listed as follows: first letter from the name of the city/village where the interview occurred/interview number/date.

Currencies and conversion rates

Most financial values included in this thesis are expressed in Chinese currency, the *renminbi yuan*–RMB (人民币元) and in Canadian dollars (CAD, $). The conversion rate I utilize throughout this thesis is the average rate effective during the July 1st 2011 to June 30th 2012 period when I carried most of my fieldwork. As such:

CAD 1 = 6 RMB
CAD 1 = USD 0.9968
CAD 1 = € 0.7449

In popular parlance, the RMB is most often referred to as *yuan* (元) or *kuai* (块). I use these expressions when quoting my interviewees.

Land categories used in this thesis

Arable land – *gendi* (耕地): Contracted valley land, flat and well-irrigated.

Private plot on collective land (valley) – *ziliudi* (自留地): non-contracted valley land over which people have acquired usufruct right, generally flat and well-irrigated

Barren lands - *huangshan/huangdi* (荒山/荒地): sloping and poorly-irrigated lands

Private plot on collective land (barren lands) – *ziliushan* (自留山): barren land areas over which people have acquired usufruct right.

CHAPTER 1

INTRODUCTION: PEOPLE, DAMS AND ENERGY CROPS

1.1 INTRODUCTION: LIVELIHOODS AND GREEN ENERGY ALONG THE RED RIVER

On a grassy bank, in the Yunnan borderlands abutting northern Vietnam, the afternoon was coming to an end. My discussions with a peasant farmer in his fifties waiting to fetch his buffalo from the barren lands were soon to become a hot and humid search for his livestock in the nearby hills. Yet, as we initially sat beside the rusty gate of an abandoned jatropha[1] seed crusher built in his village, my informant asked "What does the sign read?", pointing to the English-only script on the gate (Figure 1.1).

Figure 1.1: Jatropha company gate (photograph by author, 2011)

[1] Jatropha (*Jatropha curcas*) is a bush whose fruits contain a high content of inedible oil that can be refined into biodiesel. See Section 4.4.2 for more details.
[2] *Yangguang Keji* – 阳关科技 – is the Chinese name of Sunshine Technology, the company that owned the jatropha plantations and seed crusher before it went bankrupt.
[3] I cite my informants using an anonymous reference system, as stated in the notes at the beginning of my thesis (see also Appendix 1).
[4] The CDM is a carbon credit trading scheme overseen by the Secretariat of the United Nations Framework Convention on Climate Change (UNFCC).
[5] These names are pseudonyms. I named the villages with reference to their size. Xiaocun literally translates as

I replied in Mandarin: "'Sunshine Technology, a carbon-positive venture'. These people argue that using diesel made from the seeds of these jatropha bushes is less harmful for the environment than using diesel made from petrol." This came to a surprise to my informant, who argued: "Yes, but they are not making diesel from jatropha, and the environment is not getting better. Actually it is now worse, since grass does not grow under jatropha trees and there is no more fodder for the buffalo and cattle". It was intriguing to note how this villager conceptualized the environment, and how his take differed from that of the people who had placed this gate here. The only response I could come up with was: "Maybe this is why they did not add a Chinese sign!" Still considering what he had just learned about a sign he had seen in place for years, my livestock owner informant concluded: "Yes, this is very strange. This sign has been there for years, but we never knew what it meant". He was keen for clarification, and continued: "So you say that the two first lines, those with the bigger fonts mean *Yangguang Keji*[2] and that the smaller line means that jatropha has positive impacts on the environment?" (X-15 and field notes, 23 February 2012).[3]

This conversation reminded me of a similar information gap between what I had read in the environmental impact assessments (EIA) of the Madushan hydropower dam, built along the Chinese section of the Red River (about 50 km downstream from Xiaocun village where this livestock owner lived), and how the local population had been experiencing the consequences of its construction. The terse official paperwork available from the Clean Development Mechanism[4] (CDM) states: "In conclusion, the problems of this project brought forward by the public can be solved effectively, and there would be no negative effects" (CDM 2011: 39). Yet, I had heard the opposite countless times, including from one villager who pressed me: "Please go and tell [then prime minister] Wen Jiabao how difficult life is for me since they built the dam. All my land was flooded" (Z-66, 9 December 2011). To say the least, both these projects have far wider implications than what a rusty gate or laconic EIA suggest.

[2] *Yangguang Keji* – 阳关科技 – is the Chinese name of Sunshine Technology, the company that owned the jatropha plantations and seed crusher before it went bankrupt.
[3] I cite my informants using an anonymous reference system, as stated in the notes at the beginning of my thesis (see also Appendix 1).
[4] The CDM is a carbon credit trading scheme overseen by the Secretariat of the United Nations Framework Convention on Climate Change (UNFCC).

Since the mid-2000s, these two aforementioned Handai peasants, along with other residents of the three villages along the Red River valley in Honghe Prefecture that my investigation focuses on, have experienced important impacts from jatropha expansion and hydropower development schemes. These schemes are part of an ongoing expansion of renewable energy capacities in Yunnan Province. The global and Chinese stakeholders facilitating such developments along the Chinese section of the Red River assert that renewable energy schemes contribute to either 'sustainable' and/or 'scientific' forms of development. Yet as the above quotes demonstrate, what is being promoted is a very narrow version of sustainability and science (Hunsberger and Ponte, forthcoming). When it comes to how renewable energy development is framed at the global scale, this narrow version concentrates first and foremost on climate change mitigation, tending to overlook other consequences, notably livelihood impacts (Heynen et al. 2007; Peet et al. 2011).

Obviously, climate change is real. Humans are having direct impacts on the climate, while increasingly experiencing the consequences of global warming. Therefore, combatting climate change should be a global priority, as restated within the most recent reports from the working groups contributing to the upcoming 2014 synthesis report from the Intergovernmental Panel on Climate Change (see IPCC 2014). Yet ongoing global campaigns aimed at curbing anthropogenic greenhouse gas (GHG) emissions tend to overlook a whole set of consequences that climate change alleviation measures drive at the local level. My informants have found out about these consequences the hard way.

At the national scale, the promotion of renewable energy options in China such as hydropower dams along the Red River and jatropha plantations is part of a complex political agenda. Combatting climate change is, again, a central objective, but so too are addressing regional development inequalities, national energy security and, as will become clear in this thesis, promoting a precise form of socio-economic modernization and enforcing it in frontier regions through a specific authoritarian governance regime.

This investigation builds on preliminary fieldwork and fieldwork journeys that lasted for over ten months in Xiaocun (小村), Zhongcun (中村) and Dacun (大村) villages[5], three Handai settlements with a total population of 1,035 located along the Red River valley introduced more in Section 3.2.1 (Figure 1.2). This area is geographically, socially and economically distant from the political center and economic powerhouse provinces of China, all located thousands of kilometers away on the eastern seaboard. As for the dozens of other ethnic groups living in mountainous Yunnan province, located in south-west China, the Handai individuals whose voices shape this research are culturally distinct from the Han majority, the latter composing 92 per cent of the national population (Fei 1979; Yang 2005). Yunnan is further considered one of the poorest and least developed Chinese provinces. Yet, Yunnan is rich with natural resources, the exploitation of which is central to the provincial development model, which emphasizes outward-oriented, rapid economic growth (Donaldson 2011; Summers 2013). Most notable are the energy resources of Yunnan, especially hydropower, which are increasingly being exploited for coastal and urban locales, by state and business actors (Magee 2006a, 2006b).

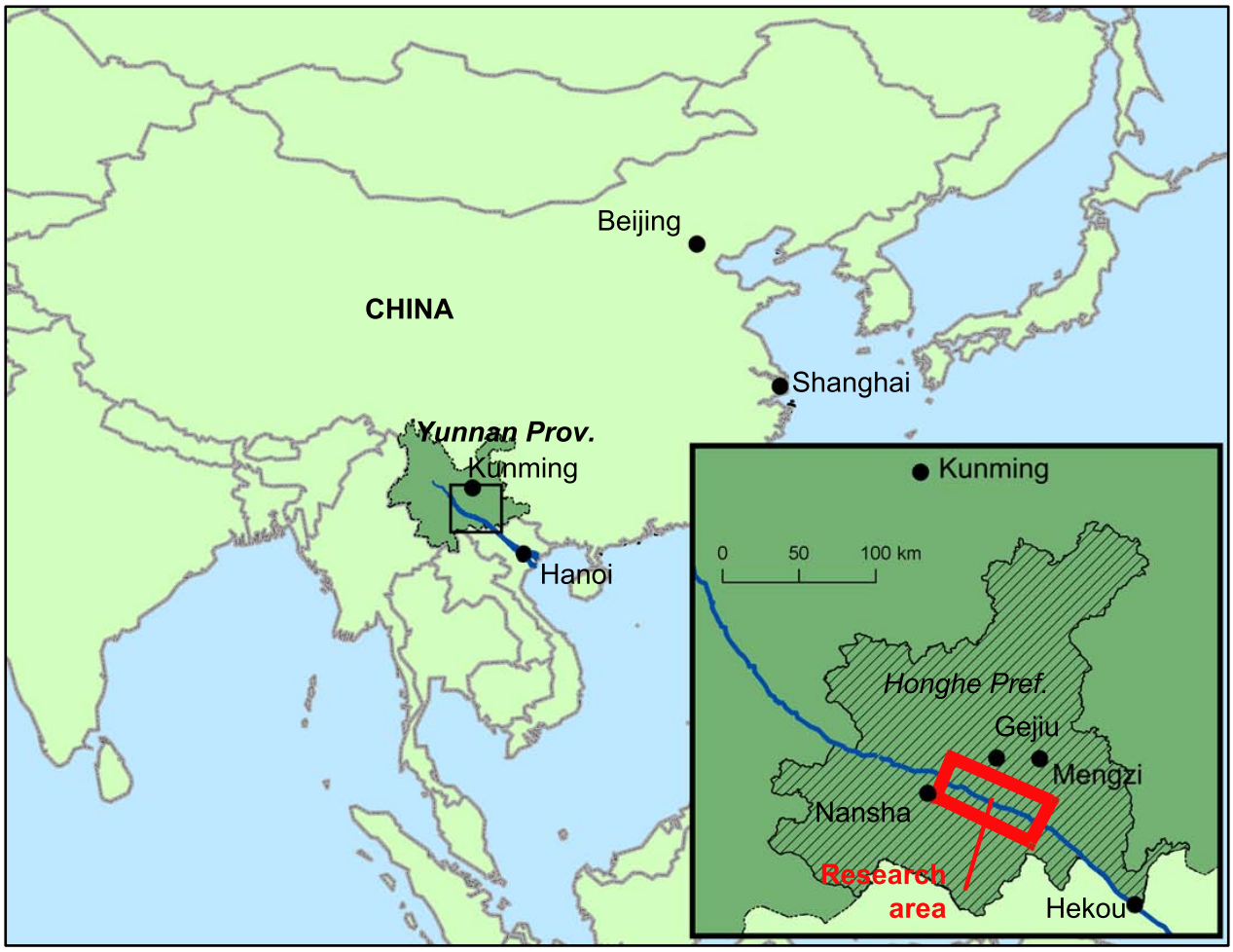

Figure 1.2: The Red River valley and approximative location of my research area

Regardless of where they occur, hydropower and energy crop plantation schemes catalyze livelihood consequences as complex and diverse as the policy objectives promoting such projects (Ariza-Montobbio et al. 2010a, 2010b; Borras et al. 2010; Ritcher et al. 2010; WCD 2000). Yet little is known to date about the impacts that renewable energy schemes have had upon rural communities in Yunnan. As is the case throughout China, hydropower development is a very sensitive topic in this province, with research addressing this subject more commonly taking a policy-making angle (McDonald 2007). Such scholarship includes work by Darrin Magee (2006a, 2006b) on how the stakeholders involved in hydropower development in Yunnan participate in an interscalar network that Magee calls a 'powershed'. Andrew Mertha (2008, 2009) argues that hydropower policy-making increasingly tolerates input from non-governmental voices, including those from Yunnan-based environmental NGOs. How hydropower development schemes carried out along international rivers traversing Yunnan impact regional hydropolitics has also long been the focus of much scholarly attention (Bakker 1999; Glassman 2010; Goh 2004; Hirsch 2010, 2011; Osborne 2009). Other scholars have begun unpacking how local cadres negotiate imperatives to both implement hydropower schemes formulated higher up the political hierarchy and maintain social stability in affected areas under their responsibility (Habich 2013; McDonald 2007). The conceptual tools these scholars emphasize are mostly meant to grasp and analyze political processes rather than livelihood change. Doing so, the above authors and others have produced important scholarship which I cite throughout this thesis. Like them, I too draw from conceptual approaches that frame the environment/society nexus as eminently political and highlight the intricate characteristics of renewable energy development as it unfolds in the waterscapes of southwestern China.

Yet I also argue that thorough inductive ethnographic case studies of renewable energy development in Yunnan are still lacking. Indeed, to date, ethnographic research scrutinizing the livelihood impacts of development projects in Yunnan has concentrated of cash crop plantations (Shen 2013; Sturgeon 2005; Xu et al. 2005, 2006), tourism (Byrne Swain 2011; Yu 2008; White 2010), environmental conservation programmes (Li 2005; Weyerhauser et al. 2005; Yeh 2009), and market expansion and associated opportunities for migration (Li 2010; Tapp 2010; Wang et al. 2013). In comparison, renewable energy development has received scant scholarly attention in Yunnan, notably due to the sensitive nature of this topic, as I discuss in Section 3.2.2.

However, a few authors have begun to partly address this gap, including Kristen McDonald (2007), in her Ph.D. thesis investigating how potential hydropower development is perceived at the local and prefecture scales along the Nu River. While highly informative regarding local politics, this research nonetheless differs from mine as it focuses on potential rather than actual dams. Wang et al.'s (2013) multi-site research on mobility in Yunnan includes a case study focusing on livelihood changes in one village affected by the Nuozhadu dam.[6] These authors shed interesting light on compensation processes and the relationship between hydropower development and migration, but their research aim transcends energy issues, which are only briefly addressed. Sabrina Habich's (2013) Ph.D. thesis focuses on the same Nuozhadu dam case study and investigates how local authorities handled different waves of peasant relocation. While including some information on livelihood changes, this research first and foremost focuses on the conflicting objectives of different government levels in China. Chen (2008) also investigates resettled communities along the upper Mekong River. However, her critique of resettlement policies does not delve into ethnographic considerations, concentrating instead on policy and failures of policy implementation. Finally, Yot (2011) also investigated how upper Mekong dams have affected Chinese, Laotian and Thai riparian communities, predominantly concentrating on the impacts of hydropower dams upon land availability and the fishery sector only.[7]

In order to further document renewable energy expansion as it unfolds in Yunnan along with its livelihood consequences, my research focuses on both the discourses promoting such developments and on the voices of those who experience such development firsthand, the local populations whose 'old home' (老家 – *laojia*)[8] is the theater for renewable energy development. I concentrate first on the governance regime that makes renewable energy schemes become reality in Chinese frontier regions; second, on the actual implementation of these schemes; and third, and on the livelihoods of Handai villagers who experience the impacts of dams and jatropha plantations in their daily lives. In this sense, my thesis contributes to scholarship that centers on environmental governance by examining how and why stakeholders who partake in this

[6] Nuozhadu dam is under construction along the Chinese section of the Mekong River.
[7] Interestingly, the findings that Yot (2011) conveys in regards to land issues are the opposite of mine, as he demonstrates that dam construction has led to increased land availability in the Dai Lue villages where he conducted his research.
[8] The proper English translation of this concept would probably be 'native place' or 'place of origin'.

governance regime emphasize renewable energy development as a priority in Yunnan. My dissertation also adds to the literature on livelihood change, its drivers, the socio-cultural factors that influence it, along with its impacts as they occur within ethnic minority settlements in this province.

The main factor that brought me to focus on how hydropower development unfolds in the Red River watershed was my desire to scrutinize hydropower development schemes that have so far received scant scholarly attention. Hydropower development is occurring across Yunnan – a province gifted with both extensive water resources and about a quarter of the total hydropower potential in China (Dore and Yu 2004; Hennig et al. 2013; McCormark 2001). Yet most of the existing scholarship on hydropower development in Yunnan focuses on 'dam cascades'[9] built or planned along the Lancang (upper Mekong), Nu (upper Salween) and Jinsha (upper Yangtze) rivers. In comparison to these river systems, the Red River watershed remains widely understudied; I saw this as an interesting challenge. As of 2014, all hydropower development carried out along the Red River has been in Honghe Prefecture Hani and Yi Autonomous Prefecture (红河哈尼族彝族自治州 – *Honghe Hanizu Yizu Zizhizhou*)[10], making this area the locale where I needed to conduct my research.

As I began to get more familiar with the area and its people, I found that the presence of jatropha plantations in dam-affected communities added a further layer of complexity and importance to my research. Conceptually, the coexistence of two renewable energy schemes in the same locale allows me to discuss their cumulative – though different – impacts. This gives me an opportunity to replicate the approach that Jim et al. (2010) adopt when addressing the combined influence of both reservoir creation and reforestation policies upon village communities in the Three Gorges Region in central China. Barney (2009) similarly analyzes the combined impacts from dam building and industrial plantations in Khammouane Province, Laos. Moreover, I later found that there are similarities and complementarities between the rationales that justify the development

[9] This expression is commonly utilized to describe multi-dam complexes developed along Yunnan rivers. In regards to the Lancang (upper Mekong) cascade, the eight dams composing it include smaller upstream regulation dams that regulate water input for the most powerful power stations, themselves built in the middle reaches of the Lancang. Smaller downstream dams serve re-regulation functions, allowing for steadier water flow in downstream countries (K-5, 30 July 2012; see also Magee 2006a).

[10] Honghe is the Chinese name for the Red River. Hani and Yi are two ethnic minorities with significant populations in the prefecture.

of the hydropower and jatropha projects, as well as parallels in the roles the schemes allocate to the local population, and in the ways villagers have experienced project related impacts on their livelihood.

Working in an under-studied area, I quickly realized that there was very limited secondary information about the Handai people who inhabit this section of the Red River valley. Moreover, the more I became familiar with my informants, the more I noticed several key differences from other Dai groups I have visited elsewhere in Yunnan and along other river valleys in the region known as the Southeast Asian Massif (Michaud 2006; Scott 2009; van Schendel 2002).[11] This has required that I address the historical and conceptual foundations explaining why 'Dainess' is associated with precise characteristics such as Buddhism and the use of a written script, and yet why the Handai informants I talked with do not share these, even though they belong to a Dai subgroup. Likewise, the overarching importance that my informants allocate to their land, along with how this shapes their livelihood strategies, clearly stands out in my analyses. Such findings allow me to contribute to scholarship documenting how ethnicity manifests in the Southeast Asian Massif. Finally, my case studies demonstrate the wide-ranging implications that arise when people are excluded from their land (Hall et al. 2011; Michaud 2011; Rigg 2001).

1.2 RESEARCH AIM, QUESTIONS AND CONTRIBUTIONS

1.2.1 Research aim

The aim of this thesis is: *to investigate livelihood changes of Handai households in the Red River valley, Honghe Prefecture, Yunnan province, with a focus on the consequences of the expansion of hydropower and energy crop schemes, ongoing since the mid-2000s.* This aim is situated within a national context that is intensely promoting renewable energy.

[11] I had earlier visited Dai settlements along the Nu River (upper Salween), and carried out fieldwork in Dai settlements along the Lancang River (upper Mekong) during my Master's degree. The Southeast Asian Massif is a transnational ensemble spanning areas of southwest China, northern Burma, Thailand, Laos, and Vietnam located above 500 meters altitude. This geographic scale is an alternative to traditional state-centered models that neglect the ethno-linguistic features predating the creation of contemporary nation-states. It also reflects cultural traits and exchanges that do not abide by the laws and nationalistic foundations that these states promote. In doing so, this approach emphasizes altitude to explain aspects of both regional and local cultural patterns. My research villages are located between 255 and 272 meters above sea level, which officially excludes these locales from the Massif. Nonetheless, as the Southeast Asian Massif surrounds the villages I discuss, this concept is still highly relevant to my case studies.

Clearly, circumstances beyond renewable energy development also influence livelihoods in the Red River valley. Therefore, any attempt to systematically identify causations between renewable energy development and all the livelihood changes my informants have experienced would be illusory. Likewise, I do not mean to essentialize the influence that dam and jatropha plantation schemes exert upon local livelihood pathways. Thus I integrate other socio-economic factors that also come into play in shaping the livelihood strategies that Handai villagers adopt, as much as possible. Nonetheless, I argue that since the mid-2000s, renewable energy schemes have had unparalleled impacts upon local access opportunities in my research area. This time period coalesces with the moment when specific important factors gained prominence in China's environmental governance. These factors include greenhouse gas emission alleviation becoming a priority, along with a lucrative market, both within global and national discourses – although with very little concrete impacts on the overall global carbon budget (see Section 4.3). Moreover, increased competition in the Chinese energy sector, corruption, and challenges in implementing the country's environmental laws count among the factors that make local livelihoods a low priority for non-local state and business stakeholders who remain the most influential regarding environmental governance in Yunnan.

To achieve my research aim requires that I scrutinize the factors that drive and oversee renewable energy expansion, and associated livelihood changes, the ways both these aspects relate to one another, as well as to other factors driving sociocultural change in the area where I carried out my fieldwork. In order to do so, I center my investigation on three main research questions:

1- *How are renewable energy projects being physically and politically designed and implemented in the Red River valley? What are the roles of different non-local stakeholders towards these schemes, given China's approach to environmental governance within a neoliberal authoritarian regime?*

2- *How is the implementation of renewable energy projects affecting and shaping on-farm components of Handai household livelihoods, especially access to land; and how do Handai smallholder agriculturalists perceive these changes?*

3- *How have Handai households engaged with and forged off-farm livelihood strategies in response to changes in access to land, other assets and state financial compensation?*

I now review each of these questions individually, along with the subsidiary questions they raise and the avenues I adopt to answer these queries in my thesis.

1.2.2 Renewable energies in the Red River valley as a window on environmental governance in China

My first research question asks: *How are renewable energy projects being physically and politically designed and implemented in the Red River valley? What are the roles of different non-local stakeholders towards these schemes, given China's approach to environmental governance within a neoliberal authoritarian regime?* This question posits that economic priorities, including the neoliberal modernization program enshrined in Deng Xiaoping's reforms, hold sway when it comes to China's environmental governance (see Section 4.2). Likewise, there is little opportunity for grassroots actors to become involved in environmental governance (see Section 2.4.3). Together, these factors facilitate commodity production and exchange but also impact how affected populations can benefit from certain assets they build their livelihoods around. In other words, this neoliberal outlook "is both a cause of environmental change and a product of changes in the way we interact with the environment" (Heynen et al. 2007: 11). Building on these premises, Research Question 1 seeks to better understand how stakeholders at various scales influence environmental governance in China and specifically, how non-local stakeholders are able to influence how dam and jatropha plantation schemes are implemented in the Red River valley (see Habich 2013; Heynen et al. 2007; Mol 2006; 2009; Peet et al. 2011).

In particular, in Chapter 4 I scrutinize why and how green energy expansion has become a dominant policy objective in the Red River valley and how this occurs to the detriment of other policy goals such as sustaining local rural livelihoods, which I investigate in Chapter 5. Specifically, I draw on my case studies to unpack the political processes that have convinced private and public companies to promote hydropower and jatropha plantation schemes in such a frontier region. I then scrutinize the implementation processes of these schemes, along with how state and business stakeholders have addressed the ensuing livelihood impacts.

I demonstrate that the obvious livelihood and environmental consequences that renewable energy schemes have caused in the Red River valley, along with the various challenges that such a

frontier setting poses for state and business enterprises (see Section 4.1) have not jeopardized renewable energy scheme implementation there whatsoever. I find that China's participation in the Clean Development Mechanism (CDM) has been an important lever for the implementation of the Red River dams and jatropha plantations (Chapter 4). Yet, whether such projects actually contribute to global greenhouse gas budgets and to 'sustainable development', as stated in the CDM statutes, is far much more debatable in light of evidence I introduce in Chapters 6 and 7. Another important factor driving the implementation of renewable energy schemes in the Red River valley is the strategic importance that the Chinese government allocates to the energy industry (Chapter 4). Indeed, although many actors partaking in this industry have been privatized since the early 2000s, energy capacity development in China still bears the fingerprints of some of the most influential governmental bodies, including the National Development and Reform Commission (NDRC) (Xu 2002; Habich 2013). These institutions have adopted very ambitious objectives for promoting renewable energy development, and private actors involved in the Red River valley-based schemes have benefited from significant financial and policy incentives (NDRC 2007). In contrast, the livelihoods priorities of small and 'distant' minority nationality subgroups, such as the Handai, weigh little in the balance.

1.2.3 Renewable energies and their on-farm impacts for Handai livelihoods

My second research question investigates: *How is the implementation of renewable energy projects affecting and shaping on-farm*[12] *components of Handai household livelihoods, especially access to land; and how do Handai smallholder agriculturalists perceive these changes?* Handai villagers in the Red River valley remain predominantly smallholder agriculturalists (synonymous in this thesis with peasant). The most obvious consequence of the Red River dam and plantation

[12] Rigg (2001: 72) highlights the "terminological morass" that surrounds the distinctions between agrarian and non-agrarian activities contributing to peasant livelihoods. For instance, Ellis (2000a: 11) distinguishes between 'on-farm', 'off-farm' and 'non-farm' income sources. According to this typology: peasants earn on-farm income from farming their own land; off-farm income stems from other food producing activities and/or activities that rely upon the natural resource base, including wage work in a plantation, forest product collection and the like; non-farm income relates to other livelihood activities. Bouahom et al. (2004: 612) rather distinguish between 'farm activities', 'other agricultural activities' – which includes fishing and forest products collection – and "non-farm village activities". I agree with Bouahom et al.'s (2004) first category, which I refer to as 'on-farm' activities (see Chapter 6). However, I prefer not to relate fishing and forest product gathering to farming and/or agriculture as both Ellis's "off-farm" and Bouahom et al. (2006) "other agricultural activities" categories do. For this reason, I understand off-farm activities as combining all activities that do not have an agrarian component, including fishing and NTFP collection. Although I realize that this category is quite broad, I argue that, at least as far as my research is concerned, it is also less ambiguous.

schemes is that these projects deprive local people of their access to significant portions of their landholdings. Farmland has been particularly affected by hydropower reservoir creation, which led to massive land flooding in all three of my case study villages. Likewise, jatropha expansion occurred over portions of so-called barren lands that used to fulfill important livelihood functions.[13] I refrain from categorizing hydropower and jatropha plantation schemes as the sole drivers of livelihood change in my research area and acknowledge other ongoing socio-economic structural processes (Section 5.6). Yet I also posit that renewable energy-driven exclusionary processes have had unequalled consequences upon local farm systems.

Research Question 2 asks that I pull these aspects together to investigate the ways in which my informants re-organized the on-farm components of their livelihoods in order to address changes in their access regimes. Among the subsidiary questions I want to tackle here are: What is the extent of this exclusion? What types of land resources have been most affected? How have people tried to relocate their agricultural practices to compensate for lost land and other changes in access regimes? In so doing, I assign special importance to land resources, as land holds exceptional importance for Handai smallholders (Chapters 5 and 6).

Research Question 2 also commands that I probe how Handai peasant farmers perceive the various livelihood assets they rely upon and the diversification strategies they commit to, along with the criteria that shape these perceptions. This itself raises further subsidiary questions, including: How do villagers feel about the loss of their land? What value do they allocate to the different land resources they build their livelihoods around? What do they think of the agrarian changes they have committed to in order to cope with exclusion? I document these aspects predominantly in Chapter 6.

1.2.4 Handai off-farm livelihood strategies

My third research question investigates *How have Handai households engaged with and forged off-farm livelihood strategies in response to changes in access to land, other assets and state financial compensation?* While related to Research Question 2, this third research question

[13] This is a very vague land category in Yunnan. Briefly put, barren lands are sloped lands that line the narrow Red River valley. Due to its irrigation and soil characteristics, this environment upholds limited agricultural potential (see Sections 4.4.2 and 5.5.1).

addresses another series of important livelihood strategies, namely those that Handai informants undertake away from their fields. It is acknowledged within the rural livelihood literature that peasant households in the Global South increasingly build their livelihoods around a combination of activities, including non-agrarian ones (Ellis 2000a; Elson 1997; Rigg 2001; Scoones 1998). Such is notably the case in situations where people must cope with sudden changes in their access to the natural capital base, which often holds disproportionate importance within the typical range of peasant livelihood assets (Bebbington 1999; de Haan and Zoomers 2005; Zoomers 1999). Therefore, off-farm diversification strategies occurring in the Red River valley must be considered in relation to land exclusion. However, the financial compensation that Handai peasants received for the land they lost as a result of hydropower development, along with other changes in their access regimes, have also shaped off-farm strategies to a significant extent. My fieldwork reveals that financial compensation payments have fuelled record amounts of investment in the village economy over the last several years. This in turn has translated into wide-ranging livelihood changes.

This situation raises a host of questions in regards to how peasants who have received compensation utilize it, and with what aims. How has livelihood diversification, and more precisely pluriactivity, been demonstrated in the villages since the mid-2000s? In other words, what activities have the villagers privileged in diversifying their livelihoods, and why? How do Handai villagers perceive the option of leaving their village and engaging in work migration? How have financial imperatives and cultural characteristics shaped these perceptions? These are among the subsidiary questions that I tackle in Chapter 7 and that allow my research to achieve the ethnographic and conceptual contributions I discuss next.

1.2.5 Research contributions

It is my contention that by providing detailed answers to the above questions, my research contributes significantly to scholarship focusing on environmental governance processes in China. I demonstrate that in the Red River valley, these processes facilitated the implementation of dam and jatropha plantation schemes over which local populations did not have a say, and from which Handai smallholders have received very few benefits. Notably, this conclusion emanates from my demonstration of the significant power imbalances between local populations

and the other stakeholders involved in renewable energy development as it occurs in China's frontier. My thesis likewise contributes to the literature on livelihood diversification strategies as it illuminates how an understudied population has coped with the on-farm and off-farm impacts from little-researched green energy schemes in southwestern China. Further, I demonstrate how my informants have dynamically positioned themselves towards the state-led modernization projects promoted within the waterscape they call home.[14]

More specifically, my thesis focuses on relatively unknown renewable energy schemes occurring in a comparatively obscure frontier setting. My investigation of the various national and global incentives that facilitate and/or subsidize the Red River valley dams and jatropha plantations highlights the gap between the planned impacts of such projects and the actual consequences that matter to those who experience them in their daily lives. Then, digging into the reasons behind these discrepancies, I find that renewable energy development in these locations has been framed as contributing to development objectives that transcend the Red River valley and its populations. Notably, these priorities include the alleviation of greenhouse gas emissions, regional development and energy security. I demonstrate that by framing renewable energy schemes as such, state, non-state and business stakeholders have perpetrated an understanding of nature that fails to account for its human component.

As such, the ensuing development schemes in fact replicate a model that does not account for local circumstances whatsoever (Swyngedouw 1999; Bakker 2010; Norman et al. 2012). These schemes further uphold a model of neoliberal natural resource commodification that current authoritarian rule in China endorses, mostly to the benefit of non-local stakeholders (Lieberthal and Oksenberg 1998; Habich 2013; Heynen et al. 2007; Peet et al. 2011). Uncovering these circumstances allows me to contribute to scholarship on the political dimensions of environmental change and the elaborate ways in which environmental change and associated social impacts are framed, promoted, welcomed, and resisted (Adams 2001; Bryant and Bailey 1997; Forsyth 2009; McDuie Ra 2011; Peet and Watts 1996).

[14] The waterscape is a scalar or territorial unit emphasized in the social science literature to capture the wide-ranging and interrelated social and environmental functions that water resources fulfill (see Section 2.2.4).

I have already noted that the implementation of renewable energy schemes – hydropower dams especially – in Yunnan is the outcome of major bargaining processes between various state actors, as well as between state and private business stakeholders (Lieberthal and Oksenberg 1988; Magee 2006a, 2006b; Mertha 2008, 2009). Yet by investigating renewable energy schemes tailored to benefit from the global fight against climate change and the financial resources this global concern generates, I highlight a new aspect of this bargaining process. I argue that the guidelines of the Clean Development Mechanism influence renewable energy governance in precise ways in southwestern China. For instance, according to CDM the guidelines, Chinese project developers must disclose more information publicly than what they have been accustomed to. Yet these same guidelines do not go as far as to require that the impacts that renewable energy projects drive be addressed and managed in locally suitable ways. Rather, the CDM facilitates and subsidizes the diffusion of neoliberal environmental governance patterns and the promotion by the Chinese state of specific modernization programs in its frontier regions (Heynen et al. 2007; Hall 2013; Sturgeon et al. 2013; Yeh 2009). My thesis demonstrates that, in many instances, local populations lose out in this new environmental governance regime, which ignores local cultural and ethnic particularities.

Yet my analysis of how Handai villagers in the Red River valley have reorganized both their on-farm and off-farm activities since the mid-2000s makes it clear that my informants refuse to consider themselves as powerless victims of a system made to benefit others. Indeed, I demonstrate that my informants have become proactively committed to various tactics to both cope with exclusion from their land and to make the best of the financial resources they have received in compensation. I posit that a great many of the diversification strategies farmers have implemented since dam and jatropha plantation schemes were first initiated in the Red River valley testify to the importance that these individuals and households allocate to their land. I support the argument that land remains a fundamental livelihood asset with no equivalent for many rural societies in the Global South (Hall et al. 2011). This holds true even though non-agrarian activities increasingly contribute to livelihood portfolios. Importantly, focusing on ethnicity illuminates this to a large extent (Forsyth and Michaud 2011). In this sense, my conclusions add to literature scrutinizing the numerous impacts of the increasingly elaborate

means by which land is grabbed from smallholder peasants (Borras et al. 2011; Fairhead et al. 2012; Hall et al. 2011; Rigg 2001; White et al. 2012).

By documenting and interpreting the diversified strategies villagers have adopted, and the gradual manner by which they have done so, I introduce a new angle to the notion of 'progressive diversification'. Progressive livelihood diversification is predominantly utilized for conceptualizing livelihood diversification strategies that aim to take advantage of new access opportunities (Bouahom *et al*. 2004; Ellis 2000b). Yet I argue that this same concept can be teased apart to provide a more nuanced understanding of the sequences that one privileges when committing to various diversification strategies.

My thesis also contributes to scholarship on research methodologies, although I had not planned this when I first initiated this project. Indeed, I find that reflecting on the ways by which I have navigated the highly sensitive nature of my research topic yields insights into how researchers can address the everyday practicalities of working in the field while ensuring not to create risks for their informants or themselves, while abiding by research ethic guidelines (see Heimer and Thøgersen 2006; Svensson 2006; Yeh 2006). Furthermore, I argue that the official information vacuum surrounding these state endorsed energy projects, actually had only modest impacts upon my capacity to carry out my research. This leads me to question the purpose and impacts of the prohibitive approach of the state towards research focusing on sensitive issues. Indeed, I demonstrate that the information vacuum does not imperil independent research on renewable energy schemes – especially dams. Yet the refusal of the government to share data with the broader public also triggers important impacts for local populations by depriving them of information that could be used to optimize livelihood diversification strategies.

1.3 STRUCTURE OF THE THESIS

This introduction briefly situates the research problem I focus on and outlines my research aim and questions along with the research contributions of my project. Following this introduction, in Chapter 2 I develop the conceptual framework that establishes the theoretical foundations of my thesis. My conceptual framework weaves together three bodies of literature, and equips me to

investigate the renewable energy schemes at the core of my case studies, along with their livelihood impacts. First, political ecology allows me to frame renewable energy capacity development in the Red River valley as an eminently political process. This literature also helps me to reconcile the various perceptions that actors operating at different scales convey about the social functions that water fulfills. Second, I delve into the scholarship scrutinizing environmental policy-making and renewable energy development in China. I focus particularly on unpacking how the notions of ecological modernization, fragmented authoritarianism and the powershed inform my case studies. Third, I introduce livelihood approaches along with the concepts through which I investigate livelihood assets, the modalities that govern the capacity of an individual or a household to access them, and the various strategies that changes in access regimes motivate.

Chapter 3 centers on the methodology I draw upon for this research project and on the factors that shaped my encounters with Handai informants while conducting fieldwork in the Red River valley. I first reflect on my positionality *vis-à-vis* my research participants, and consider how this affected my interpersonal encounters in the field and, ultimately, my research results. I also explore the ways in which I negotiated the sensitive nature of my research topic so as to ensure that my inquiries would not pose risks for my informants. I then turn to my research methods *per se*, distinguishing between the main qualitative and quantitative approaches I utilized in the field. Finally, I introduce the various coding, analysis and interpretation procedures I undertook to organize my data into a legible thesis.

In the introduction of Chapter 4, the first of two context chapters, I posit that the notion of the frontier best grasps how external actors promote modernization and development agendas in the Red River valley, including the dam and jatropha plantation schemes my case study focuses on. First I frame these developments as recent manifestations of the campaign mentality of the central government in China. In other words, I focus on the capacity of the government to mobilize social forces in order to achieve development and/or modernization goals throughout the country, including in its most 'remote' corners. I investigate the impacts of three such campaigns in the Red River valley, namely the Great Leap Forward (1958-1960), the Household Contract Responsibility System (gradually implemented from 1979 until the mid-1980s) and the

Go West Campaign (implemented from the year 2000 onwards). This last campaign is one of many initiatives that overtly promote renewable energy development in Yunnan for its alleged capacity to reconcile environmental and economic priorities, directly resonating with the main tenet of ecological modernization. Other such schemes I investigate include the Clean Development Mechanism and specific environmental and energy policies promulgated by the Chinese government. I then turn to the Red River valley dams and jatropha plantations themselves, introducing details of the projects' implementations as well as the state and business stakeholders that participated in them. Therefore, this chapter reviews how governance unfolds in Chinese frontier regions in general, along with the specific circumstances that promote renewable energy development in Honghe Prefecture and how the Red River dams and jatropha plantations have been implemented. As such, this chapter provides answers to Research Question 1.

Chapter 5, also contextualizes my thesis, and likewise combines information I obtained through primary and secondary sources. First, I concentrate on the physical and social geographies of the area where I carried out my inquiry. I introduce key characteristics of the hydrology of the Red River and the climate of the Red River valley. I then turn to aspects of human geography. I scrutinize how ethnic relations are structured in China, along with the main characteristics most often associated with the Dai minority nationality. Doing so, I find that state-centric visions completely fail to grasp how my Handai informants, as a sub-group of the Dai, perceive themselves. In fact, in many instances, these visions lead to social changes that negatively affect core components of Handai livelihoods and culture with inadequate compensation. This, I argue, documents an important facet illustrating how state policies neglect to acknowledge local particularities and how rigid ethnic classifications tell more about the state itself than about the Handai populations I work with. Third, narrowing my focus, I begin interpreting the main assets my informants build their livelihoods around, drawing from fieldwork data. This is a prerequisite for addressing how livelihoods have evolved since the mid-2000s, as per Research Questions 2 and 3.

Chapter 6 centers on on-farm changes that my Handai informants have committed to since the mid-2000s. My data demonstrate how land availability plummeted when renewable energy development began to impact the villages where I conducted research. I investigate how such

drastic changes in landholdings have been a catalyst for a host of agrarian diversification strategies. These tactics have included extending agricultural activities over new landscapes and an overall intensification of local agrarian practices. After examining these different strategies, I probe how my informants have dynamically positioned themselves in relation to such changes. Chapter 6 therefore contributes core answers to my second research question.

In Chapter 7, I posit that a significant rise in financial capital availability has combined with land scarcity in driving and/or influencing a series of off-farm diversification strategies. I first investigate the amount of financial compensation my informants received for their flooded landholdings and what they have done with it. I find that besides investing in their houses and in consumption goods, many have set some of their compensation money aside, with the intent to engage in new off-farm livelihood activities. In so doing, most of my informants have privileged activities they can undertake without leaving the villages. Yet for others, engaging in work migration has increasingly become an inevitable coping mechanism, even though it involves leaving their land and families. In Chapter 7 I carefully examine how these activities have unfolded in the villages since the mid-2000s, along with how my informants reflect upon the recent modernization of the village economy. Thus this chapter answers my third research question.

In the eighth and final chapter, I revisit the main points from each of the previous chapters and the main findings of this research. I then unpack how my findings specifically relate to the aim and questions that drive this project. Finally, I scrutinize the main conceptual contributions that emanate from my thesis.

My research demonstrates that the structures and actors that promote renewable energy schemes in the Red River valley participate in a form of renewable energy governance distinct from what has been written on this topic to date. For instance, greenhouse gas alleviation has now become a full-fledge argument for implementing renewable energy schemes in Yunnan. Along with this new policy objective, new stakeholders have joined environmental governance processes in the province, strengthening the neoliberal and authoritarian inclinations of such processes. By scrutinizing how renewable energy schemes were implemented in the Red River valley, I

demonstrate that this governance regime addresses only certain individual components from the local waterscape in isolation from one another. In consequence, this regime promotes a vision of nature that fails to account for any social component. For instance, by only visualizing barren lands as sites for potential jatropha plantations and the Red River as the theatre for a dam cascade, this vision promotes development patterns that induce greater negative social consequences than necessary.

My case studies shed new light on the intricate livelihood impacts that renewable energy schemes drive in Yunnan. While this is partly due to the very limited scholarship available on this subject, my research is nonetheless innovative in demonstrating how my informants have adopted elaborate diversification strategies for coping with the impacts of dam and jatropha schemes in their livelihoods. These strategies respond to particular cultural priorities, beginning with the importance that Handai populations allocate to their land and houses. Concurrently, coping tactics testify to the pragmatic reactions of my informants towards renewable energy schemes rather than their complete refusal or acceptance of so-called modernization. Thus, I emphasize that my informants have utilized their agency in a host of ways to address the negative consequences of dams and jatropha plantations upon their livelihoods, and to benefit from some of the opportunities these projects have brought about. Finally, I question the strict control under which state authorities hold information pertaining to renewable energy projects. I argue that the local population bears the greatest consequences from this censorship. But next, let us turn to the conceptual framework that helps me guide these investigations and interpretations.

CHAPTER 2

CONCEPTUAL FRAMEWORK: MEDIATING BETWEEN THE CHINESE STATE, ITS ENVIRONMENTAL PROJECTS AND THEIR LIVELIHOOD IMPACTS

2.1 INTRODUCTION

As noted in my introduction chapter, my research aim is *to investigate livelihood changes of Handai households in the Red River valley, Honghe Prefecture, Yunnan province, with a focus on the consequences of the expansion of hydropower and energy crop schemes, ongoing since the mid-2000s*. The conceptual notions and debates I outline and critique in this chapter contribute to achieving this aim in two main ways. First, my conceptual framework helps me to understand the nature, along with the political and economic ramifications, of such renewable energy projects when they occur in a Chinese frontier region by building on literatures from **political ecology** and **environmental policy-making and renewable energy development in China**. Equipped with such an epistemological overview I can evaluate, compare and contrast how actors operating at different scales position themselves towards the development of renewable energy capacities in Honghe Prefecture, as well as the consequences this 'development' brings. Second, among these stakeholders, I have purposefully decided to allocate particular importance to the local Handai populations that bear most of the consequences from such schemes.[15] For this reason, my conceptual framework integrates debates about **livelihood approaches** that allow me to conceptualize the empirical livelihood changes I witnessed and documented in the field. I argue that my conceptual framework combining political ecology, the literature centered on environmental policy-making and renewable energy development in China and livelihood approaches achieves this balance (Figure 2.1).

[15] Since previous scholarship on renewable energy development in Yunnan mostly concentrates on aspects of policy-making, I argue that my focus on the local population also allows me to address an important gap in currently available research (see Sections 1.1 and 3.2.2).

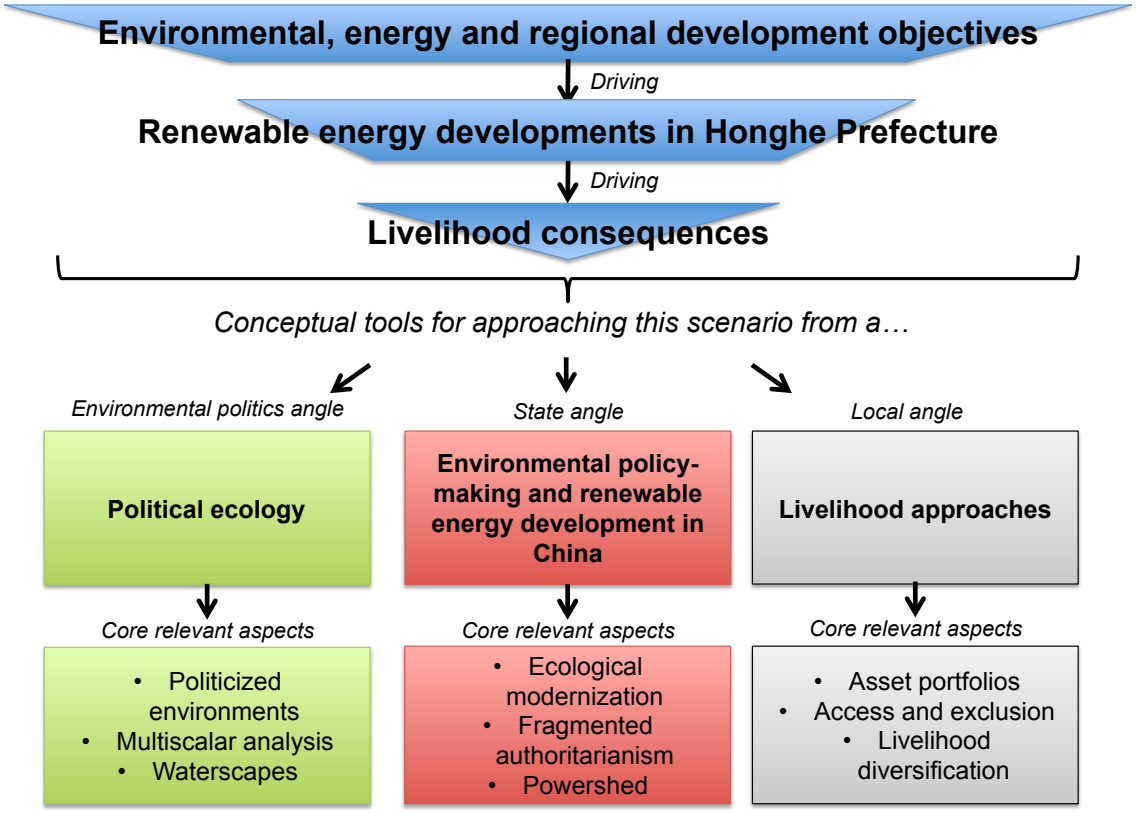

Figure 2.1: Conceptual framework

There are commonalities among the conceptual approaches I emphasize in my conceptual framework: for instance, all three demonstrate that knowledge is both context-dependent and socially constructed, and that there is accordingly no such thing as one 'Truth'. In other words, sociocultural and political contexts create multiply truths, and vice versa, as Foucault and scholars from the Foucauldian tradition demonstrate most convincingly (see Agrawal 1995; Foucault 1975, 1991; Said 1978; Valentine 1999). Likewise, the conditions characterizing how researchers access and process information also influence the knowledge they produce (see Crang 2002; Rose 1997). The three approaches that form my conceptual framework also bring to the forefront the interplay between internal and external factors and actors, and how they mutually influence each other. In particular, this shapes how I address environmental and economic policy-making and helps me to uncover the importance that resulting policies allocate to the local impacts of development schemes such as renewable energy projects.

Political ecology, the literature centered on environmental policy-making and renewable energy development in China, and livelihood approaches are also complementary in several key ways. For instance, whereas livelihood approaches tend to focus on the agency of micro-scale actors, discussions about environmental policy-making and renewable energy development in China emphasize national structures; political ecologists, for their part, document the interplay between structures pertaining to various scales and the agency of local populations. Moreover, livelihood approaches concentrate on how individuals and households adapt their livelihoods in order to cope with environmental changes and associated impacts within access regimes, while environmental policy-making and renewable energy development scholarship focuses on the political, economic and environmental ramifications of such processes. Again, political ecologists aim to reconcile such complementary inclinations and assess them in light of various contextual circumstances.

In Sections 2.2, 2.3 and 2.4 of this chapter, I critically discuss each of these three approaches at the core of my conceptual framework, namely political ecology, the scholarship about environmental policy-making and renewable energy development in China and livelihood literature. I also investigate how these bodies of literature have given rise to the concepts that form the building blocks of my conceptual framework. In Section 2.5, I demonstrate how I integrate the different components of my conceptual framework with my research questions and how this serves my analysis.

2.2 Political ecology: When ecology and politics try talking to one another

Political ecology consists of a research agenda that brings together scholars with diverse disciplinary and methodological backgrounds. Nonetheless, these scholars share a common interest in the various drivers and consequences of environmental change, along with an emphasis on fieldwork (McCarthy 2002; Peet and Watt 1996). Notably, authors identifying with this scholarship have stressed the political and ecological dimensions of politicized environments. They have also participated in scholarly debates regarding multiscalar analysis and have contributed to grasping what is so unique about water and how it shapes waterscapes. The notions of politicized environments, multiscalar analysis, and waterscapes are central components of my

conceptual framework and I discuss and critique each of them further in Sections 2.2.2, 2.2.3 and 2.2.4 respectively. However, before I do so, I introduce the historical and conceptual debates and critiques that have formed political ecology as we know it today.

2.2.1 Epistemological considerations: From Malthus to poststructuralism

In the 1970s, conceptual debates in the west led to "the final decline of the modern ideology of naturalism, that is, the belief in the existence of pristine Nature outside of history and context" (Escobar 1999: 1; see also Castree 2001). At that point, approaches focusing on nature-society relations, such as cultural and human ecology, were argued to have failed to account for political economy considerations that had obvious influences on environmental degradation and that could speak to environmental policy planners (see Walker 2005; Zimmerer 2010).[16] The same planners had long blamed environmental policy failures on Malthusian considerations, technological misfits, or the 'irrational' or 'backward' practices of local populations (Blaikie and Muldavin 2004; Bryant 1997; Bryant and Bailey 1997; Escobar 1996; Moore 1996; Neumann 1992; Vaccaro 2005). It was within such a context that Blaikie and Brookfield (1987) published their *Land Degradation and Society* highlighting the complex 'chains of explanations' that lay behind the allegedly irrational behaviour of African land managers.[17] Their manuscript has since become a foundational text within political ecology (see Muldavin 2008; Peet and Watts 1996; Robbins 2004; Turner 2009).

As political ecology matured from the initial political economy-centered structuralist framework of the 1980s and 1990s into its second, poststructural phase, its explanations of the drivers and consequences of environmental change became more nuanced (Adams 2001; Walker 2005). Feminist scholars addressed the gendered dimensions of resource tenure and environmental knowledge, forming the sub-branch of feminist political ecology (Elias 2010; Rocheleau and Edmunds 1997), while postcolonial authors highlighted the colonial legacies of historical resource management and/or conservation (Neumann 1992; Willems-Braun 1997). In addition, discourse analysis became central to assessments of how various knowledge regimes and cultures

[16] Human ecology promotes the holistic inquiry of the interrelationships among individuals or societies and their environments, whereas cultural ecology mostly addresses how different natural resource usage patterns relate to the 'cultural core' of a given society (Ingold 1987; Orlove 1980; Steward 1955).

[17] Blaikie and Brookfield convey a broad understanding of this notion, as land managers can range from household members to government and corporate actors.

allocate different meanings to particular environmental problems (Adger et al. 2001; Bassett and Zuéli 2000; Peet and Watts 1996; Robbins 2001). As a result, political ecology now offers a more nuanced toolkit for acknowledging the complexity of the social actors involved in environmental change as well as the power relationships in which they participate. Intrinsically, the approach recognizes the diversity of local natural resource users and portrays the state as a coalition of more or less conflicting interests rather than a monolithic entity. This last aspect, in turn, creates the potential for local actors to exploit inconsistencies (Bryant 1992; Moore 1996).

2.2.2 Politicized environments: "All animals are equal but some animals are more equal than others"[18]

Broadly speaking, political ecology literature frames the environment as a political arena where ecological change and degradation are outcomes of both ecological and political processes. However, Bryant and Bailey (1997) argue that the latter political processes are predominant in reality. They coined the notion 'politicized environment' to emphasize how politics regulate environmental change and how different social actors exert varying influences on such change (see Bryant 1998; Bryant and Bailey 1997; Robbins 2004). Environmental change consequently impacts or benefits these distinct stakeholders differently. Bryant and Bailey argue that within the 'Third World'[19] context of their research, local stakeholders hold the least influence over environmental change, and at the same time tend to be those whose livelihoods often depend most on the environment. Therefore, these people typically endure a disproportionate share of the impacts of environmental change and derive an insignificant proportion of the potential benefits. Such unequal redistribution mechanisms in turn influence power relations as well as inequalities between these same internal and external actors, typically to the benefit of the latter.

The approach that Bryant and Bailey (1997) conveyed, along with their focus on the wide range of actors involved in environmental change marked an important contribution to how political ecologists frame notions such as vulnerability, marginality, resistance and risk. It has also fuelled

[18] Orwell (1983: 114).

[19] The typology distinguishing between the first (capitalist), second (communist), third (everything else/non-aligned) and fourth (tribal/stateless/least developed) worlds is a Cold War legacy seldom utilized nowadays as it typically carries obsolete generalizations as well as pejorative and/or ethnocentric biases (Berger 2004; Rigg 2007). Hence, I only utilize these analytical categories when discussing literature that refers to these concepts or emphasizes Cold War rhetoric.

academic debate between scholars arguing for a concentration on the political dimensions of environmental change and others emphasizing ecology. For instance, Vayda and Walters published a strong argument 'against political ecology', accusing political ecologists of carrying "*a priori* judgments, theories, or biases about the importance or even primacy of certain kinds of political factors in the explanation of environmental changes" (Vayda and Walters 1999: 167; see also Walker 2005, 2007). Their critique further conveyed that because of the same *a priori* biases, political ecologists systematically underappreciate "the complex and contingent interactions of factors whereby actual environmental changes often are produced" (ibid.). Responses to this critique claimed Vayda and Walters put all political ecologists in the same basket, failed to acknowledge those among them who seriously engage with ecology and perpetuated an apolitical vision of ecology (Peet and Watts 1996; Simon 2008; Walker 2005).

This epistemological debate occurred in the midst of the transition from political ecology's structuralist phase, emphasizing the role of political economy in driving and moulding environmental degradation, to its poststructural phase (Adams 2001). Urging political ecologists to further engage with discourse analysis and Foucauldian scholarship, the *Liberation Ecologies* collection that Peet and Watts co-edited in 1996 was a milestone in this transition. Likewise, by focusing on the diversity of actors involved in environmental change, Bryant and Bailey (1997) participated in revisiting the structuralist origins of political ecology. Nonetheless, *Third World Political Ecology* does portray a constant opposition between powerful state and private actors on the one hand and less powerful on-site communities on the other. Moreover, Bryant and Bailey (1997) suggest – though with some nuance – that within each of these two groups, individual stakeholders all tend to experience environmental change in a somewhat homogenous manner (ibid.; see also Forsyth 2003).

This scholarship later gained in sophistication as researchers turned their attention to on-site actors for whom environmental change has created differentiated livelihood opportunities and constraints. In the context of Indian Sikkim, McDuie-Ra (2011) correctly argues that the histories of pro-development ethnic minority actors are less well documented than the resistance strategies utilized against modernization projects. Similarly, Forsyth (2009: 271, emphasis in original) states that scholars tend to adopt a resistance mentality, "*assuming* state-society relations are

those organized by notions of resistance, or that certain groups are unwilling to accept changes, or that change must necessarily instil resistance". Therefore, while I acknowledge the importance of documenting how environmental change negatively impacts livelihoods and how people resist these drawbacks, I also argue that being open to the possibilities of actors embracing modernization projects – or aspects thereof – is important in my research context. Again, the framework from Bryant and Bailey (1997) alone might fall short of this objective, as even though it acknowledges the diversity of the actors involved in and/or influenced by environmental change, it tends to allocate precise roles and vulnerabilities to each of these individual actors. However, combining this approach with a focus on livelihood assets and debates of access and exclusion (Section 2.4) allows me to highlight how environmental change impacts rural communities and their members in differentiated ways.

Indeed, political ecology has a long legacy within studies documenting how rural societies undergo various processes of social change, especially those set in developing countries (Robbins 2002). Bryant and Bailey (1997) justify this focus by arguing that 'Third World' countries share high levels of poverty, often inherited from the colonial past of many of these countries. However, many scholars have pointed out that political ecology notions and approaches are just as relevant in developed countries and urban settings (Neumann 2005; Robbins 2002; Schroeder 2005; Schroeder and Martin 2006; Swyngedouw and Heynen 2003; Walker 2003; Zimmerer and Bassett 2003b). Notably, it has been argued that whatever the context, political ecology is a powerful tool to bring new analytical and scalar categories to the fore (Magee 2006a; Walker 2003; Zimmerer and Bassett 2003a). The following section, focusing on multiscalar analysis, unpacks one of the strategies political ecologists most often use for achieving this.

2.2.3 Multiscalar analysis: Invisible relations between constructed entities

Although scale is a central notion within geographical inquiry, geographers have long taken the scalar constructions they emphasize in their research for granted, perpetuating a belief in the ontologically-given nature of scale. However, as with other concepts I discuss here, in the 1980s and 1990s many scholars began to deconstruct scalar constructions and probe the political motives and strategies they served (Delaney and Leitner 1997; Marston 2000; Rangan and Kull 2009). For instance, Bakker (1999) and Glassman (2010) have demonstrated how the creation of

the Greater Mekong Subregion (GMS), a regional entity that brings together the six riparian countries surrounding the Mekong River, did little to promote regional integration apart from creating new opportunities for commodification, including that of regional hydropower potential. Similarly, reviewing the relationship between the scales of the state and that of the nation, Agnew (1994) argues the current emphasis on the nation-state as the legitimate locus of state sovereignty has elevated the legitimacy of the state above that of the nation, thereby obscuring the cultural specificity and self-determination aspects the nation conveys. Purcell and Brown (2005) introduce another argument in such debates. They have coined the expression 'local trap' to critique scholarship and development policies that systematically portray the local scale and local population as more democratic, just and communitarian than actors and institutions at wider analytical scales.[20] In the Chinese context, scholarship that avoids falling into the local trap includes studies demonstrating how local Chinese authorities have utilized their power and above-average access to information in ways detrimental to their fellow villagers; Grispoon's (2002) research on land auctions in Sichuan and Sturgeon's (2005) work on rubber expansion in Xishuangbanna Prefecture, Yunnan Province are examples of this.

Likewise, scholars have identified how socially constructed scales consist of relational entities and have highlighted the importance of addressing the relationship between scalar configurations through multiscalar analysis (Magee 2006a; Swyngedouw 2001). Multiscalar analysis is indeed among the main tenets of political ecology, and this, again, goes back to Blaikie and Brookfield (1987) and their emphasis on 'chains of explanations'. Multiscalar analysis breeds significant intellectual and logistical challenges however. These challenges include identifying pertinent scales of analysis and developing methodologies that allow for moving from one such scale to another (Paulson and Gezon 2005).

Blaikie and Brookfield (1987) have suggested solutions to these obstacles (see also Blaikie 1985, 1989). First, they emphasize the regional meso-scale as the locus where micro- and macro-structural factors mesh. Second, they argued that the range of options that land managers can choose from are determined by 'chains of explanation' in which each link relates to

[20] This conclusion mirrors my earlier claim that Bryant and Bailey (1997) sometimes lacked nuance when portraying the on-site and off-site actors involved in environmental change.

circumstances emanating from a wider scale. This approach echoes that of 'progressive contextualization', which Vayda (1983: 265) has defined as a set of procedures that "involve focusing on significant human activities or people-environment interactions and then explaining these interactions by placing them within progressively wider or denser contexts".

Of course, we now see flaws in the above solutions, as they neglect to question the existence of the local, regional and global scales (or what Vayda calls contexts) they promote. Blaikie and Brookfield also failed to challenge the universal pertinence of 'the region' in understanding environmental degradation. The unilinear vertical and hierarchical 'chains of explanation' approach also disregards the multidirectional influences among the links composing the chains, and tends to allocate predetermined roles to the actors involved (Gray and Moseley 2005; Rocheleau 2008; Zimmerer and Bassett 2003a).

Regardless of these caveats, an important outcome of the approach that Blaikie and Brookfield (1987) proposed is the appreciation of how the factors that drive and explain environmental change pertain to various levels of explanation. This same idea is often emphasized in scholarship on Land Use and Land Cover Change (LUCCC), distinguishing between the proximate and ultimate/underlying causes of environmental change (Honey-Rosés 2009). The former series of causes relate to local practices that drive environmental change, while the latter consist of factors pertaining to wider scales of analysis that trigger and/or shape these local practices. Geist and Lambin (2002: 143; see also Honey-Rosés 2009; Leblond 2011) have applied this framework in their research on tropical deforestation, defining both forces:

> Proximate causes are human activities or immediate actions at the local level, such as agricultural expansion, that originate from intended land use and directly impact forest cover. Underlying driving forces are fundamental social processes, such as human population dynamics or agricultural policies, that underpin the proximate causes and either operate at the local level or have an indirect impact from the national or global level.

Other research that has investigated this proximate/ultimate causes couple includes work by Hirsch (1997) on resource usage intensification in Laos and Vietnam. Rao and McGowan (2002) use these same categories in their discussion about the criteria influencing wild meat availability and its livelihood impacts globally. Likewise, Bassett (1998) builds on these categories to

analyze the determinants of peasant-herder conflict in the Ivorian Savanna. Alternate versions of these same concepts include those of "mechanistic [proximate] cause" and "final [ultimate] cause" that Bromley (1999: 98) emphasizes in his discussion of deforestation. Likewise, Carr's (2013: 84) livelihood research in Ghana concludes that livelihood decisions and their outcomes are shaped by both "proximate biophysical events, social units and processes" and "less-proximate" versions of the same features. I, too, emphasize this latter typology in the following chapters, including when analyzing how livelihood change relates to the actual implementation of specific renewable energy schemes in the Red River valley and to more general sociocultural factors.

Finally, multiscalar analysis allows the researcher to combine the political and ecological scales where environmental change occurs. Zimmerer and Bassett (2003b: 289) foresee that such an integration of ecological and socially-constructed scales should lead to "distinctive environmental geographies". With these considerations in mind, I now turn to a scalar construction particularly appropriate to my research: that of the waterscape.

2.2.4 The waterscape: There is more in water than meets the eye

While the politicized environment approach and multiscalar analysis capture society-environment interactions as they occur in any ecosystem, scholars use the notion of the waterscape to address interactions when water resources come into the picture. Unpacking the various functions that water fulfills, Bakker (2010: 3, see also Béthemont 2002) explains: "Water is simultaneously an economic input, an aesthetic reference, a religious symbol, a public service, a private good, a cornerstone of public health and a biophysical necessity for humans and ecosystems alike." Some 50 years earlier, Wittfogel had highlighted some of the physical characteristics that make water so unique, like how it gathers in bulk and can be channelled (Wittfogel 1957). Given how the pursuit of these two features can require significant amounts of energy and coordination, Wittfogel related the massive irrigation systems developed in Asia with the alleged 'despotic' nature of the political regimes overseeing them (ibid.).[21] Many academics have since highlighted

[21] Wittfogel promotes strong ethnocentric biases, which is probably not surprising given the 'Red Scare' period during which he was writing. His thesis nonetheless is informed by Marxist theory on the modes of production, and most particularly focuses on the 'Asian mode of production' (Marx 1965 [1867]). Doing so, Wittfogel elevates the 'hydraulic bureaucracies' Weber discussed before him (Weber 1951 [1915]; see also Foster and Holleman 2012) as

the permanent, linear and deterministic nature of the 'Oriental despotisms' thesis, along with the historical inaccuracies it conveys (Bannister in press; Foster and Holleman 2012; Molle et al. 2009b; Scott 2009; Stargardt 1992; Stott 1992).

Despite these critiques, the contribution from Wittfogel is an inescapable starting point for research on the roles, influences and motivations behind the promotion of various hydraulic technologies – most notably irrigation, water transfers and dam projects – that render water legible to hydraulic bureaucracies (Bannister in press; Bray 1986; Harrower 2009; Meehan in press; Scott 1998). One of the most often cited examples of hydraulic bureaucracies are the US Bureau of Reclamation, which promoted large-scale multipurpose water resource development as a tool to contain communist spread in 'Third World' countries during the Cold War. Another example is that of communist China, which, following the Stalinist model, elevated hydraulic works as one of the pillars of national identity in the People's Republic of China (PRC) (Ekbladh 2002; Molle 2009; Molle et al. 2009b; Shapiro 2001; Sneddon 2012).[22] These examples show how water can indeed lead to particular social arrangements, connecting, according to Orlove and Caton (2010: 402), "domains of social life to each other in ways that are not haphazard or accidental because they depend on each other" (see also Fonstad 2013; Swyngedouw 2007). The notion of the waterscape captures these connections, the material and symbolic processes driving them and the locales in which they materialize.

Like that of the landscape, the notion of the waterscape has a long history associated with pictorial representations of place, though waterscapes depict settings that encompass bodies of water (Cresswell 2003; Orlove and Caton 2010). Like the notion of the landscape, the waterscape has undergone a thorough reconceptualization from the 1980s onwards. Previously understood as fixed and univocal settings, waterscapes are now considered to exemplify fluidity and accommodate conflicting visions and perceptions (Baviskar 2007). As a result, waterscapes now embody the social practices and power relations embedded within water and how water is

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the most important aspect of this particular stage in Marxist social evolution theory. Other scholars have emphasized different applications of the Asian mode of production concept, including Chinese social scientists using it for categorizing and critiquing the excesses of the Maoist period (1949-1976) (Day 2013).

[22] As Shapiro explains (2001, see also Nickum 2010), dam projects were an important aspect of 'Mao's war against nature' and Maoist times probably mark the apex of the Chinese hydraulic bureaucracy. Nonetheless, hydraulic actors nowadays remain powerful within both Party and state organs (see Sections 2.3.3 and 4.4).

conceived and utilized (Molle et al. 2009a). Scholars participating in these debates have spanned various fields, but many adopt a political ecology approach, including Erik Swyngedouw, whose 1999 article on the Spanish waterscape is a key reference (Loftus 2009; Orlove and Caton 2010).

Swyngedouw (1999) first refutes the long-standing opposition between society and nature and emphasizes socionatures, a scalar construction where these two mutually constitutive aspects can no longer be isolated from one another (see also Bakker 2012; Bannister in press; Budds 2009; Castree 2001; Loftus 2009). He then retraces the history of Spanish hydraulic programmes during the 1890-1930 period, arguing: "The rhizome of underground and surface water flows and the stream, pipes, and canals that come together in water gushing from fountains, taps, and irrigation channels is a powerful metaphor for a deeply interconnected socionature" (Swyngedouw 1999: 446). Therefore, whether aspects of a waterscape belong to its allegedly 'natural' or 'social' dimensions makes no difference in the end; it is their organization, linkages and connections that are important (Bakker 2010; Norman et al. 2012). Indeed, water availability, quality, location and uses, along with how these evolve, are all consequences of political decisions that both inform the relative power of the social actors involved and constantly alter how these actors relate to one another (Budds and Hinojosa 2012; Budds and Sultana 2013; Linton and Budds in press; McDonald 2007; Swyngedouw 1999, 2009).

Budds and Hinojosa (2012) argue that a focus on the constant evolution of social relations within a waterscape makes this framework a powerful tool for overcoming scalar constructs where the natural and political materialities of water are embedded in predetermined ways. Predetermined ecological scales span the watershed, the region and the global, while water politics most often emphasize the local, provincial, national and international lenses. These debates help me contextualize the scalar constructions that the Chinese political system strictly imposes, and how these constructions fail to account for socio-ecological dynamics such as those involving upstream/downstream and lowland/highland actors (see Section 2.3).

2.2.5 Concluding thoughts on political ecology contribution

Political ecology as a research field is still being defined. As such, political ecologists continue to debate the appropriate balance of the importance they ought to attribute to ecology versus politics

when addressing the determinants and outcomes of environmental decision-making, resulting environmental change and its social impacts. While acknowledging and often highlighting the multiscalar considerations governing resource use and access, political ecologists still investigate the interconnections and causation links among the micro, the meso, the macro, the social, the natural and everything in between, along with the implications that privileging any of these scales entail. Far from paralyzing the field, this continuous quest makes it a dynamic approach that notably breeds novel ways to understand what is so particular about water, and how the ways we utilize it inform particular social arrangements.

In regards to my own work, political ecology helps me approach the Red River valley as a waterscape where environmental change is a consequence of political factors and actors external to the area as well as of local land use practices and decision-making. My result chapters examine the imbalances between how each set of factors affect the local environment in the Red River valley. These numerous causes, across scales, influence how much water remains available for different activities, under what conditions, the degree to which it is polluted or not, who it benefits and what it means for others.

2.3 Environmental policy-making and renewable energy development in China: "Everything is political in China"[23]

Biofuel plantations and hydropower development in China are mostly framed as contributing to environmental objectives, as their contribution to reducing the dependence of the country on coal and oil-derived fuels overshadows any other potential environmental or social impacts. I discuss how these discourses translate into actual policies that promote renewable energy development in China in Chapter 4. However, it is important to first set the conceptual foundations on which the latter discourses that aim to reconcile economic and environmental objectives rest; and this is what my discussion of ecological modernization is meant to achieve in Section 2.3.1. Further, Section 2.3.1.1 introduces how China emphasizes a version of ecological modernization 'with Chinese characteristics' that promotes development as a solution to its environment problems

[23] Prof. Li, 9 September 2011.

while strictly controlling public debate, thus turning a blind eye to one of the central components of an ecological modernization agenda.

The notion of 'fragmented authoritarianism' that Lieberthal and Oksenberg coined in 1998 allows for connecting such unexpected outcomes with the very nature of decision-making processes in China. Focusing on energy governance, including hydropower development decision-making, their approach highlights the bargaining processes vital to the functioning of the Chinese government, as I discuss in Section 2.3.2. Then in Section 2.3.3, I review the concept of the powershed promulgated by Darrin Magee (2006a, 2006b) as it too informs how hydropower governance is the outcome of various stakeholders coming together. However, the powershed differs from fragmented authoritarianism in the sense that it concentrates on Yunnan hydropower resources in particular, and gives greater importance to corporate actors than the Lieberthal and Oksenberg (1998) approach.[24]

2.3.1 Ecological modernization: Green development as a development fix

Conceptualizing ecological modernization first requires addressing modernization theory, given the close resemblance between the promotion of progress and modern technologies that epitomize the ethos of both theories (Foster 2012; Gilman 2003; Hajer 1995). The heyday of modernization theory occurred in the post-World War II decades and marked the period when the notion of modernization became closely associated with that of economic development, and more particularly with economic development in the 'Third Word'. Indeed, modernization theory "saw Third Word development as a process of emulation of the patterns of development previously experienced by the now so-called developed nations" (Herath 2009: 1452). More particularly, Walt Rostow stated that 'traditional societies' from the 'Third World' needed to undergo four distinct stages of growth before they could become societies of high mass-consumption emulating the North American model (Hettne 1990; Rostow 1971;). Emphasis was placed on the 'take-off' stage of Rostow's formula, and natural resource wealth was understood as an important asset in achieving the industrial-scale economies this juncture would make possible (Pritchard 2013).

[24] This is no coincidence as Lieberthal and Oksenberg published their essay before the privatization of the energy sector began in China, hence in a period when private actors were absent from energy activities (see Section 4.2.2).

The approach that Rostow proposed was straightforward and simple. Development practitioners widely promoted it during the Cold War as a road map for achieving the western-led and liberal social progress development programme intrinsic to the United States' communism-containment policies (Foster 2012; Gilman 2003; Simon 2006). However, modernization theory and the unilinear development trajectories it promotes did trigger much scholarly critique. First, dependency and world system theorists highlighted the empirical shortcomings of modernization theory and how inadequate the approach was for theorizing why modernization takes root in certain locales and not in others (Hettne 1990). Later, poststructural scholars associated with postdevelopment scholarship vilified the teleological approach modernization theory conveys, along with its 'one-size fits all' stance to development (Escobar 1995, 1996; Long 2001; McGregor 2009; McKinnon 2007).

According to Mol (2002: 93), ecological modernization consists of a scholarly approach regrouping studies that focus on the analytical, political, ideological and economic implications of an emerging "rupture in the long established trend of parallel economic growth and increasing ecological disruption" since the 1980s. Analytical aspects include the raising profile of an ecological rationality within a given society. This emerging rationality leads to changes in policy-making processes, themselves partly driven by the emergence of an environmental movement independent from the state and/or political ideologies. These features together facilitate development patterns that promote environmentally friendlier technologies and a reversal of the correlation between economic development and environmental degradation (ibid.; Murphy 2000).

Ecological modernization emerged in the west, where economic and social factors first combined in promoting technologies that could reverse the relationship between the "two old enemies" (Escobar 1996: 49) of economic development and environmental protection. Simultaneously, ecological modernization introduced strong counter-arguments to warnings about the limited availability of natural and energy resources and their foreseeable exhaustion, the most notable of which were highlighted in the *Limits to Growth* report from the Club of Rome (1972). Indeed, the proponents of ecological modernization argue that such radical critiques carry neo-Malthusian

biases and could be overcome through technological innovations (see Bäckstrand and Lövbrand 2006; Becker and Jahn 1998; Mol 2006; Spaargaren 2000).

Along with this strong belief in technology as a development fix, early ecological modernization theorists had ambitions for this approach to catalyze wide-ranging social change. It was envisioned that ecological modernization could facilitate a state-led political project that would institutionalize environmental concerns and ecology as autonomous and independent forms of rationality within the capitalist system (Buttel 2000; Langhelle 2000; Mol 2000; Spaargaren 2000). The report published by the World Commission on Environment and Development in 1987 also supported such claims (WCED 1987). Widely known as the Brundtland Report, it promoted 'sustainable' forms of development "meeting the needs of the present without compromising the ability of future generations to meet their needs" (WCED 1987: 1). Since then, the notions of sustainable development and ecological modernization are often conflated (Langhelle 2000). Yet, Langhelle highlights important distinctions between both concepts: sustainable development promotes holistic systemic changes, while ecological modernization concentrates on environmental issues only. Likewise, sustainable development involves comprehensive systemic changes in a global development governance regime, while ecological modernization rather focuses on national governance regimes (ibid.).

By the early 1990s, the proponents and critics of environmental modernization alike began acknowledging that the political project ecological modernization promoted had failed to become reality (Buttel 2000; Harvey 1996). Proponents thus toned down their emphasis on socio-political reform and moved their focus towards explaining why some modernization projects – including in Germany, the Netherlands and Switzerland during the late 1990s – led to ecological progress, while others – such as in the United States during the same period – did not. Hence, ecological modernization as a conceptual approach now mostly aims to highlight capitalist ventures that yield desirable ecological outcomes so as to promote, in the words of Foster (2012: 212), the "fine-tuning of the productive apparatus" (see also Buttel 2000; Curran 2009).

Critics of this approach see ecological modernization as altogether discredited. First, they argue that ecological modernization theorists fail to recognize that bringing environmental degradation

to a stop demands much wider systemic changes than their utilitarian logic suggests (Bryant and Bailey 1997; Hajer 1995; Harvey 1996). Second, Hajer (1995; see also Hajer and Versteeg 2005) has demonstrated that some environmental issues and their associated technological fixes stand out as more pressing than others only because political and economic actors frame and define them as such. With its technocratic stance, ecological modernization fails to account for the political processes through which this hierarchization occurs (Blaikie and Muldavin 2004; Hajer 1995; Langhelle 2000; Oels 2005). As a result, the environmental opportunity costs associated with the resulting priority lists are by default left out of the ecological modernization equation.

For instance, Martin Jänicke (2008: 560), one of the originators of ecological modernization, sees alarmist studies on climate change as the "new driving forces behind the accelerating trend towards 'ecological modernization'".[25] For Jänicke, the demonstration of the extent and scale of climate change calls for immediate action and technological fixes. Although Oels (2005) does not share the same enthusiasm towards ecological modernization, she also agrees that climate change is first and foremost understood as a pressing environmental crisis that needs to be curtailed. However, she further notes that such dominant discourses silence the ethical concerns that climate change and associated alleviation measures raise. In addition, the same discourses fail to question the capitalist system that breeds the anthropogenic causes of climate change (ibid.; see also Bäckstrand and Lövbrand 2006). Instead, they frame climate change as one of the most dangerous ecological crisis humanity faces: a crisis to which all of us contribute to different extents, and, in accordance with ecological modernization, as a crisis that calls for market-based solutions (Liverman 2009).

With regards to climate change, this commodification process has led to the trading of carbon credits, a component of the Kyoto Protocol officially known as 'Certified Emission Reductions' (CER) (Section 4.3.1; see also Bumpus and Liverman 2011; Peet et al. 2011).[26] CERs have not

[25] Jänicke does not precisely identify what alarmist studies he refers to, but one can easily extrapolate that these include reports from the Intergovernmental Panel on Climate Change (IPCC) and the Stern Report. The former is a scientific body responsible for assessing the risks climate change poses (see www.ipcc.ch), while the Stern Report was a highly mediatized assessment that Great Britain Treasury commissioned on the potential economic cost associated with climate change and climate change alleviation (Stern 2007).

[26] Commodification is the process leading to the creation of new commodities that have a market value and that are traded for cash (Fox 2000; Nevins and Peluso 2008; Peluso 2007). Commodification is not particular to the capitalist system, but it is understood as one way to create new markets, which in turn facilitate capital accumulation.

achieved the objective of reducing global greenhouse gas emissions (GHG). Yet CER markets have allowed for "previously uncapitalized aspects of nature and society become, themselves, internal to capital" (Escobar 1995: 199), in a pattern Escobar calls the emerging 'ecological phase' of capitalism.

While this commodification facilitates ecological modernization agendas, it is noteworthy is that aspects of the ecological phase of capitalism now merge with aspects epitomizing capitalist modernity. These aspects include the hydroelectric dams and monocrop biofuel plantations my case study focuses on. Jawaharal Nehru's famous reference to dams as 'temples of modernity' best captures the symbolic relation between dams and the modernization scheme. Likewise, 'scientific' monoculture plantation management is at the core of a demonstration by James Scott (1998) of how modern states make territories legible. Nowadays, proponents of ecological modernization promote these same activities on the grounds that they produce energy with a lower carbon footprint than other energy sources and thus hold CER production potential.

Brown and Corbera (2003) refer to this situation in which policy initiatives promote specific development scenarios for reducing GHG emissions as the 'new carbon economy'. To Boyd et al. (2011), the alleged 'newness' of the new carbon economy lies in the fact that it creates new incentives for promoting existing and novel technologies alike. This same conjuncture epitomizes supposedly novel and unprecedented environmental challenges and intertwines local and global climate governance in new scalar constructions.[27] However, Boyd et al. (ibid.: 602) further argue that the new carbon economy and the actors controlling it replicate previous patterns, only "suit[ing] the preferences of powerful fractions of capital in leading economies for trading schemes over taxes or regulation". The new carbon economy thus offers very little opportunity for local populations to get involved in designing the projects that constitute this system (Brown and Corbera 2003).

[27] For instance, an agreement between indigenous Tzeltal farmers from the Chiapas State of Mexico and the Formula One organization, where the former plant trees to offset GHG emissions from the latter, exemplifies that carbon trading operation creates quite unexpected networks (Gutiérrez 2012).

2.3.1.1 Ecological modernization in China: Environmentally friendly Asian values?

According to Nils Gilman (2003: 3), the United States relied on modernization theory during the Cold War for "promoting change that would make these [postcolonial] regions become more like "us" – and less like the Russians or the Chinese". Yet the Red Scare origins of modernization theory has not prevented some Chinese academics and cadres from embracing western modernization as an alternative to Marxist and Maoist doctrines since the 1980s.[28] Indeed, this marks the moment when modernization "with Chinese characteristics" began to be actively promoted in the country in replacement for Maoist revolutionary narratives (Cao 2009: 11; see also Li 2010).[29] For instance, Cao argues that this pragmatic programme reconciles modernization theory, the one-party socialist system, long-lasting efforts by the Communist Party of China (CPC) to modernize the Chinese industrial base, as well as a more recent focus on developing the tertiary sector (ibid).

Similarly, the Chinese government has framed ecological modernization as a solution to acute environmental degradation, itself aggravated by population size, rapid economic development and relative natural resource scarcity in China (see Ho 2006; Liu and Diamond 2005). Notably, the Chinese Academy of Sciences (CAS) dedicated the 2007 edition of its China Modernization Report series (中国现代化报告 *Zhongguo xiandaihua baogao*, CAS 2006) to ecological modernization and to how to apply this exogenous and mostly European concept domestically. The report promotes a form of ecological modernization 'with Chinese characteristics' that does not bother acknowledging the social change and wider public participation aspects at the root of this vision. In this sense, the report echoes the conclusion from Mol (2006) that although globalization forces facilitate the diffusion of western concepts such as ecological modernization, local and national factors and histories 'tint' how individual governments manage the analytical, political, ideological and economic implications enshrined in this approach.

[28] This marks the moment when Deng Xiaoping initiated his 'Reform and Opening' reforms (see Section 4.2). The promotion of modernization theory therefore remains closely associated in China with the reforms and their liberal spirit. Modernization approaches have more recently faced critiques from scholars participating in a Chinese 'new left', who plead for further and firmer political control over all aspects of society, including markets (see Day 2013).

[29] This does not contradict that modernization theory and Maoist policies promoted similar development trajectories, including industrial growth. Yet my argument here concentrates on the paradigmatic transition from the promotion of a revolutionary narrative that characterized Maoist rule (1949-1976) to that of various modernization processes, including ecological modernization (see Li 2010).

Mol (ibid.) further argues that the institutionalization of environmental issues has so far only been partial in China. For instance, China has acquired modern institutions and legal instruments to protect its environment and water resources, but suffers from an 'implementation gap' in which policies and/or laws diverge from their applications and/or outcomes at the local scale (Economy 2004; Kostka and Mol 2013; Magee 2013; McDonald 2007). The endemic corruption that plagues the country often motivates authorities to turn a blind eye to development projects that contravene environmental laws (Economy 2005; McDonald 2007; Van Rooij 2006a, 2006b). In addition, while environmental agencies from the central government operate within a relatively independent structure, the local Environment Protection Bureaus (EPB) responsible for the implementation of laws and policies drafted in Beijing are dependent upon local governments allocating them their budget (Andrews-Speed 2012; Economy 2004; Mol 2006; Mol and Carter 2006). This occurs in a context where career advancement for local cadres is assessed with regard to economic development rather than environmental achievements. Therefore, local authorities notoriously privilege the former over the latter (Birney 2014; Blaikie and Muldavin 2004; Cai 2000; Smil 1993; Van Rooij 2006a).[30]

Similarly, China refuses to commit to environmental measures that could potentially impact its main economic priorities (Mol 2006; Van Rooij 2006a). A meaningful example is the refusal from the government to adopt a country-wide mandatory greenhouse gas emission reduction objective (Chen 2009; Heggelung 2007), along with its emphasis on energy and CO_2 intensity reduction policies instead of emission caps (see Price et al. 2011; Yi et al. 2011).[31] This approach has so far failed to yield the expected results, and the Chinese economy is now more energy-intensive than in the year 2000, with its energy consumption having increased almost two per cent faster than its economy over the last decade (Vermeer 2011).[32]

[30] The 12th Five Year Plan (2011-2015) introduces 'binding' environmental targets pertaining to energy and CO_2 intensity. Kostka and Mol (2013) read these guidelines as a strong signal from the central leadership that it intends to tone down the importance economic development plays within the cadre career promotion system. However, one has to remember earlier failed attempts to achieve such environmental objectives. These failed attempts included, in the mid-2000s, the ambitious project from the Central Government to implement a so-called 'Green GDP' system to account for the environmental externalities of development. The project was aborted due to resistance from local governments (Li and Lang 2009).

[31] Energy intensity and CO_2 intensity are functions of GDP/Energy consumption and GDP/CO_2 emission formulas.

[32] Yet China did achieve a gain in energy efficiency over the 1980-2010 period (see Section 4.3.2).

Finally, the government instrumentalizes so-called ecological modernization-inspired programmes to achieve social objectives that do not relate to environmental enhancement whatsoever. Yeh (2009) demonstrates that ecological programmes targeting western Chinese regions attribute environmental degradation to local resource users often belonging to national minority groups, and fail to acknowledge the legacies of previous Beijing-led campaigns on the environment. She concludes that the solutions the government proposes to curtail environmental degradation, namely reforestation (including developing agrofuel plantations over barren lands) and grassland improvement, have "had the effect of further marginalizing already politically and economically marginalized citizens, while also producing only questionable environmental benefits" (ibid.: 892). In other words, these allegedly green solutions participate in a wider agenda that promotes social change and modernization for minority nationality groups (see Sections 4.2 and 5.3.1).

2.3.2 Fragmented authoritarianism: What lies behind the red bamboo curtain

In their oft-cited study on decision-making in China, Lieberthal and Oksenberg (1988) discuss three case studies that pertain to energy resources, including one focusing on the Three Gorges dam.[33] Their research first documents the highly hierarchical structure of Chinese government and state agencies, the official procedures overseeing how organs from the central government adopt policies, and subsequent policy implementation by other bureaus with an equal status in the central government and/or located further down the chain of authority. Second, Lieberthal and Oksenberg (ibid.: 32) demonstrate that "the networks of individuals bound by mutual organizations and loyalties who are embedded in the formal organizations, and by the total web of bargains among hundreds of thousands of units" fragment this authoritarian structure. Within this system, authority is dispersed at all levels from the central to the provincial and the local. The guiding principle is that individuals involved in structures from upper echelons have more authority than their subordinates (Andrews-Speed 2012). Nonetheless, higher cadres need to "secure compliance" (ibid.: 407) from those located further down in the state apparatus to

[33] The Three Gorges dam is situated in Yichang, Hubei Province, along the Yangtze River. Its 22.5gW capacity currently makes the Three Gorges dam the most powerful dam in both China and the world. While the project to build the dam dates back to Sun Yat-Sen, it received the green light from the National People's Congress (NPC) in 1992, after the most contested vote ever held in the history of the People's Republic of China (PRC) (see Dai et al. 1994). Former Prime Minister Li Peng was the greatest supporter of this project, which has been widely contested for its far-reaching environmental and social impacts.

exercise their power, and mostly resort to bargaining to avoid their projects stalling somewhere within the diffuse policy implementation process (see also Heggelung 2004). Lampton (1992) argues that bargaining is particularly important when it comes to water projects, as water resources often spread among many jurisdictions and upstream-downstream dynamics create unique management challenges.

The fragmented authoritarianism approach echoes theories on post-totalitarian political regimes that list pluralism among the criteria that distinguish them from totalitarian systems (Linz and Stepan 1996). Chan (2005) identifies how pluralism within the political structure in China is a legacy of the economic reforms that Deng Xiaoping initiated after the death of Mao Zedong (see Section 4.2). He further argues that these reforms have left room for a wide range of social organizations, including non-governmental organizations (NGO), to influence policy-making within this somewhat flexible structure. One way social actors often get involved in this process is by utilizing what has been termed 'rightful resistance'. As O'Brien and Li (2006; see also O'Brien 2013) document, individuals and organizations resorting to rightful resistance frame their claims for social change in legal terms, rally cadres who share similar opinions and/or strategic interests to their causes, and manoeuvre to get the media interested in their struggles.

This framework is important for a discussion of hydropower development since Chinese environmental NGOs exploit the fragmented nature of the regime and use resistance strategies that demonstrate aspects of rightful resistance. The campaign against the damming of the Nu River, the Chinese upstream section of the Salween River, has been one of the most publicized cases that built on rightful resistance tactics, and has had significant political impacts in China (see Brown. et al 2008; Litzinger 2007; McDonald 2007; Mertha 2008, 2009; Tilt 2012; Wells-Dang 2011). Participants in this endeavour included both Chinese and international NGOs, along with journalists and academics. Notably, in the early 2000s campaigners argued that preliminary work undertaken near potential dam sites in the Nu watershed targeted for hydropower development contravened the commitments that China made to UNESCO when the 'Three Parallel Rivers' area encompassing sections of the Nu was added to the list of World Heritage

sites.[34] They also demanded that the 2002 Environmental Impact Assessment (EIA) Law apply to the Nu River dam scheme (see Mertha 2008, 2009).[35] The success of this campaign was assured in 2004, when then-Premier Wen Jiabao ordered all preliminary damming work along the Nu River to be stopped indefinitely. Although this decree is still valid today, reports of further ongoing preliminary dam work have occasionally made headlines in the ensuing years (K5, 30 July 2012; see also Jacobs 2013).

The timing of the decision Wen Jiabao took on the fate of the Nu River more or less coincided with Andrew Mertha initiating field research for his *China's Water Warriors* book (Mertha 2008). Mertha argues that the fragmented authoritarianism framework from Lieberthal and Oksenberg (1988) must be revisited, notably because policy-making in China now leaves more room for non-state actors than during the late 1980s:

> Since the 1980s and early 1990s, the political process in China, while no less fragmented, has become somewhat less authoritarian: it has seen the sphere of political conflict increase, allowing actors hitherto relegated to passive recipients of policy outputs to become influential players within the policy process. (Mertha 2008: 5; see also Mertha 2009)

My field experiences both among villagers who campaigned to receive appropriate land flooding compensations (see Section 6.2.2) and with NGO campaigners and academics who are actively trying to influence hydropower development suggest that authoritarianism has made a comeback since Mertha published his somewhat optimistic outlook (see also Habich 2013). Indeed, some actors involved in the Nu River campaign have faced serious retaliation since then, and those among them with whom I have been in contact for over ten years argue that there is less room for public debate now than in the mid-2000s.[36]

[34] The answer to this critique from the government was the planned dams schemes were located in the Nu River valley, while the UNESCO site protected the watershed's highlands, from an altitude of 2,000 meters and above (Brown and Xu 2010; Mertha 2008).

[35] A significant difference between the 2002 law and earlier regulation is that requires authorities preparing regional development plans to conduct 'Planning EIAs' upstream of the individual development projects for which EIA requirements were already mandatory, although vague. The new law clarifies this and also introduces minimum sanctions for non-compliance with the law (Van Rooij 2006a, 2006b).

[36] For a review of the various means through which the Chinese state maintains its grip on local and international NGOs, see Wu and Chan (2012).

2.3.3 The Powershed: Who really pulls the ropes?

Darrin Magee's research (2006a, 2006b) focuses on the plurality of actors involved in hydropower development in China, particularly along the Nu (upper Salween) and Lancang (upper Mekong) rivers in Yunnan Province. He coined the notion of the 'powershed' to grasp the particular scalar construction in which hydropower development and the power relations overseeing it materialize. The powershed therefore represents a space "over which a portable resource (water or electricity) is collected and concentrated for use, with use frequently occurring far from the site of collection (or in the case of electricity, generation)" (Magee 2006b: 26). Further discussing this space, Jiusto (2009: 542) argues: "Nowhere are the unevenly distributed spatial consequences and contradictions of low-carbon energy development more apparent than in the case of hydropower dams". Magee sheds light on these contradictions and spatial consequences.[37] In so doing, he traces the influence of actors from wealthy eastern Chinese regions over hydroelectric development occurring in the watersheds of western provinces. He concludes that "while rural in location, many of China's largest hydropower projects are decidedly urban in intent; that is, massive hydropower stations on rivers in rural western China provide electric power to urban industrial centers hundreds of kilometers away" (Magee 2013: 1192).

The model that Magee introduces coalesces with the conclusions of Oakes (2004), who scrutinized stakeholders involved in hydropower development in Guizhou province, also pinpointing the disproportionate importance of actors from the eastern coast. Magee's argument also supports that of Donaldson (2011), namely that Yunnan authorities privilege large-scale infrastructure and an outward-oriented growth model. Donaldson further demonstrates how this occurs to the detriment of other policy objectives, including poverty alleviation.

Following this lead, I argue in this thesis that the local development and environmental enhancement objectives that hydropower developers allegedly promote are in fact secondary. Rather, hydroelectricity capacity development in Yunnan is driven first and foremost by west-to-east resource transfer schemes carried out, in the words of Magee (2006a: 183), "in the name of

[37] Yet, when Magee was in the field, CO_2 was not framed as such an environmental issue as important as it is today. Therefore he does not precisely address the contradictions and consequences that result from hydropower now being promoted as a vehicle for alleviating global GHG emissions.

comparative advantage, economic necessity, energy security, and global and regional competitiveness".[38] Actors from Guangdong Province, the Chinese industrial powerhouse, hold a disproportionate influence over such resource flows mostly because they provide both the capital and market that justify hydropower development in Yunnan. They also profit from policies and institutional measures that frame western regions in China as simultaneously resource-rich and socio-economically backward, thereby encouraging extractive industry development such as the Go West Campaign and the related 'West Electricity Send East' policy (西电东送 – *xidian dongsong*) (Section 4.2; see also: Oakes 2004; Magee 2006b; Tullos et al. 2010). These factors, along with the strong influence of Guangdong-based corporate actors over power grid construction[39], combine to "naturalize and give urgency to plans to tap hydropower potential on Yunnan's major rivers" (Magee 2006a: 266). These circumstances also ensure that the local social and environmental impacts of such plans are under-considered.

2.3.4 Concluding thoughts: Chinese characteristics and renewable energy development

In this section, I introduced aspects pertaining to environmental governance in China and emphasized how renewable energy development engages state and corporate actors in various bargaining processes. By emphasizing an ecological modernization agenda, the state aims to achieve an alleged reconciliation of development and environmental objectives. The western version of this model tolerates and promotes public debate among a wide-range of governmental, non-governmental and private actors. However, since decision-making processes in China do not tolerate such debate, Chinese policy-makers pragmatically promote a variation of ecological modernization better suited to the national political context. In both cases, proponents of this approach tend to prioritize certain environmental objectives over others, and in doing so emphasize only some of the environment impacts/consequences/benefits of a given development project while turning a blind eye to others.

Nonetheless, though there is no official room for public debate in China this is not to say that energy governance systematically leads to consensus among interested parties. Indeed, the

[38] I personally add environmental/climate change arguments to these justifications.
[39] The capital city of Guangdong Province, Guangzhou, is home to the headquarters of the China Southern Power Grid, which links South China provinces, including Yunnan and Guangdong (Section 4.3.2; see also Ma and He 2008; Yeh and Lewis 2004).

fragmented authoritarianism notion informs the debates surrounding energy capacity development and how state actors manage their dissensions. Discussing this approach, I highlighted how interactions among cadres at different levels in the state hierarchy create webs of power. For instance, officials from the central government, though located higher in the power pyramid than local actors, still need to secure local support in order for policies drafted in Beijing to percolate down to the wider population. Hydropower development in Yunnan also creates particular networks where actors from Guangdong Province exert a disproportionate influence over the distribution of the benefits and consequences associated with this activity. The notion of the powershed allows us to grasp the peculiar scalar configurations that result from this situation.

2.4 LIVELIHOOD APPROACHES: VIEWS FROM THE BOTTOM

Livelihood approaches form the third pillar of my conceptual framework, allowing me to gain a nuanced understanding of the various assets my informants use to make a living, the criteria that govern their ability/inability to do so, and the strategies they deploy when these criteria change, especially as a consequence of renewable energy capacity development. In Section 2.4.1, I first review the factors that convinced scholars and development practitioners to promote livelihood approaches from the 1990s onwards and to emphasize the individual and/or household levels in their inquiries. In Section 2.4.2, I discuss how livelihood approaches equip me with a refined framework for identifying what assets come into play when people make a living. In Section 2.4.3, I introduce the notions of access and exclusion, while in Section 2.4.4 I examine a wide range of livelihood diversification strategies.

2.4.1 Epistemological considerations: A way out of the impasse?

Livelihood approaches emerged in the early 1990s at the time when the mainstream growth-centered development thinking that the 'development machine' had promoted since the end of WWII[40] and the neo-Marxist critiques it encountered were reaching an impasse (see Schuurman

[40] Modernization theory, along with Walt Rostow's (1971) hypothesis that traditional societies undergo five distinct stages of growth to become societies of high mass-consumption emulating the Western model, influenced this growth-centered model (Section 2.3.1). The 'development machine' encompasses the various mechanisms that participated in the diffusion of these ideas to the 'Third World' in order to "mak[e] the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas", in the words US President Harry Truman used in his second inaugural speech (1949).

1993). Systematic project failures had resulted in the stagnation and/or degradation of livelihood conditions within societies targeted by development programs (Arce 2003; Bohle 2009; de Haan and Zoomers 2005; Ellis and Biggs 2001). Likewise, the neo-Marxist critiques of such development models and their somewhat stubborn espousal of structural explanations failed to provide much-needed answers on how to make development work better and endow the people of the Global South with a degree of agency (see Blaikie 2000; Escobar 1995; Rigg 2007).

This impasse called for novel ways to understand development and its impacts. Among those new ideas was the poststructural pronouncement that the growth-centered development paradigm first and foremost drives cultural changes that in turn facilitate cultural homogenization (Bebbington 2000; Escobar 1995). Peet and Watts (1996: 17) discuss how this homogenizing effect unfolds, stating: "[development's] power acts not by repression but normalization, the regulation of knowledges, the moralization of issues". Alongside such new epistemological approaches, more practical empirical discussions about the criteria most often emphasized to quantify the success and failure of development projects emerged.

For example, one outcome of the homogenizing nature of development is that the successes and failures of development projects were long systematically assessed with regards to standard, tangible and measurable variables, such as financial income and employment (Chambers 1995; Whitehead 2002). In other words, the professional reality of economists monopolized the development agenda and set benchmarks (ibid.). Livelihood approaches were introduced as a multidisciplinary alternative to such an approach. Notably, livelihood scholars aimed to bring into the picture livelihood assets more intangible and complicated to measure. These assets include those that traditional livelihood strategies tend to procure as well as in-kind earnings (Chambers and Conway 1991; Ellis 2000a; Rigg 1997).

The oft-cited definition from Chambers and Conway (1991: 6) acknowledges livelihoods as multi-dimensional, stating that a livelihood "comprises the capabilities, assets, (stores, resources, claims and access) and activities required for a means of living". Ten years later, Norman Long (2001: 241) introduced his own, complementary interpretation, stating that livelihoods consist of the "practices by which individuals and groups strive to make a living, meet their consumption

necessities, cope with adversities and uncertainties, engage with new opportunities, protect existing or pursue new lifestyles and cultural identifications, and fulfill their social obligations". This latter take further disembeds livelihoods and monetary and/or physical assets, and helps, according to Staples (2007: 12, emphasis in original) to "resist the reduction of 'livelihoods' merely to the *means* of making a living and let it also refer, as it does in the older sense of the term in English, to *ways* of living".

Chambers and Conway (1991: 6) further explain that a livelihood is 'sustainable' when it allows an individual or a household to "cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation". Obviously, this approach echoes that of 'sustainable development', a term that the Brundtland Report had made popular a few years before (Section 2.3.1; see also Farrington et al. 1999; Scoones 2007, 2009). However, as Adams (2001: 5) frames it, "the Brundtland definition of sustainable development is a better slogan than it is a basis for theory". In other words, the aura placed around the notion of sustainability encourages many to use it loosely, and for promoting different – and often contradictory – agendas (Scoones 2007). For these reasons, I personally refrain from emphasizing sustainable livelihoods.

Livelihood approaches thus emerged in a context where most development practitioners and programmes systematically over-emphasized financial assets, in spite of the repeated failures they encountered. As I discuss below, the objective of those who formulated livelihood approaches was not to remove financial assets from the equation altogether, but rather to consider these assets on par with other livelihood means.[41] As later research demonstrated, including work Carr (2013) undertook in the Ghanaian context, social goals often become the predominant factor driving livelihood decision-making once households have reached a very low financial income threshold. Livelihood approaches aim to bring such considerations back into the picture and pose the question "how do people live in this place" as a starting point to livelihood inquiries (Carr 2013: 78). I discuss below some concepts that livelihood scholars have developed to guide their investigation.

[41] Lu (2010, 2012) demonstrates how such ideas have failed to take root in the Chinese context where economic development remains the sole variable to assert development levels (see Section 2.3.1.1).

2.4.2 Asset portfolios: Going beyond money

Instead of focusing on what people do not have, or on what they need to have to move 'out of poverty', livelihood approaches pinpoint what rural people and households do possess and what they make of it (Ellis and Freeman 2005; Staples 2007). Hence, livelihood assets are simultaneously a means through which people make a living, criteria shaping how they understand their livelihood, and determinants of their capabilities (Bebbington 1999).[42] Carney et al. (1999, see also Bebbington 1999; Ellis 1998; Turner 2007) introduce different frameworks to assess the tangible and intangible constituents of a livelihood portfolio. Notably, one such perspective is the 'asset pentagon', a brainchild of the UK's Department for International Development (DfID) and its post-Washington Consensus policies.[43] DfID and its partner institutions played a major role in institutionalizing livelihood approaches from the late 1990s onwards.[44] Notably, this encouraged scholarship defining livelihood portfolios as the combination of five capitals, namely natural, physical, human, financial and social (Figure 2.2; see also Bonnin 2011; Carr 2013; de Haan and Zoomers 2005).[45]

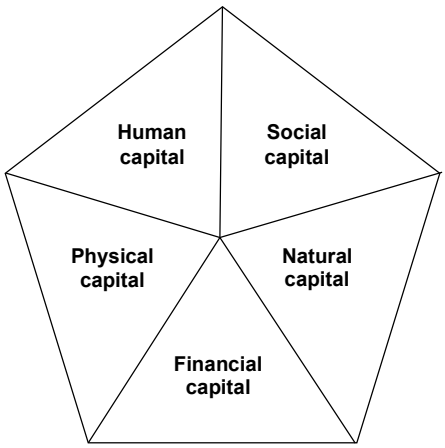

Figure 2.2: The asset pentagon (source: DfID 1999: 1)

[42] Bebbington builds from Sen (1997: 1959), who defines capability as the ability of the people to "lead lives they have reason to value and to enhance the substantive choices they make".

[43] John Williamson (1993) coined the expression 'Washington Consensus' to capture the influence of the Washington-based global economic institutions (the United States government, the International Monetary Fund and the World Bank). The expression now broadly refers to the promotion by these organizations, mostly during the 1980s and 1990s, of austere fiscal reforms, financial and trade liberalizations, privatization of state assets and so on as solutions to endemic poverty and debt crises.

[44] These include the University of Sussex-based Institute for Development Studies (IDS) where Robert Chambers and Gordon Conway published, in 1991, their oft-cited *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century* (see Murray 2002).

[45] Rakodi (1999, 2002; see also Carney 1998) introduces a framework that also accounts for political capital, which refers to the level of involvement in decision-making at the local, regional or national scales. However, I argue that this notion is covered within that of social capital and adopt the five-tier asset pentagon framework.

Discussing these five capitals, Ellis (2000a: 8) explains:

> Natural capital refers to the natural resource base (land, water, trees) that yields products utilised by human populations for their survival. Physical capital refers to assets brought into existence by economic production processes, for example, tools, machines, and land improvements like terraces or irrigation canals. Human capital refers to the education level and health status of individuals and population. Financial capital refers to stocks of cash that can be accessed in order to purchase either production or consumption goods, and access to credit might be included in this category. Social capital refers to the social networks and associations in which people participate, and from which they can derive support that contributes to their livelihoods.

While this framework was introduced as a way to obtain a comprehensive understanding of the assets that people utilize in their livelihoods, classifying these assets is not always a straightforward process. A good example is that of livestock, which is often a multifunctional asset (see Bonnin 2011). For instance, animals can be used to provide food, their power can be used in farmwork, they can be used during rituals, and they can be traded (DfID 1999). According to DfID (ibid.), prevailing cultural practices best inform how such complex assets should be classified. For instance, most of my Handai informants either eat their livestock or slaughter animals during rituals. Therefore, in most cases, livestock contributes to the physical capital base of most of my informants (see Section 6.4).

Likewise, Scoones (2009: 173) explains that a focus on the "micro-level contextual realities on the ground" is necessary to unravel the intricate characteristics of a livelihood portfolio. Such a qualitative, context-dependent and integrated approach marks a radical shift from the methodologies associated with what Long (2001: 11) calls "structural models of development", namely those emphasizing liberal modernization and the various neo-Marxist responses to it (Carney 1998; Prowse 2010). Scholars emphasizing livelihood approaches nonetheless remain cognizant that micro-level analysis often becomes incompatible with the mandates, financial resources, theoretical inclinations and organizational culture of development agencies. Two solutions are advanced for addressing this (Ellis 2000a; Scoones 2009). Firstly, Scoones (1998) argues that organizations that cannot afford to achieve and/or process holistic information about a given population should at least aim for achieving 'optimal ignorance'. In doing so, they should concentrate on finding out "what is necessary to know for informed action to proceed" (ibid.: 13). In other words, he advocates for a compromise between the holistic social analyses that

livelihood approaches promote and the minimal local information development programmes too often build on.

Secondly, livelihood approaches stress the household as a pertinent intermediary scale between the individual and the community or region (de Haan and Zoomers 2005; Ellis 2000a). Rakodi (2002: 7, see also Rakodi 1999) defines a household as "a person or co-resident group of people who contribute to and/or benefit from a joint economy in either cash or domestic labour". The above definition obviously fails to capture all possible household models; for instance, it does not account for migrants that temporally or permanently leave the household but still contribute to it (Ellis 1998; Hart 1995). Similarly, this definition ignores how influence over decision-making processes is not necessarily shared in an egalitarian manner among household members. The same often goes for the duties and benefits associated with participating in a household, with the distribution of duties often replicating the unequal (often gendered) power relations that characterize the household (Beall 2002; Turner 2007).[46]

The two above considerations aimed to address critiques about an alleged incompatibility between development programmes and livelihood frameworks such as the asset pentagon. Yet Beall (2002) raises a more fundamental question about the pertinence of such frameworks and their potential limits. Notably, she argues that livelihood frameworks:

> can be a useful mechanism for the frequently perplexing understanding derived from detailed social analysis. However, they can also become straitjackets, rigid grids that awkwardly accommodate the micropolitics of everyday life and the realities of policy planning processes (ibid.: 72)

Although I remain cognizant of this critique, which Scoones (2009: 176) refers to as the obligation of "making sense to economists", I personally do not feel such pressure. Rather, I argue that the asset pentagon equips me with a guide to assess key aspects participating in the livelihoods of my informants and to initiate investigations on how the latter aspects enmesh and evolve (Rakodi 2002).

[46] I have emphasized the household in the survey I conducted for this research because it is the most relevant scale for informing my research questions. I remain cognizant of the caveats associated with this approach, and strategies I utilized to overcome these included surveying the individual roles and contributions of each members of a household and further documenting these during unstructured interviews (see Chapter 3).

Likewise, the above obligation to 'make sense to economists' partly explains that development programs often emphasize financial capital (Section 2.4.1). Yet along with financial capital, such programmes, including the World Bank anti-poverty efforts in the early 2000s, also placed great emphasis upon social capital, which they framed as one of the prerequisites to economic growth (World Bank 2001). This instrumentalization of social capital by capitalist stakeholders and inconsistencies in how development practitioners and academics alike understand and quantify this notion triggered important critiques and debates (Bebbington 2002, 2004; Bebbington et al. 2004; Fine 1999, 2001, 2008). Notably, it was pointed out that development policies framed social capital as a desirable and de-politicized asset, thereby silencing how it can also further aggravate social inequalities (Prasad Adhikari and Goldey 2010; Bebbington 2007).

The quarrelling over the importance that development programmes should allocate to social capital persisted long after World Bank discourses shifted to other priorities. From these debates, I focus on the comment from Bebbington (2002: 802) that social capital "is a vital building-block for illuminating the microfoundations of broader and deeper changes in societies". Assessing how bonding, bridging and linking social capital manifest is an oft-cited approach to assesses how this asset comes about within livelihood portfolios (see Prasad Adhikari and Goldey 2010; Turner 2007; Turner and Phuong 2005). Bonding social capital occurs between people who share common characteristics, for instance in terms of their belonging to the same ethnic group, kin network, gender and so on. Bridging social capital involves extending such connections to a wider range of actors, although these nonetheless share similar socio-economic backgrounds (ibid.). Linking social capital transcends socio-economic backgrounds and links actors from diverse milieus together, most often normal citizens and authorities

Further critiques raised against livelihood frameworks pointed out that stressing 'capitals' participates in, according to Fine (1999: 3), "universalizing the so-called 'economic approach' based on utility maximization to all areas of life, including those that are traditionally perceived as lying outside the domain of economics". Concurrently, this approach potentially relegates the members of a household to the role of mere 'managers' of their resource base and overlooks the improvisational component that partly characterizes what they make of this base (Scoones 1998). In this way, the evolution of the asset portfolio of a household becomes no more than a testimony

of the managerial ability of its members (Beall 2002; Elias 2010; Toner 2003). Moreover, Arce (2003) argues that the word 'capital' only emphasizes privately-owned assets and fails to acknowledge the collectively-owned assets rural households also build their livelihoods around. One answer to such critiques posits that livelihood asset analysis must be combined with a close scrutiny of the criteria shaping access regimes (Bebbington 1999; Whitehead 2002). Following this lead, I also make access and its opposite, exclusion, foundational elements of my conceptual framework.

2.4.3 Access and exclusion: What you see and what you get

Access is an important notion within livelihood approaches, shaping the extent to which individuals can build their livelihood portfolios around particular assets. Ribot and Peluso (2003: 155) define access as "the ability to benefit from things", disembedding access from *de jure* right and *de facto* ability (see also Ribot 1998). A pre-condition for people's ability to benefit from something is the availability and/or existence of the means necessary to produce, acquire or reach it (Leach et al. 1997, 1999; Sen 1981). Once this condition is fulfilled, as Ribot and Peluso (2003: 164) explain, "structural and relational access mechanisms" determine access. On the one hand, these structural mechanisms encompass laws and property regimes overseeing how people acquire, secure, exchange and lose formal access rights. On the other hand, the 'relational' components of access regimes comprise a whole series of cultural norms and informal arrangements explaining instances where people access things they do not own or have formal access rights to. In other words the notion of access encompasses that of right, and the former is therefore a broader concept than the latter (Ribot 1998).

The notion of 'institution' encompasses the formal and informal "rules, norms and values that shape our behaviour" (DfID 2001: 1). As such, institutions inform both the structural and relational mechanisms that govern access regimes (Bebbington 2000; Ellis 2000a; Leach et al. 1997, 1999; Schoenberger and Turner 2008; White 1991). Among the institutions often pinpointed for the importance they exert on access regimes are life cycles of household members, environmental and/or market seasonality, laws, and labour and credit markets (de Haan and Zoomers 2005; Ellis 2000b; Zoomers 1999). Institutions are by no means fixed and permanent, but rather evolve under the influence of formal and informal processes that modify their role in

overseeing access regimes (Rakodi 2002). In regards to my case study, the coexistence of formal and informal credit markets in Xiaocun Zhongcun and Dacun villages provides a good example of how structural and relational institutions shape how my informants can access financial capital (see Sections 5.3.4 and 7.3).

Hall, Hirsch and Li (2011: 7, emphasis in original) complement the above analysis from Ribot and Peluso (2003) by defining exclusion as the "ways in which people are *prevented* from benefiting from things". In their study focusing on land access and exclusion in Southeast Asia, these scholars address three facets of exclusion, namely: the processes by which one loses access; the processes through which one maintains access by excluding others; and the processes that prevent one from gaining access. The same scholars further pinpoint how regulation, the market, force, and legitimation are the four 'powers' most often involved in exclusion. Within their framework, regulation refers to the formal and informal institutions governing access and exclusion; force refers to the legitimate or illegitimate use of force to implement regulation; the market refers to the mechanisms that set land values and oversee land transactions; and legitimation to the discourses pertaining to moral aspects of land access and exclusion (ibid.). The authors further note that these powers seldom manifest individually; rather, circumstances involving several or all four powers accumulate to exclude people from their land.

While the four powers of exclusion have long influenced land access regimes, they now manifest in unconventional manners, creating what Peluso and Lund (2011) label 'new frontiers of land control'. Land grabbing is one such approach currently receiving important scholarly attention. In a narrow sense, land grabbing refers to the acquisition of land resources by either foreign private or foreign governmental actors (Hall 2013; White et al. 2012; Zoomers 2010). However, Borras et al. (2011) promote a broader understanding of the same notion, accounting for a wider range of large-scale land transactions that modify land use and land property relations. An aspect of the land grabbing literature particularly relevant to my research relates to how private and state actors emphasize environmental justifications to facilitate such changes in land use, ownership and access. Clearly relevant here is the expression 'green grabbing' coined by Fairhead et al. (2012) to discuss exclusion processes promoted for environmental ends, including biodiversity conservation, biocarbon sequestration, ecosystems services, ecotourism and so on.

Peluso and Lund (2011) further argue that the new modalities of land control involve more than just land grabbing. They state: "What is new is not only land grabbing or ownership but also new crops with new labor processes and objectives for the growers, new actors and subjects, and new legal and practical instruments for possessing, expropriating, or challenging previous land controls" (Peluso and Lund 2011: 668). With regard to the case studies I research in this thesis, scholars have highlighted how biofuel plantation expansion, including that of jatropha plantations, has modified land access regimes, often over marginal lands (see Ariza-Montobbio and Lele 2010; Ariza-Montobbio et al. 2010; Bailis and Baka 2011; Borras et al. 2010; Zoomers 2010). However, this scholarship has allocated scant attention to another aspect of land use change, namely its disappearance under reservoir water.

Finally, it is no coincidence that many among the authors I cite in this subsection use and/or emphasize political ecology. Indeed, this is because appreciating how a given political economy influences access regimes at the local scale calls for multi-scalar analysis, itself a central tenet within political ecology (Section 2.2.3) (see also Bryant 1998; McCarthy 2002; Robbins 2004). Yet, I convey that, as Ribot (1998: 312) argues:

> An access analysis is empirical: it is concerned with who has the 'ability to obtain or make use of benefits (…) and how. It does not presume any set of rights, structures, processes and so forth, that confer this ability; instead, it derives them from observed practice.

This bottom-up and ethnographic approach does not conflict with the predicaments of political ecology in any manner. Yet, the ethnographic data I introduce in thesis first and foremost concentrate on how renewable energy schemes have modified how my informants benefit from certain assets in their livelihoods, and how these people subsequently re-organized how they make a living. Since I utilize a specific livelihood framework to achieve this, I therefore argue that I must approach the notions of access and exclusion with reference to the same framework.

2.4.4 Livelihood diversification: Changing, hopefully for better

Whether they lead to greater access or exclusion, changes in access regimes bring individuals to engage in new livelihood strategies, or in other words, to diversify their livelihood (Ellis 1998; 2000a, 2000b). Diversification strategies are numerous and the extent to which households and

individuals adopt one or more rests on their own characteristics (including age, education, responsibilities, values) and the context within which they live, which itself is under the influence of wider structural forces (Ellis 2000a; Radoki 2002). Livelihood approaches introduce various frameworks to categorize livelihood diversification. Regardless of the individual strategies involved, livelihood diversification by default brings about changes in how individuals make a living, driving either sectorial change and/or occupational multiplicity (Start and Johnson 2004).

One approach to livelihood diversification distinguishes between distress diversification strategies that stem from necessity and/or constraint and progressive diversification processes involving decisions made by people keen to exploit new access opportunities (Bouahom et al. 2004; see also Ellis 2000b). Turner (2007) additionally documents individuals who sometimes purposefully refuse to exploit potential opportunities completely. Her research among Hmong textile traders from northern Vietnam demonstrates how her informants purposefully set limits to their involvement in new market opportunities in spite of favourable market conditions. She has coined the term 'selective diversification' to capture these particular circumstances.

Zoomers (1999; see also de Haan and Zoomers 2005) discusses another approach to livelihood diversification, differentiating among accumulation, consolidation, compensatory and security strategies. She argues that people deploy accumulation strategies to secure an initial resource base, itself a precondition to initiating further strategies to attain the social status people aim for in the long term. Consolidation strategies occur when households have obtained surplus assets they can invest toward that same aim. For instance, peasants who decide to plant a portion of their land with trees that will only start yielding timber or fruit a few years later do engage in such strategies. Compensatory strategies aim to cope with the impacts of a sudden livelihood stressor, while security strategies are meant to diversify potential sources of livelihood input within contexts where ecological factors create livelihood insecurity.

While diversification strategies are decided upon at the individual or household scale, de Haan and Zoomers (2005: 42) explain that livelihood pathways consist of "observed regularities or patterns in livelihood in particular social groups" (see also Scoones and Wolmer 2002). Three common pathways most often stand out within rural areas in the Global South (Ellis 2000a;

Scoones 1998). The first of these involves a change in the intensity of farming practices, which itself is an outcome of variations in the financial and/or labour resources invested into such activities. Accordingly, farming practices over a particular parcel of land can either become more intensive or extensive, while agricultural expansion or contraction involve farmed areas increasing or decreasing (Scoones 1998; De Koninck and Rousseau 2012).

Second is a shift from livelihoods "directly based on natural resources to livelihoods based on a range of assets, income sources and product and labour markets" (Bebbington 1999: 2022). Most often, this process leads to a particular form of sectorial change involving land and on-farm activities fulfilling decreasing portions of the livelihood assets combining in the asset portfolios of rural households (see Rigg and Nattapoolwat 2001; Scoones 1998; Start and Johnson 2004; Whitehead 2002). However, there is sometimes more to this change than only economic readjustment, as it can also lead to modified social arrangements scholars which coined deagrarianization (Bryceson 1996; Rigg 2001, 2005). Working in Africa and Southeast Asian, these scholars found that rural societies often undergo a social re-identification process through which they identify less and less with peasantry and consider off-farm activities as increasingly desirable livelihood options.[47]

Such change often comes along with, third, increased work migration flows (Scoones 1998). Work migration is a strategy that often involves young adults eager to benefit from work opportunities outside their villages. Other frequent pathways encompass people resignedly leaving their homes because they cannot make a living in their villages anymore, or individuals that development projects have evicted from their homes (Wang et al. 2013). Whether voluntary or involuntary, migration flows include a wide range of strategies such as seasonal, circular or permanent migration movements (Carney 1998; McDowell and de Haan 1997). That being said, deagrarianization seldom involves rural livelihoods becoming completely independent from the

[47] Bryceson (1996) portrays deagrarianization as a process with fewer sociocultural ramifications than Rigg (2001, 2005). To Bryceson, deagrarianization first and foremost relates to the decreasing importance of agriculture within rural economies and livelihoods. To Rigg, deagrarianization also involves further cultural changes such as those described above. I understand deagrarianization along the same lines as Rigg, and rather refer to 'off-farm diversification strategies' or 'the increasing importance of off-farm livelihood activities' to address deagrarianization *à la* Bryceson. Among the main off-farm activities I stress in my case study are reservoir fisheries, involvement in retail activities, NTFP collection and work migration (see Chapters 1 and 7).

local natural resource base; rather, it most often leads to other livelihood assets being increasingly brought into the picture (Scoones 1998).

2.4.5 Concluding thoughts: Livelihood concepts contributing to this thesis

Livelihood approaches focus on livelihood assets and – as opposed to structural development approaches – emphasize that much more than just financial and tangible assets go into how individuals and households construct their livelihoods. Notably, these assets include a natural resource base upon which rural livelihoods typically rely to a great extent, including a land component of particular importance for agrarian households. Changes in access regimes, including exclusion from land, trigger wide-ranging on-farm and off-farm livelihood diversification strategies with potentially beneficial and negative consequences upon livelihoods.

As such, livelihood approaches equip me with solid conceptual ideas with which to address how renewable energy schemes have influenced access regimes in the Red River valley, along with the asset trade-offs and livelihood strategies the same projects have triggered and their outcomes. Similarly important, this literature emphasizes and demands inquiry into how livelihoods and livelihood strategies result from unique and elaborate nexuses combining structural, cultural, formal and informal institutions. Therefore, as Radoki (2002: 7) explains, livelihood approaches have "the advantage of restoring agency to poor people, rather than regarding them as passive victims". I refrain from using the adjective 'poor' while discussing the Handai people this research addresses because many of them do not consider themselves as such and would most likely find this label offensive. Yet I argue that uncovering how the agency of my informants comes into play in their livelihood decisions is vital for my work to do justice to their experiences.

2.5 OPERATIONALIZING THE CONCEPTUAL FRAMEWORK

In this chapter, I have reviewed the three main bodies of literature I draw on to shape my conceptual framework, namely political ecology, the scholarship documenting environmental policy-making and renewable energy development in China, and livelihood approaches. I now

revisit the main concepts I draw from each of these approaches and explain how they contribute to creating a conceptual framework that will aid in answering my research questions (Figure 2.3).

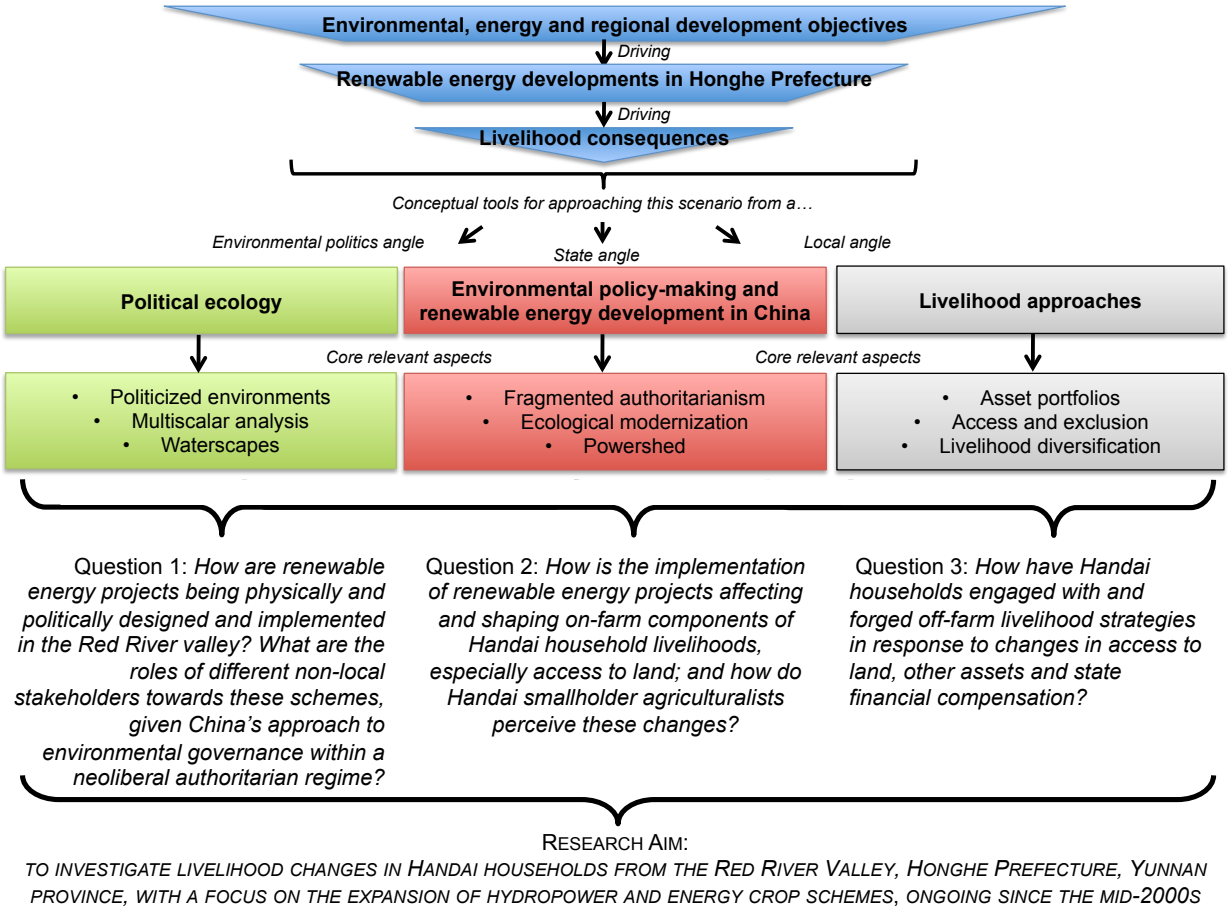

Figure 2.3: Conceptual framework and research aim and questions

My research aim and questions require me to build a conceptual framework that reunites bodies of literature guiding me in two core ways. Beginning with political ecology and writings on environmental policy-making and renewable energy development in China, these literatures first help me explain and interpret ongoing renewable energy capacity development projects in Honghe Prefecture by situating ongoing hydropower and jatropha development schemes in the Red River valley within national and global development discourses. This, in turns, posits the valley as a politicized waterscape within a broader powershed where actors operating at various scales and their respective objectives and needs collide. Second, this scholarship, and livelihood approaches in particular, guides me to elucidate how renewable energy schemes recently implemented in the Red River valley affect local livelihoods and shape both their on-farm and

off-farm components[48], including access regimes and diversification strategies. I claim that the contextual framework I have developed allows me to meet these epistemological and empirical challenges.

Documenting ongoing renewable energy capacity developments in Honghe Prefecture, situating these within a wider context and retracing how external factors and actors encourage and benefit from such development all hold relevance for my discussion of political ecology. This approach highlights how environmental change results from decisions that actors operating at various scales make, and how environmental change affects each of these stakeholders in differentiated manners. Political ecology helps me grasp and organize these considerations and highlight how they pertain to specific resource usage and resource proximity/distance combinations. Furthermore, the influence that water exerts over land resource availability in my research area requires an analytical framework that accounts for the particular power and social relations that materialize within water management. I argue that the notion of the waterscape fulfils this condition like no other.

Secondly, my conceptual framework equips me to investigate different compromises as they occur within political systems intermeshing aspects of communism, capitalism, totalitarianism and post-totalitarianism. For instance, while ecological modernization was first understood as a participative political project reconciling economic development and environmental concerns, it can also justify top-down development policies promoting certain environmental narratives over others. In addition, the fragmented authoritarianism and powershed approaches illuminate different aspects of the power relations inherent to environmental policy-making and renewable energy development. These power relations set limits to the implementation of development projects promoting environmental and/or livelihood enhancement. Any implementation of such a project thus requires close scrutiny.

Thirdly, livelihood approaches are key to set the scene for elucidating how renewable energy development affects local livelihoods and shapes both their on-farm and off-farm components. Livelihood approaches equip me with a systematic framework to assess all livelihood assets that

[48] I understand on-farm activities as activities involving an agrarian component. The main on-farm activities I discuss in this thesis are farming, livestock rearing and fish farming (See Chapters 1 and 6).

come into play when considering how people make a living. Important aspects of this framework, including the asset pentagon and theories on access and exclusion, allow me to identify the factors making it possible for my informants to benefit from certain assets in their livelihoods. The assets-access nexus also informs the livelihood strategies my informants deploy when facing exclusion, particularly exclusion driven by the renewable energy schemes central to my inquiry. As I demonstrate in my result chapters, hydropower and/or jatropha development-driven exclusion has affected my informants in differentiated manners. It has partly or completely deprived them of their overall access to land, but has also often allowed households to access supplemental financial resources through compensation mechanisms. Such trade-offs have prompted a host of on-farm and off-farm livelihood strategies that are indicative of how my informants understand and negotiate the diverse aspects coming into play to shape their livelihoods.

CHAPTER 3

METHODOLOGICAL FRAMEWORK: "NO MATTER WHAT, IF THE PEOPLE INVITE YOU FOR A MEAL, YOUR FIELDWORK GOES WELL"[49]

3.1 INTRODUCTION

My research results testify both to who I am and to the personal and academic challenges I negotiated while producing this work. Social scientists in general, and human geographers and anthropologists in particular, are increasingly addressing and critiquing the experiences that shape their positionalities and influence their levels of personal engagement with their research (Clifford 1997; Robertson 2002; Rose 1997; Turner 2013). I argued in my conceptual framework that searching for one singular 'Truth' is not an objective for social scientists anymore. Likewise, disembodied objectivity is no longer considered a scientific ideal. The criteria for rigorous social research now encourage the researcher to provide reflective details about his or her own subjectivity (Baxter and Eyles 1997; Dowling 2005; Eyles 1997; Philip 1998; Rose 1997).

Therefore, in Section 3.2 I first critically reflect on my positionality and subjectivity and how it influenced how I negotiated the sensitive nature of hydropower development in Yunnan. While it might not be usual to introduce such considerations upfront, I think that doing so humanizes the following methodological discussion: it gives a face to what is said about individual methods, and it demonstrates why there are always differences between 'by the book' usage of these methods and what happens in the field. Furthermore, I think it is fundamental to introduce my assistant and our relationship before discussing the methods we undertook, otherwise I would take too much personal credit for them. In Section 3.3, I focus on the research methods I utilized in the field *per se*. I divide this section into three sub-sections: in Section 3.3.1, I address how I situate my methodological framework within wide-ranging theoretical debates on fieldwork methodology; I center Sections 3.3.2 and 3.3.3 on the qualitative and quantitative methods I used in the field, respectively. In Section 3.4, I introduce my coding, analysis and interpretation strategies.

[49] Prof. Li, 10 September 2011.

3.2 POSITIONALITY, REFLEXIVITY AND MY FIELDWORK RESEARCH: FROM 老外 (*LAOWAI*) TO 远帆 (*YUAN FAN*)[50]

3.2.1 Positionality and everyday practicalities: Fieldwork as a rite-of-passage

Personal pathways shape the relationships between social scientists and their informants and inform how researchers conduct their studies. In regards to my positionality in the field, the most obvious element is that my informants and I stand a world apart from each other, literally. I am a Western urbanite, and apart from a two-year detour in a Beijing news bureau (2002-04), I have spent most of my adult life to date in (or not so far from) university settings. My informants are rural ethnic minorities from Southwest China whose livelihoods are predominantly centered on agriculture. I have travelled to their villages on many occasions, but they will most likely never come to my hometown. I do research about their livelihoods but they do not research mine. These factors are common to numerous cross-cultural fieldwork endeavours and the list could go on (Scheyvens and Leslie 2000).

Despite the vast differences, a few circumstances made it possible for me and my research participants to develop relationships based on mutual confidence and trust. First and foremost is the openness and hospitality of the Handai people, who rapidly welcomed me to share their daily lives. Second was my previous knowledge of China and its diverse societies as well as some of their social norms. I spent many years in China prior to undertaking doctoral fieldwork, working as a research journalist (2002-04), conducting fieldwork during my Master's degree (2006), studying Chinese (2007), and carrying out preliminary doctoral fieldwork journeys (2009-10). The cultural background I obtained during these stays allows me to be functional in China in general and within village societies in particular.

While it remained a work in progress throughout my fieldwork endeavours, my capacity to communicate in Chinese allowed me to carry out my research without an English-speaking assistant-interpreter. While proficiency in Mandarin (普通話 - *putonghua*), the *de facto lingua*

[50] *Laowai* is a most common way to refer to foreigners (and Westerners in particular) in the Chinese language, while Yuan Fan is my Chinese name.

franca in China, is uneven throughout China and its minority nationality populations (Li 2006), most young and middle-aged villagers from my research area speak it.[51] Hence, though Chinese is a second or third language for both my informants and myself, we managed to communicate in the same language, or through my local – Handai and non English-speaking – assistant-interpreter. Since cultural differences were already at the forefront of our interactions, avoiding the third layer of cultural sensitivity that a Han translator would create was an important element for both my hosts and myself.

As Turner (2010: 27) frames it, research assistants often end up being the "ghost workers" of the research projects they participate in. There is indeed no way I can do justice to the contributions of my assistant to my work. My assistant is currently in his late twenties and he was the first person from the villages where I carried out my research who had gone to university. [52] The ease with which we got along when we first met, as well as his availability to help me for an extended period of time, made him a perfect fit for the job.

My research assistant had strong skills in quickly understanding what information I was looking for. He excelled in framing or re-framing my questions to make them intelligible to his fellow villagers in Chinese, or in the local dialect, or in a hybrid of the two languages. For that reason, it is he who predominantly asked questions when we conducted surveys (Section 3.3.3), and if he was around when I carried out conversational interviews (Section 3.3.2), he would often facilitate discussion. As the months passed, he also became a very close friend, and our relationship now transcends the reasons and context that brought us together at first (see Bonnin 2013). My assistant was always keen to facilitate my participation in village life, including inviting me to participate in cultural experiences typically forbidden to outsiders, such as shamanistic rites, and thus enriching my appreciation of the local culture and livelihoods (see Fiskesjö 2013). Most importantly, as he got to know me well, he contributed to how people accepted and understood my presence in the villages more than I could have done by myself.

[51] Such is not the case in adjacent mid- and highland areas, predominantly populated by minority nationalities other than the Dai such as the Yi, Hani, Miao and Yao, who are on average less proficient in Mandarin Chinese.
[52] I refrain from naming my assistant and my informants due to the sensitive nature of my research. I am aware that this alters my objective to give these persons a voice, but my personal ethics and the ethical requirements I discuss in Section 3.2.2 compel me to anonymize my manuscript.

Gender must be included in the list of factors that had an influence upon my social relationships – and thus my research results – while in the field. Gender roles are highly flexible in the Handai villages where I carried out my fieldwork. This is not to say that household or farming chores are not gendered, but rather that the principles guiding these arrangements are elastic. Hence, women sometimes end up carrying out tasks typically associated with men, and vice-versa. This flexibility testifies to the relative gender equality that characterizes Handai society. Given this, I could have discussions with women and 'hang out' with no male chaperon without raising eyebrows. That being said, the closest relationships I developed all involved men and I accordingly ended up spending more time with men than with women, most often participating in male rather than female gendered activities. As such, my findings potentially perpetuate a male bias. Nonetheless, I am cognizant of this bias and I have tried my best to avoid its impacts by having regular discussions with female informants and by having women participate in my household survey and jatropha census (see Section 3.3.3).

By default, cross-cultural fieldwork compels those who undertake it to leave their homes and relatives for extensive periods of time. While some researchers undertake fieldwork along with their partners (see Flinn et al. 1998; Raybeck 1996), this was not an option for me. This had important emotional and logistical implications on my research project (see Scheyvens and Nowak 2003). While away from home, I sometimes dealt with loneliness and other aspects of researcher/culture fatigue (Heller et al. 2010; Jones 1973; Mandel 2003). Simultaneously, my partner, with whom I had regular video calls, would experience completely different emotions, and while we would both try not to impose our mood on the other, there were ups and downs in this process, giving the distance that separated us a whole new meaning (see Gallagher Goodenough 1998).

The emotional challenges that this involved for both my partner and myself cannot be overstated, but they fall outside the scope of this thesis. More relevant here are the logistical arrangements that I carried out to address these challenges. Indeed, in order to cope with the requirements of both my personal and professional lives, I conducted four fieldwork sojourns to my research

area.[53] These totalled nine months and spanned over a year, allowing me to experience all yearly seasonal changes and were interspaced with visits home that typically lasted for a month (Table 3.1).

Table 3.1: Preliminary fieldwork and fieldwork schedule

	Schedule	Achievements
Preliminary 1	November 15th-30th, 2009	Preliminary fieldwork site monitoring, Develop research partnerships
Preliminary 2	June 15th- July 25th, 2010	Preliminary fieldwork site monitoring, Develop research parternships
Fieldwork 1	July 14th - September 21th 2011	Confirm research sites, Build rapport, Meeting with my research assistant, Observation, Interviews
Fieldword 2	October 24th - December 23rd 2011	RRA, Initiate livelihood survey, Observation, Interviews
Fieldwork 3	February 8th 2012 - April 18th 2012	Complete livelihood survey, Jatropha Survey, Observation, Interviews
Fieldwork 4	May 25th 2012 - July 30th 2012	Observation, Interviews, Failed attempts to interview authorities

All this long-haul traveling, along with having my belongings – if not my life – spread between Montreal, Paris (where I flew twice over that period), Beijing (where I made stop-overs on my way in and out China), Kunming, Mengzi, and Nansha sometimes made fatigue even more challenging.[54] Also, given that villagers were very curious about intercontinental airfares, some

[53] Added to this were two preliminary field trips I carried out in Honghe Prefecture in 2009 and 2010, as well as longer stays in Yunnan during the preceding years.
[54] Sturgeon (2013) and Heller et al. (2010) also mention how their fieldwork logistics involved similar forms of physical and psychological dispersions.

of my informants were initially under the impression that money was not an issue for me.[55] As time went by, I managed to make people realize that the reality was not so straightforward.

3.2.2 Sensitive topics: 谈虎色变 (*tanhu sebian*), or turning pale when the tiger is mentioned[56]

Chinese history is closely connected to the hydraulic projects the imperial, nationalist, and communist leaders have promoted to control waterways in the kingdom first, and then in the People's Republic. No regime has pursued this agenda more vigorously than the Communist Party of China (CPC) (Shapiro 2001). On the one hand, a great many early leaders from the People's Republic of China (PRC) promoted hydropower development as a *vitrine* to the domestic technical *savoir-faire* (Yeh and Lewis 2004). On the other hand, many top leaders have been directly involved in large-scale hydropower development ventures. Most notable was Li Peng, the Chinese Prime Minister from 1989 to 1998 and the main advocate of the Three Gorges Project (Heggelund 2004; Lieberthal and Oksenberg 1988). The son of Li Peng, Li Xiaopeng, chaired the Huaneng company[57] before becoming Governor of Shanxi Province in 2012, a nomination confirming his rising star status and that of a so-called 'energy faction' within the CPC leadership (Ho 2012; Lam 2011). Given the strong connections between the CPC and the hydropower lobby, hydropower development is considered a very sensitive (敏感 – *mingan*) topic in China. This is particularly true in Yunnan province, as it holds a quarter of the untapped national hydropower capacity, while hydropower is a core pillar of the provincial government economic development strategy (Dore and Yu, 2004; Macdonald 2007).

The best-documented cases exemplifying how sensitive hydropower issues can be in China relate to opposition campaigns against the Three Gorges (Dai et al. 1994) and Nu (upper Salween) River dam projects (Hattaway 2010; McDonald 2007; Mertha 2008; Section 2.3.2). Many NGO workers and public intellectuals endured serious political problems in retaliation for their participation in these campaigns, and my urban-based informants were well aware of this.

[55] For a discussion about other aspects of how monetary issues come into play in fieldwork endeavours, see Scott et al. (2006).
[56] This is one of thousands of Chinese idioms (成语 – *chengyu*) drawn from ancient literature, which are still used as guides to Chinese morals and culture today. I thank Éric Meyer for patiently and generously introducing me to this aspect of Chinese culture and many others.
[57] Huaneng is one of the five major Independent Power Producers (IPPs) created during the dismantling of the former energy sector, the State Power Corporation (Section 4.3.2).

Therefore, many NGO workers and university professors based in both Kunming and Mengzi warned of the serious risks I faced because of my interest in hydroelectric dams.

In other words, my topic fulfills some of the criteria that Lee and Renzetti (1993: 5) bring forward in their definition of a sensitive fieldwork topic, namely "one that potentially poses for those involved a substantial threat, the emergence of which renders problematic for the researcher and/or the researched the collection, holding and/or dissemination of research data". My interest in such a topic accordingly had wide-ranging impacts at all stages of my project. I address the challenges this created in a chronological order so as to reflect on how contextual aspects pertaining to the sensitive nature of my fieldwork inquiry colour my research results (see Valentine 2002). I also hope that such details can help researchers conducting similar investigation reflect on their own methodologies and build on both the successes and failures I encountered.

Before undertaking fieldwork, I decided to broaden the scope of my research so that it addressed 'renewable energy' development issues much less politically sensitive than hydropower development alone. Hence, I certainly practised self-censorship and omitted "selected facts and features" (Adler and Adler 1993: 250) at all stages of my field research. The protection of my informants has been my foremost priority during data analysis, and I have resorted to self-censorship wherever I doubt that the pseudonyms I use are sufficient for achieving this. I am aware that self-censorship sometimes takes its toll on the insightfulness of a research, but I have no hesitation in committing to such a potential compromise (see Salemink 2013).

As I prepared to 'enter the field', the sensitive nature of my work influenced the outcome of my procedures to obtain a research visa. Such a visa would have officialized my presence in the villages and saved me the hassle of frequently renewing short-term tourist visas through well-connected – though pricey – travel agencies. For foreign researchers, obtaining a research visa marks the endpoint of a quest for a series of red stamps, including one from a Chinese research unit that becomes the 'work unit' (单位 – *danwei*) of the visa holder (see Gros 2013; Heimer and Thøgersen 2006).

Sturgeon (2005: 87) explains that "getting things done in China" requires personal connections (关系 – *guanxi*), and this could not be more true when red stamps are involved. Prior to undertaking fieldwork, my connections in Yunnan included two professors heading important research institutes. Given their senior status, these persons were in a position to help me obtain a research visa, but doing so would have required them to tie their fates and those of their organizations to my own endeavours. Both academics were reluctant to face such a risk and obviously cannot be blamed for this. One academic thus recommended that I conduct my research with a tourist visa in my passport and, in my pocket, a red stamped-introduction letter he kindly wrote for me.

As such, I was never officially allowed to conduct any research activity in China, least of all to study the impacts of hydropower development. However, I knew that previous social scientists had conducted research in more or less similar conditions in China, and that neither their informants nor they had run into trouble (see Henrion-Dourcy 2013; Saether 2006). Also, probably like them, I did not feel that my status conflicted with my moral and ethical obligations. Rather, I envisioned my research as contributing to get the voices of villagers heard, an objective much more important to me than a by-the-book obedience to PRC law – which is not that frequent in China anyways. Moreover, as Hansen (2006) explains, researchers who abide to official procedures in China often end up holding a disproportionate power over their informants, who sometimes feel obliged to participate in officially sponsored research. I wanted to avoid such relationships.

While in the field, I first made sure not to address dam issues directly during my encounters with villagers. When informants raised these issues, I would listen to what they had to say, but I would not initiate these discussions. Similarly, my household survey questions did not refer to dam issues directly, but rather centred on livelihood and farming changes in the villages over the 2006 to 2011-12 time period.[58] I purposely selected this time interval to investigate the periods before

[58] This is because as mentioned in Table 3.1, my survey spanned two fieldwork journeys, one in late 2011 and another in early 2012. Therefore for insuring that my results remain consistent, when referring to time periods I always made sure to frame my questions as such: 'during the last year' / 'compared to five years ago' rather than asking about precise yearly values.

and after hydropower development and jatropha plantation expansion both occurred in the Red River valley.

In order to fulfill my own ethical guidelines along with those from institutions associated with my research, I obtained informed oral consent from each of my research participants before gathering information from them.[59] While doing so, I explained to my potential informants that:

- I was a student researcher from Canada;
- I was collaborating with Kunming-based academic institutions;
- my research focused on livelihood and agricultural change;
- my research results would potentially be published but all names would remain confidential;
- they held the right to refuse to participate in my research, to refuse to answer any of my questions or ask that I do not cite particular information. Anyone who requested this would not have to justify his/herself.

While it is difficult for a foreigner to go unnoticed in China in general, doing so is virtually impossible in remote and non-touristic places such as the section of the Red River valley where I conducted research. Nonetheless, I took all the precautions I could to remain as invisible as possible to the authorities while in that area. My unofficial status was a constant source of stress, and I took care to create as little risk as possible for my informants and myself – and, incidentally, my research. Therefore, I declined all offers to stay in villagers' homes in Xiaocun, Zhongcun and Dacun, as home stays in rural China must be registered with the local Public Security Bureau (PSB). The only foreigners to have previously stayed in the villages were American and British men employed by Sunshine Technology, the joint-venture company involved in jatropha development in the Red River valley (X-17, 18 March 2012; see Section 4.4.2). These individuals did not speak Chinese and benefited from very good connections with the local authorities. There was therefore no cause for their extended presence in the villages to raise suspicions. Such was not my case, and I stayed in hotels in Nansha, the closest urban settlement to the villages, where PSB registration is carried out through a web-based system.[60] To

[59] I obtained ethics clearance from McGill's REB-1 prior to entering the field (REB File #397-0410). As the holder of an Adaptation H_2O fellowship from the IDRC, I was required to abide by the ethical guidelines of that organization as well.

[60] Two of the three villages can easily be reached by the minivans (*mianbao che*) and buses commuting in and out Nansha during daytime. I hired motorbike drivers to get to my third research village. At night, I would also come back to Nansha on the back of a motorbike.

my great surprise and relief, the local authorities tolerated my awkward prolonged stays without asking too many questions.

Similarly, I refrained from visiting resettlement villages built to relocate peasants who lost their houses as a consequence of hydropower reservoir creation along the Red River. Resettlement processes often trigger dissatisfaction from resettled and/or existing local populations. As a result, instability and/or unrest are frequent in resettlement areas, inciting the authorities to monitor these locales quite closely (K-5, 30 July 2012; see also Habich 2013; Heggelung 2006; Hensengerth 2010). Although there is a resettlement village in my research area, I purposely avoided visiting it or discussing resettlement issues with its population, judging that doing so would involve too much risk for my research participants and myself.

Likewise, I purposefully avoided questioning the authorities during most of my time in the field. I argue that the ethnographic component of my thesis research is its most original contribution, and I accordingly concentrated my data collection efforts in the villages above all. Therefore, it was only after I had collected the bulk of my ethnographic data that I finally decided to contact county, prefecture, and provincial officials. This ensured that the potential consequences of my 'coming out' after I left the villages would involve less risk for my informants and myself.

As it turns out, as of June 2014, the news I have had from the villages almost two years after I completed my fieldwork is that my repeated visits created no consequences for the villagers whatsoever, and that I would still be warmly welcomed to visit again. Likewise, apart from comments by officials at the Honghe Prefecture International Affairs Department suggesting the possibility that I was a spy, as related by a Mengzi-based academic (M-3, 28 June 2012), I also managed to avoid getting into trouble. That being said, by contacting the authorities at the very end of my fieldwork, I knew I was then at odds with how people are expected to handle *guanxi* (network relations) in China. I was also conscious that my etiquette *faux pas* seriously hampered my chances to obtain interviews. Along with the sensitive nature of my research topic, my unofficial status, the peculiar political conjuncture at the time[61] and my unusual approach indeed

[61] I first contacted the authorities in the midst of the preparations leading to the plenum of the 18th CPC National Congress (8-15 November 2012), when CPC authorities undertook a once-in-a-decade reshuffle of the Party's top leadership. The months preceding these gatherings are always a tense period for officials from all levels. This was

meant that no officials agreed to meet with me. Similarly, my repeated attempts at obtaining complete versions of the environmental impact assessments (EIA) drafted for Nansha and Madushan dams systematically failed (see Section 4.4).

As each of my field research sessions came to an end, I made sure to digitalize all the data I gathered in Xiaocun, Zhongcun and Dacun villages and to destroy original paper copies before leaving China.[62] Hence, I did not carry documents explicitly referring to the villages while going through Chinese customs. Similarly, files from my password-protected computer have always remained coded so as not to feature the names of places and individuals involved with my research. I will use these same codes and pseudonyms in all publications that will potentially stem from this research, including this thesis.

That being said, it has been argued that academic publication outlets are generally of little interest to the Chinese leadership, which scrutinizes the news media far more than scholarly publications (Heimer and Thøgersen 2006). This was among the many factors I knew lowered the risk my research posed for my informants and myself. Adding to this was that when facing dilemmas, I constantly reflected on the potential ethical consequences of my decisions. I would often contact my trusted colleagues and mentors, including Chinese ones, asking for advice on research strategies that entailed the lowest risk. I also kept these same persons informed about how my research was unfolding and had them approve my survey questionnaire in order to make sure its content would not raise attention from the authorities.

In other words, I had internalized fear (Yeh 2006), either justified or fantasized, and this conditioned my actions throughout fieldwork as well as the writing process. By so doing, I remained within the undefined and moving boundaries separating what Chinese authorities do and do not tolerate (Heimer and Thøgersen 2006; Svensson 2006). I also always kept in mind the conclusions from Svensson (2006: 279) that the foreign researcher's "loyalty and responsibility foremost is to the individuals in the field". As such, I ensured that none of my informants would

especially true of the preparations for the 2012 meeting, which were punctuated by an intra-party struggle of rare intensity that notably involved the arrest of Chongqing CPC Committee Secretary Bo Xilai and his wife Gu Kailai (K-2, 23 June 2012; M-1, 28 June 2012).

[62] For details on the politics and logistics of leaving the field, see Kindon and Cupples (2003).

face consequences in retribution for participating in my research, and I was able to carry out my investigation safely.

3.3 RESEARCH METHODS: PRODUCING DATA

3.3.1 Methodological framework

My decisions on what research methods to utilize aimed at reconciling my desire to highlight the general livelihood pathways that renewable energy development have created along with my will to account for the individual stories and trajectories behind these trends. The diversified research methods I utilized dovetail with the approaches from my conceptual framework (Chapter 2) and inform diverse aspects of my research questions. The following discussion introduces the methodological considerations that underpin my research method decisions.

Philip (1998: 264) defines mixed-method research as an approach whereby "two or more methods are used to address a research question at the same stage in the research process, in the same place and with the same research subject".[63] For instance, while conducting a survey, switching back and forth between questionnaire questions and unstructured follow-up discussions would fit this definition. However, this understanding differs from the more widely used definition of mixed-method research, which defines it as a research design characterized by a methodology encompassing both qualitative and quantitative research methods and within which the level of integration of the resulting qualitative and quantitative data varies (Creswell and Plano Park 2007; Tashakkori and Creswell 2007).

The distinctions, contradictions, complementarities, and similarities between qualitative and quantitative research are well documented (see Berg 2007; Creswell 2009). Distinctions include that quantitative analysis builds on data that can be organized in a numerical format and processed through statistical methods. This itself allows for quantitative researchers to test hypotheses and replicate their research methodologies in various contexts (Berg 2007; Philip 1998). The same authors explain that qualitative analysis is rather associated with inductive

[63] This definition closely relates to that of triangulation, which I further discuss below.

small-scale analyses building on non-numerical data about the daily lives and experiences of specific individuals and communities.

My experience within Handai villages testifies to the infinite diversity of human nature and experience, and to the overarching influence of intangible dimensions such as ethnicity and culture. As such, my research emphasizes qualitative research methods such as participant observation and conversational interviews (Section 3.3.2), as these are helpful to capture what Baxter and Eyles (1997: 505) call "the richness of context-dependent sites and situations" at the core of qualitative approaches.

I also wanted my research results to highlight livelihood pathways, which itself required that I outline how the populations from Xiaocun, Zhongcun and Dacun villages perceive and cope with the impacts from renewable energy development upon their livelihoods. This objective necessitated combining qualitative research methods with quantitative research strategies, including rapid rural appraisals, mostly quantitative household surveys, and census data (Section 3.3.3). Another advantage of using the latter methods was that the formal nature of the quantitative questionnaires made it easier to recruit research participants neither my assistant nor I knew well beforehand. Indeed, asking unknown persons to share their thoughts, perceptions, and opinions or to discuss their values is considered somewhat rude in Handai culture (D-118, 30 November 2011). The survey allowed me to overcome this, since this investigation was carried out in a uniform manner that did not place the spotlight on the individuals per se, but rather treated them as members of a wider group they identified with. Besides, there were ample occasions for me find out more about individual experiences and livelihood strategies given my field research timeline and the large research sample my research aim called for (n=106, see below). Therefore, combining a mostly quantitative questionnaire with qualitative inquiry appeared as an optimal approach in the area where I conducted my research.

Finally, triangulating research results obtained through various methods is considered a means of enhancing the rigour of qualitative research (Baxter and Eyles 1997; Barbour 2001). Yet, Winchester (1999) questions the pertinence of method triangulation, especially when researchers pursue this approach in different contexts and/or with different purposes. She therefore argues

that researchers combining datasets derived from various research methods should aim to achieve a more complete outlook rather than achieving pure triangulation.[64] I personally argue that triangulation allows achieving both these aims, and I often used it to crosscheck data as well as for widening the scope of my inquiry. For instance, when survey answers from an informant seemed anomalous, I would go back to notes from conversational interviews my assistant and I carried out with this person as the survey unfolded or at another stage of my fieldwork. This allowed me to both double-check my survey results and to further comprehend how answers from this person differed from the potential pathways emerging from my overall database.

3.3.2 Qualitative methods: Worm's-eye-view

I first arrived in my research area alone and I was never formally introduced to the villagers, to the great astonishment of my Chinese contacts and colleagues, who most often resort to their networks and connections to identify their research sites and 'enter' the field.[65] Thus, the only research method I could initially undertake as an outsider was non-participant observation, gathering descriptive data I used to revisit my prior conceptions about my research villages (Hennink et al. 2011; Patton 2002). That being said, Kearns (2005) points out that the very presence of a researcher in the field influences the course of events and argues that there is no such thing as genuine non-participant observation. The fact that I also had brief encounters with the villagers at this stage of my field research further adds to this argument. In any circumstance, the curiosity and hospitality of members of the local population rapidly allowed me to build rapport with individuals from each of my research villages and to carry out active forms of participant observation (Gold 1958; Kearns 2005) rather than just being "a fly on the wall" (Hennink et al. 2011: 185).

Developing a sampling strategy to define whom I would first build rapport with was not an option, and I found my first informants through nonprobability convenience sampling; that is I selected the participants I first had access to (Saumure and Given 2008). Two individuals I have

[64] Bryman (2006) surveys a number of self-identified multi-methods case studies and discusses how such approaches serve triangulation, complementarity, development, initiation, and expansion purposes.
[65] I actually ended up playing this role for a Chinese M.A. student whose supervisor is a Chinese friend of mine and who began his fieldwork in two of the villages where I did fieldwork just a few weeks before I last left the area.

gotten to know through this random process became key informants.[66] People I met in turn introduced me to others involved in their social networks, adding snowball sampling to my nonprobability sampling portfolio (see Valentine 2005). Nonprobability sampling offers no protection against the biases of the researcher using it and potentially leads to data that can be difficult to extend to other cases and/or applied to other social groups (Saumure and Given 2008). In order to cope with these potential caveats, I also used a probability sampling procedure while conducting my livelihood survey (see Section 3.3.3).

Building rapport in turn allowed me to actively undertake participant observation, which was much more involving and rewarding, both personally and academically, than my initial non-participant approach. DeWalt and DeWalt (2002: 1) define participant observation as a method that brings researchers to "take part in the daily activities, rituals, interactions, and events of a group of people as one of the means of learning the explicit and tacit aspects of their life routine and culture". The explicit events and actions this method documents are those that research participants can easily translate into words and discuss, while the tacit aspects relate to unconscious features of one's values or culture. Patton (2002) adds that researchers undertaking participant observation can also observe and discuss what precedes and follows the activities they participate in. Participant observation is one of the preferred research methods for conducting ethnographic fieldwork, which, in the words of Mullings (1999: 337), is "firmly grounded in an empirical methodology that is devoted to the analysis of research data acquired by means of first-hand interactions with members of a local community over a substantial period of time". While participant observation is mostly associated with cultural anthropology, it has gained ground within other disciplines, including human geography (ibid., see also Kearns 2005; Schensul et al. 1999).

The main activities I carried out while conducting participant observation were: working in the fields; "hanging out" in public squares where people spend most of their hot afternoons; fishing in or along the Red River; participating in food preparation and cooking; and undertaking a Dai version of what Magnus Fiskesjö (2010) calls 'participant intoxication', namely participating in

[66] I developed a network comprising three key informants, one of whom lived in each of my three research villages. I have met my third key informant through a snowball sampling approach, discussed next.

endless, and intense sessions of eating and drinking. I also attended weddings, funerals, festivals, and shamanistic rites. These circumstances offered me an important *vitrine* on both the daily lives of my informants and on some of the most important events and rites of passage they have been undergoing for as long as the elderly can remember.

Conducting participant observation also influenced my usage of other research methods in two important ways. First, it gave me many opportunities to refine my survey and census questions. I therefore ensured that my inquiries were closely connected to local livelihoods and intelligible to my informants. Second, participant observation provided me with multiple occasions to conduct unstructured interviews. On that note, Fontana and Frey (1994) suggest that drawing a distinction between participant observation and conversational (unstructured) interviews, another "everyday technique" (Wolcott 1994: 23), is illusory, since the two methods are systematically intertwined. Unstructured interviews nonetheless constitute a distinct research method *per se*, and need to be addressed and defined as such.

An unstructured or conversational interview, as the name suggests, is "a dialogue rather than an interrogation" (Valentine 2005: 111). Unstructured interviews consist of informal and reciprocal exchanges, which mostly absolve them from the unequal power relations characterizing more structured forms of interrogation such as semi-structured interviews or questionnaires (Kitchin and Tate 2000; May 1997). Though I carried out my unstructured interviews without interview schedules, these discussions nonetheless allowed me to address themes and issues of relevance to my research. Moreover, I always tried to introduce these topics in a smooth and non-insistent manner. Finally, similarly to participant observation, these interviews allowed me to learn about issues that mattered to my informants in ways I had not previously considered.

I carried out unstructured interviews in settings as varied as those where I undertook participant observation. That being said, food preparation and meals were, again, particularly appropriate for using this method. Men are responsible for cooking on a daily basis in Handai society, and many people typically get involved in long-lasting meal preparation. Similarly, people often eat with friends or relatives and share responsibilities associated with receiving many people through very flexible resource pooling arrangements (D-118, 17 March 2012). Dinners (as well as breakfast

and lunch on special occasions) shared among members of more than one household typically last for many hours, with food and drinks consumed both slowly and in great quantities.[67] These circumstances are, of course, perfect for in-depth discussions. Outside of situations where conversations were freely flowing, my assistant and I felt we could find good moments for engaging unstructured discussions while carrying out our survey investigations. Typically, an unexpected answer to a survey question would bring my assistant or myself to ask probing questions, initiating unplanned exchanges that most often rapidly diverted from the predetermined questions.

In the villages, I had hundreds of conversational encounters with as many individuals, and kept notes on most of these discussions. After the necessary 'cleaning and trimming' process coding involves, my coding folder (see Section 3.4) includes details of discussions with 86 individuals about issues that directly touch upon my research aim and questions (Appendix 2). While I only had brief encounters with some of these people, others, including three key informants, repeatedly informed my research. The discussions that did not relate closely enough to the codes I identified while processing my data (see Section 3.4) nonetheless helped to situate and enhance my overall knowledge of my research area and population.

While in the field, I always had the option to go back and further inquire about any issue, and thus never felt the need to record my unstructured interviews. Trying to overcome the sociocultural differences between my informants and myself constantly remained one of my foremost priorities, and I felt that using a voice-recording device would hinder me in that regard. However, I always carried a small mp3 player/recorder with me, and I would sometimes isolate myself to record quick audio memos about important issues raised during conversations. Similarly, while I always carried a notebook in my daypack, I seldom took it out, except when discussing quantitative issues such as crop yield figures. However, I often took pictures, and since people got accustomed to me carrying my camera, my informants would sometime request

[67] The Handai increasingly drink beer, and thus tolerated me not sharing the maize alcohol they favour, acknowledging the health and security reasons I emphasized to justify my drinking preferences. In order to excuse myself, I most often cited a gastric condition and my concern with riding on the back of a motorbike after an evening of drinking strong alcohol.

that I take their photograph or recommend that I document events they thought pertinent to my research.

I organized such snapshots and updated my field notes/research journal daily after returning to my hotel. Comparing the reflexive process they went through in their fieldwork journeys and discussing the virtues of maintaining a journal, Heller et al. (2010) draw a distinction between their field notes and research journal. I personally did not separate these two documents, and compiled both my research data and personal reflections on the research process within a single document that totalled some 85,000 words by the end of my journeys. I must admit I did not have the energy to take a step back and draw a clear separation between my impressions and data while in the field. However, I did so at a later stage in the process, namely while I coded my field notes (Section 3.4).

After having made first contact in all three research villages, I got to a point where I was able to use the aforementioned qualitative methods smoothly and satisfactorily. Then, I purposefully abstained from utilizing more formal research methods for some time. Doing so allowed me to get more familiar with my research area and populations, and for the local populations to get used to my presence in their villages and homes. After I concluded that this adaptation was well underway and began feeling the pressure of my field research timeline, I laid the groundwork for adding more formal quantitative methods and getting my household survey started. I discuss how this materialized in Section 3.3.3.

Finally, as explained above, my plans to carry out semi-structured interviews (SSIs) with government officials did not materialize. Nonetheless, I did use this method during encounters with thirteen academics and NGO workers based in either Kunming or Mengzi. SSIs consist of a researcher-led discussion combining pre-established, unplanned, follow-up, open-ended, and closed questions as well as conversational exchanges (see Dunn 2010; Gillham 2005; Kitchin and Tate 2000; Longhurst 2003). Interviewers typically refer to interview guides or schedules when conducting SSIs, but whether these guides include a precise list of questions or only broad themes to be addressed is up to the researcher. In general, I have opted for broad themes. Since the researcher controls the SSI, (s)he is considered to hold a fair amount of power over the

interviewee (Kvale 2006). However, many strategies allow levelling how power manifests within researcher-informant relationships, and I systematically emphasized such tactics in my encounters. They included letting the informant decide where to hold an interview, making SSIs two-way exchanges, showing empathy, and emailing my informants after I typed my interview notes[68] so as to further thank them for their time and let them know that I gave high importance to the information they shared.

3.3.3 Quantitative methods: Bird's-eye-view

I obtained most of the quantitative data I cite in this research through a household survey I carried out in the villages following a probabilistic sample. As a prerequisite to creating my sample, I needed to gather exhaustive information about my research population, in particular at the household scale.[69] I did so by carrying out transect walks, participatory mapping and wealth ranking exercises in the three villages, in a process somewhat similar to a rapid rural appraisal (RRA). Rapid rural appraisal indeed regroups a collection of research methods, including the latter three approaches, utilized for rapidly collecting mostly quantitative information about a given locale (Chamber 1981, 1992, 1994a, 1994b).[70]

Development practitioners and research teams have long utilized RRA without accounting for the drawbacks that come along with the cost-effectiveness and speed associated with this research approach. Critics have noted that RRA is most useful for informing 'optimal ignorance' and have stressed its potentially extractive nature (Campbell 2001). However, I am among those who do not necessarily foresee RRA as problematic and argue that there is more to this approach than cost efficiency, and that it can be pertinent within a multi-methods agenda (ibid.). I also believe that the ethical caveats associated with RRA can be addressed if such an approach is used carefully, or in a "relaxed" manner, as Chambers (1992) frames it. For instance, I only carried out RRA after having spent over two months in my research area. By then, I felt that some of my

[68] I conducted all these interviews without my research assistant. Some of these discussions occurred in Chinese only, though since many of my interviewees spoke good English, we often found ourselves utilizing a hybrid language entwining both English and Chinese words. I drafted my interview notes in English.
[69] See Section 2.4.2 for further details about this scale of analysis.
[70] Typically, RRA is undertaken by sizeable research teams, and include much more exhaustive data collection exercises than what I describe below. Nonetheless, as the following description makes obvious, the procedures I undertook were done 'rapidly' and yielded mostly quantitative information, hence why I label my approach RRA.

informants had gotten more involved in my research and that they would genuinely be happy to help me with this task.

I carried out transect walks, participatory mapping and wealth ranking exercises in Xiaocun, Zhongcun and Dacun villages, each time with a different assistant. Though I had not requested it, two of these individuals were village chiefs, as the friends who recruited them for me apparently felt that elected representatives were in the best position to fulfill this task. The third one was a key informant who was happy to help me. All three individuals helped me in a committed manner and took their roles very seriously, though one village chief was obviously bothered with the time this asked for and saw no point in it even though I explained the reasons at length (this person nonetheless refused my offer that we stop in the middle of the assessment and that I complete the process with someone else). The other two individuals assisting me appeared to genuinely enjoy their duty, and it obviously 'gave them face' (面子 – *mianzi*)[71] to lead a foreign student around the village (X-1, 22 November 2011; D-65, 24 November 2011).

While carrying out RRA, my assistants and I would stroll along each alley within the village and stop in front of each door. I would make a quick sketch of the alley and identify each door with a number. My assistants would then tell me the number of household members, which, according to the local understanding, includes the co-residents of a house along with migrants that normally reside in the house while in the village. I also compiled the surname and name of the household head, along with the perceived financial wealth level of the household (below average, average, or above average). I was interested in the first data for statistical purposes, while I used surnames and wealth levels to create the clusters for my stratified household survey sample. A Kunming-based informant familiar with conducting surveys in minority nationality villages in Yunnan recommended that I use such financial wealth level clusters (K-2, 5 August 2011). I discussed these clusters with my assistants prior to conducting the RRA and we together calculated perceived financial wealth based on a combination of criteria, including household house type

[71] Like *guanxi* (Section 3.2.2), 'face' is a central component within interpersonal relations in China, where maintaining face is a constant priority (Hwang 1987). Notably, face intermeshes notions of pride, empowerment and respectability.

and size, car or air conditioner ownership, landholdings, the number of male heirs,[72] as well as current and/or previous occupations and income sources.

Takasaki et al. (2000) and Christiaensen et al. (2001) recognize that RRA does not yield the most precise results, but they also acknowledge their pertinence for creating samples. Through my RRA, I found that Xiaocun, Zhongcun and Dacun respectively included 33, 86 and 120 households, amounting to 239 households in total. The same villages respectively counted 145 365 and 525 inhabitants, while their total population reaches 1,035 individuals, or 4.3 individual per household on average. In order to achieve some consistency in how my survey data would represent each of my research villages, I knew that, proportionally speaking, I needed to carry out more surveys in Xiaocun and Zhongcun villages than in more populated Dacun. Therefore, I set the requirement that my survey sample achieves a 90 per cent confidence interval and a 10 per cent margin of error in each village.[73] As such, I needed to survey 23 households in Village A (70 per cent of all households), 39 in Village B (42 per cent) and 44 in Village C (37 per cent), or 106 households in total (44 per cent). Also, as each survey lasted for about 50 minutes, carrying out about 100 surveys or so also seemed like a feasible endeavour, and so I continued with this sampling approach.

After I determined how many household surveys I had to conduct within each village, I went back to the clan/wealth level clusters I created during the RRA. Then, golden rule calculi allowed me to identify how many households from each of these clusters I needed to survey for my survey sample to proportionally represent data I obtained through the RRA. For instance, in Xiaocun, as I knew we needed to survey 23 households, the sample clusters were as shown in Table 3.2. In order to compensate for the difference between the rounded cluster size results (22) and the number of households I needed to survey (23), I surveyed one household in a purely random manner.

[72] Local inheritance rules state that land is divided equally among male heirs when a male household head dies. Therefore, the higher the number of male heirs, the smaller the landholdings that each of them inherits.

[73] I am cognizant that such criteria are typically used with much wider samples than mine and lead to statistical findings that can be expanded to wider scales. I do not pretend – nor aim – to achieve this with my data. My survey results only fuel my case study on how renewable energy development impacted the livelihoods from the populations from Xiaocun, Zhongcun and Dacun villages. I thank Prof. Sebastian Breau and Dr. Theresa Thompson-Colon for sharing their insight on sample size matters.

Table 3.2: Cluster sizes in Xiaocun village

Patronym	Wealth level	Number of households	Cluster size
A	Below average	2	1
A	Average	2	1
A	Above average	4	3
B	Below average	3	2
B	Average	4	3
C	Average	1	1
D	Above average	1	1
E	Below average	2	1
E	Average	4	3
E	Above average	5	3
F	Average	3	2
F	Above average	2	1
	Total	33	22

My assistant and I began the survey with the information included in Table 3.2 in hand, along with similar data for Zhongcun and Dacun villages. At first, we would mostly identify survey participants randomly, either by knocking on their house's door or asking people we would encounter in the villages to participate in the survey. However, about midway through the process, we adopted more systematic approaches to complete the clusters. For instance, we would knock on the doors of the houses that we know would allow us to complete our clusters. To my greatest surprise, my final survey sample corresponds almost perfectly to these initial clusters, as we only had to choose three survey participants in a purely random manner from a total of 106 households to compensate for people that refused or were not available to participate in my research.

Surveys are widely used in social research, including in China (see Gustafsson and Li 2006). Surveys are based on standardized structured questionnaires useful for gathering original data about "people, their behaviour, experiences and social interactions, attitudes and opinions and awareness of events" (McGuirk and O'Neil 2010: 191). Surveys can yield both qualitative and quantitative insight, but they are mostly used to produce what De Vaus (2002: 5) calls "hard evidence", through closed questions (Valentine 2005; McGuirk and O'Neil 2010). Given this,

survey questionnaires have been critiqued for imposing inflexible categories on respondents whose answers might not reflect their actual opinions (ibid.; Davis and Whittington 1998).

In order to address this caveat, surveys are often enshrined within a multi-method research design. For instance, Mertens et al. (2000) have paired surveys with remote sensing, Christiaensen et al. (2001) did so with RRA, Davis and Whittington (1998) with community meetings, and so on. McGuirk and O'Neil (2010) also highlight the benefits of combining surveys and in-depth qualitative interviews, as I did in this research, arguing that such an approach provides more in-depth perspectives than the sum of its components.

Less often acknowledged is that this combination also serves questionnaire creation.[74] Indeed, conversational interviews and participant observation convinced me that I needed to thoroughly revise the preliminary survey questionnaire I had drafted before undertaking fieldwork. As expected, my second rendering was then edited two more times: two rounds of pilot surveys and subsequent discussion about the questionnaire highlighted that the survey was still too long and that some questions were unintelligible to my respondents. A third round of piloting convinced my assistant and I that we had finally come up with a questionnaire that would make sense to us as well as our informants. My household survey questions (see Appendix 3) cover wide-ranging issues and are mainly meant to document the assets that my informants use in their livelihood portfolios along with their perceptions on future environmental and social change. Particular attention is placed on changes that occurred over the 2006-12 time period since, as explained above, this encompasses the moments before and after the renewable energy development projects at the core of my research were implemented. Moreover, such a relatively short time span helps to avoid the inaccuracies that long-term retrospective survey investigations can bring about (Gibson and Kim 2010).

On a typical surveying day, my assistant and I would conduct three household surveys. As mentioned previously, administering each questionnaire lasted for 50 minutes or so, and we both felt three surveys to be a reasonable daily objective. For several reasons, we preferred to conduct the survey in the homes of our respondents. Firstly, informants were comfortable in that setting,

[74] Cameron (2005) holds that focus groups can also serve this aim.

and this had a positive levelling influence upon the power relations characterizing such encounters (Elwood and Martin 2000). Secondly, this allowed for discreetness both my informants and I welcomed: my research participants were keener to share personal information in a private setting, while this suited my goal to remain as 'invisible' as possible while undertaking research in the villages. Thirdly, entering the houses of my informants offered me a chance to see the materiality of their living environment, increasing my general overall knowledge of their culture and livelihoods.

While conducting the surveys, my assistant would usually ask most questions, while I would note answers and any other comments/information on coded paper-copies of the questionnaire. Computing the answers for one survey took about 20 minutes, and I carried out this task each evening so as not to forget details about the comments I had jotted on my answer sheets. By default, we preferred to administer the survey in Mandarin Chinese, but we did so in a very flexible manner. We carried out discussions using the local dialect with respondents not proficient in Chinese, or in a mixture of both Chinese and Handai languages with others. Apart from avoiding conducting the survey with minors under 18 years of age, we did not have any guidelines in regards to which household member could answer the survey questions. Often, household members would designate the male household head as the *de facto* respondent, but my assistant and I did not knowingly influence this process in any manner – although the fact we were both male might have done so. We also administered surveys with women, young and old, as stated in Table 3.3.[75] Moreover, since the surveying obviously triggered curiosity in the households, it was fairly rare for only one person to attend the discussion. Accordingly, our questions typically led to family discussions before we were provided with a final answer, a little like an informal focus group.

[75] These data offer a first glance at the diversity of human experience I discuss above as they highlight atypical family patterns. These include three instances where household are headed by women – including two whose husbands have died and one whose husband left the household – and one case where a man move to his in-laws after he got married.

Table 3.3: Survey respondents

Sex	Relation to household head	Number	Percentage
Man	Household head	57	54%
Man	Son	19	18%
Man	Father	4	4%
Man	Brother	1	1%
Man	Son-in-law	1	1%
	Sub-total	82	77%
Woman	Household head	3	3%
Woman	Wife	15	14%
Woman	Daughter	1	1%
Woman	Mother	4	4%
Woman	Daughter-in-law	1	1%
	Sub-total	24	23%
	Total	106	100%

In addition to the household survey, I conducted a census focusing on the impacts of jatropha plantation expansion in Xiaocun (henceforth the jatropha census). My household survey results demonstrated that this locale was by far the most impacted by jatropha plantation expansion (see Section 4.4.2). I tailored the census to further document how these developments impacted livelihoods and farming regimes. Since Xiaocun village only includes 33 households and the census questionnaire was much shorter than that of the survey (see Appendix 4), lasting for only ten minutes or so, I wanted to conduct this inquiry with representatives from every household in the village. In the end, members from 28 households participated. Members from two other households were away from the village during the census, and those from a further three households refused to participate. Otherwise, the circumstances relating to how my assistant and I administered the jatropha census are all similar to those characterizing the progress of the household survey.

Finally, I have gathered official data and statistics from government publications unavailable outside of Yunnan, including the Annual Yearbooks (年鉴 – *nianjian*) and Annual Statistical Yearbooks (统计年鉴 – *tongji nianjian*) from Gejiu City – on the western bank of the Red River, where Zhongcun and Dacun villages are located – and Yuanyang County – on the eastern bank, where Xiaocun is located – and Honghe Prefecture. While I cite these and other secondary information in my thesis, I remain cognizant that such official information must often be taken

with a grain of salt, particularly so in China (Bernstein 1984; Cai 2000; Holz 2002; Ma et al. 2014; May 1997). For instance, Ma et al. (2014) report that in 2011, the sum of the GDP figures from all provincial bureaus of statistics exceeded the countrywide GDP value published by the National Bureau of Statistics by 10.3 per cent. Therefore, governmental sources do no more than allow me to better understand official narratives on how environmental change and development projects unfold in Honghe Prefecture, and to understand how my informants are positioned within a wider population. Indeed, the above sources are reminders that career advancement for government cadres is closely connected to the economic development achieved within the areas under their authority (Section 2.3.1.1), and that this yields a notorious influence upon the data that such official publications relay. Likewise, the technical challenges associated with establishing sound statistical instruments throughout the country also affect the overall reliability of official statistics in China. Moreover, when it comes to livelihood conditions in my research villages, it appears that my database is currently the most accurate that exists, since, as an informant complained just before I last left the villages: "The authorities know nothing about what is going on here, because they have never undertaken surveys like the one you did. So how could they know?" (L-118, 13 July 2012).

3.4 CODING, ANALYSIS AND INTERPRETATION: SEEING LIKE A SOCIAL SCIENTIST

While the challenges accompanying fieldwork cannot be overstated, combining massive amounts of raw data into a structured thesis is also reckoned as one of the great tasks in a Ph.D. programme. In order for researchers to avoid drowning in a sea of data, many methodological treatises emphasize procedures aimed at organizing what initially seems like unrelated qualitative and quantitative information into a legible analysis and interpretation (see Auerbach and Silverstein 2003; Kitchin and Tate 2000; Patton 1990; Saldana 2009; Wolcott 1994). A common approach within this literature is to distinguish between the coding, analysis, and interpretation stages of the process through which researchers achieve their findings.

Auerbach and Silverstein (2003: 35) explain that coding data allows one to process data "from a lower to a higher (more abstract) level of understanding". Coding involves developing strategies to identify pertinent data and to associate these in coherent ensembles so as to enlighten

previously unknown processes and typologies. This can be undertaken with specialized software applications referred to as Computer Assisted Qualitative Data Analysis Software (CAQDAS, see Coffey et al. 1996) or 'manually' with a word processor or spreadsheet application. I utilized the latter strategy.

The coding strategy I have developed in this research builds upon four distinctive approaches, beginning with simultaneous coding, which involves using more than one coding tactic.[76] While processing my fieldwork notes into codes, I also carried out attribute coding. To do so, I organized my list of informants into coded pseudonyms. These codes included a letter referring to the village of residence (X, Z, or D) along with the number of allocated to their house door during earlier transect walks (see Section 3.3.3). For informants other than household heads, the code also included information about how these individuals were related to the household head (mother, young brother, wife, daughter, and so on).[77] I also added the first date when each of these individuals was listed in my field notes so that I could easily trace back contextual information about my encounters with them. Finally, I inserted details that would allow me to easily remember who each code referred to (examples include: 'the guy missing a finger', 'owner of the small shop on the road', 'banana trader', 'neighbour to the purple house', etc.).

Once this was achieved, I began organizing my data into a series of descriptive and theoretical codes. Descriptive codes consist of words or short sentences that describe qualitative data, whereas theoretical codes consist of umbrella/analytic codes that encompass more than one concept (Saldana 2009; Cope 2010).[78] I first concentrated on the *a priori* theoretical codes that the literature informing my conceptual framework dictated. I also identified descriptive codes arising from my results. Therefore, while one could argue that a purely inductively-grounded theory creation process should emphasize descriptive and theoretical coding processes individually and chronologically, such was not the case for me. Instead, I moved back and forth

[76] Saldaña (2009) identifies no less than 28 different coding methods.
[77] The referencing system I use in this thesis is a simplified version of these codes. As such each reference is composed of a letter referring to the village or city where I met my informants and a number I allocated to all the interviewees listed in my coding file.
[78] Although Cope (2010) emphasizes a different typology, her discussion on analytical codes shares many similarities with that of Saldana (2009) on theoretical codes.

between these different levels of coding in an iterative manner (see Cope 2010). As the analysis unfolded, new concepts emerged and shed new light on my research questions.

The next step was to strike a balance between analysis and interpretation in my core results chapters (Chapters 6 and 7) and conclusion chapter (Chapter 8) (see Wolcott 1994). Defining interpretation, Patton (1990: 423) writes:

> Interpretation means attaching significance to what was found, offering explanations, drawing conclusions, extrapolating lessons, making inferences building linkages, attaching meanings, imposing order and dealing with rival explanations, disconfirming cases, and data irregularities as part of testing the viability of an interpretation.

While deciding on the issues to which I should attach special significance to in this thesis, I privileged matters that both stood out as significant for my informants and simultaneously contributed to answering my research questions. This approach convinced me to closely scrutinize the governance regime promoting dam and jatropha plantation schemes in Yunnan. I also concentrate on how these green energy schemes influenced local access regimes, how my informants understood these influences and what strategies they adopted to cope with exclusion and/or to benefit from new access opportunities. Pushing the iterative process I described above further, I fostered my interpretation by probing how my findings relate to and shed new light on the literature I critique in my conceptual framework.

3.5 CHAPTER CONCLUSION

In this chapter, I have emphasized the influence that the positionalities and subjectivities characterizing both my informants and myself have exerted upon my endeavours in the field. Notably this explains that my research would have been quite different if I had conducted it in another locale, while another researcher working in the same research area as me would have achieved results probably different from mine. The sensitive nature of my research topic has influenced my need to be critically reflexive in the field and has been crucial for determining how to assure that neither my informants nor I encounter problems with the authorities, while also complying with my ethical commitments. I have further discussed the theoretical and ethical justifications behind my decisions to utilize particular research methods, along with the

individual research strategies I employed while in the field. Finally, by addressing my coding, analysis, and interpretation approaches, I have highlighted how I have managed the data I brought back from the villages along with how I have organized and combined this information so that it can yield original interpretations about the factors driving the renewable energy development projects in my research area, along with its impacts.

CHAPTER 4

RENEWABLE ENERGY FROM THE GLOBAL SCALE TO THE RED RIVER VALLEY

4.1 INTRODUCTION

An understanding of how the notion of the frontier evolved over the twentieth century is crucial to studying how non-local stakeholders promote development and modernization projects in the area where I conducted this research. Writing about the western conquest of the United States, Frederick Jackson Turner (1894: 200) defined the frontier as "the outer edge of the [westward expansion] wave – the meeting point between savagery and civilization". The same scholar drew a distinction between the American and European versions of the frontier. In Europe, Turner (ibid.) argued, the frontier rather consists of "a fortified boundary line running through dense populations".

Some four decades later, Owen Lattimore (1940) also utilized the concept of the frontier as the backbone of his study about the *Inner Asian frontiers of China*. At that stage, the outer fringes of the young Republic of China (1910-1949) were nothing like a fortified boundary line. While the Great Wall had long prevented the Middle Kingdom from 'barbarian' invasions from the north, it had been eclipsed by almost a century of Mongol domination, a further two and half centuries of Manchu rule, and sustained Han immigration to Manchuria.[79] The inner frontiers Lattimore was interested in were not just regions located north of the Great Wall; his discussion also focused on Tibet and 'Chinese Turkestan' (contemporary Xinjiang). The Chinese frontiers Lattimore documented spanned 7.8 million km^2 and totalled some 45 million people, including over 30 million Han Chinese. In comparison, the region he called "China proper" (Lattimore 1940: 12) was half the size and ten times more populated. The dualism between empty/backward and densely populated/modern enshrined in the American frontier thus served Lattimore and his analysis far better than the European version.

[79] Epitomized by Kublai Khan, the Yuan Dynasty (1271-1368) was governed by Mongol leaders who ruled over China and Manchuria – then spanning portions of Siberia, as well as Inner and Outer Mongolia. The Qing, the last Chinese Dynasty (1644-1912), was ruled by Manchu leaders who had invaded Beijing after crossing the Great Wall southward. Nowadays, Manchuria is now known as *Dongbei* (东北 – lit. northeast) and covers Heilongjiang, Jilin, and Liaoning Provinces.

Lattimore portrayed frontier relationships as the march of Chinese modernity over marginal lands and people. To him, the costs that came along with frontier formation governed the pace of its displacement, as the frontier marks "the limits of diminishing returns" for economic and imperialistic endeavours (ibid. 243). Also, cognizant that frontier formation is never absolute, Lattimore (ibid. 19) notably questioned: "In the society of China and the societies of its inland Frontier region, which characteristics and peculiarities (…) are destroyed when the modern world breaks in on them and overrides them? Which of them are able to survive?" Lattimore attributed this persistence of cultural characteristics to features he drew from the histories of the people from the frontier. However, although he argued that these people had a history before their encounter with Chinese modernity, he did not go as far as questioning their 'barbarian' nature.

Also working in China, Giersch (2006) tackles the obvious ethnocentric biases such a conception of the frontier perpetuates. To Giersch (2006: 3), the frontier is rather "a territory or zone in which multiple people meet; at least one group is intrusive, the other indigenous". Scholarship on the frontier also demonstrates that frontier formation is a material and metaphorical endeavour led by actors promoting capitalist and modernization agendas (Barney 2009; Fold and Hirsch 2009; Hirsch 2009). These agendas most often promote agriculture expansion and the incorporation of distant natural resources in new commodity exchange networks (ibid.; De Koninck 2000, 2006). The actors participating in frontier formation typically entwine political, economic and legal powers, and they spare no expense to overcome the 'diminishing returns' associated with their frontier endeavours. Common tactics include framing frontier formation as contributing to highly subsidized global development priorities – fighting global climate change is an obvious example – and/or not being financially responsible for the all social externalities that opening the frontier drives (Barney 2009).

The area where I conducted research combines many of these features. It is a zone of contact between various peoples, most notably Han Chinese and ethnic minorities, but also among different ethnic minority groups. It is a territory where geographic conditions have long created hurdles for imperialistic projects, both French and Chinese (see Abadie 1924; Doudart de Lagrée et al. 1873; Giersch 2006; Scott 2009). More recent state and economic ventures have also faced

"friction of terrain" (Scott 2009: 166) in the fringes of Yunnan. Subsidy regimes such as those I explore later in this chapter and the imposition of externalities to the local population (Chapters 6 and 7) allowed coping with the poor prospects from the frontier in some cases.

In this chapter, I turn my focus to multiple social policies and development plans drafted in faraway Beijing that have been implemented in the Red River valley with significant local impacts. Doing so, I amalgamate secondary literature with fieldwork insights. I argue here that this is relevant for highlighting multiscalar relationships and influences that neither secondary literature nor my own data fully grasp when taken individually. On the one hand, it is important to remember that the development projects I scrutinize in Honghe Prefecture did not occur in a vacuum, but take place in a particular political economy and a particular environmental governance regime. On the other hand, the specifics of these projects and the conditions under which they have been implemented remain widely unknown, and this chapter addresses this gap.

In particular, this chapter concentrates on the development projects that I argue have brought about the most significant livelihood impacts for the population of Xiaocun, Zhongcun and Dacun villages since the mid-2000s; that is, the development of renewable energy capacities within or nearby the villages. However, before I address the circumstances that have led to the construction of hydropower dams and to the expansion of jatropha plantations along the Red River and document their actual implementation, I first review, in Section 4.2, national policies that have also impacted the area where I carried out my research: the Great Leap Forward, the Household Contract Responsibility System and the Go West Campaign. Although the former two initiatives were implemented decades ago, discussing them here is important because my informants still experience the effects of these campaigns. This legacy in turn influences how villagers adapt their livelihoods when coping with the consequences of contemporary development projects. As for the Go West Campaign, it has provided, since the early 2000s, strong institutional support for development projects in Chinese western frontier regions, thereby facilitating renewable energy capacity development in Honghe Prefecture.

That being said, the Go West Campaign is just one of many policy instruments that promote renewable energy development in Yunnan Province, as I demonstrate in Section 4.3. Indeed this

same sector also benefits from major incentives from the Clean Development Mechanism (CDM - reviewed in Section 4.3.1), one of the main instruments developed at the global scale to advance what Brown and Corbera (2003) have deemed a 'new carbon economy' (See Section 2.3.1). China is a major actor within this emergent global political economy and has instituted a host of policies to incentivize renewable energy development within its territory, as I show in Section 4.3.2. This brings me to address the actual development of renewable energy capacities in Honghe Prefecture. I investigate hydropower dams and jatropha plantations implemented in the Red River valley individually in subsections 4.4.1 and 4.4.2, respectively. In Section 4.4.3, I conclude by unpacking the relationship between the Red River dams and jatropha plantations and the exclusion processes these schemes catalyze. By investigating governance processes in China, along with the positions of various stakeholders involved in environmental governance – especially those promoting renewable energy schemes in the Red River valley – this chapter helps me to answer Research Question 1, namely: *How are renewable energy projects being physically and politically designed and implemented in the Red River valley? What are the roles of different non-local stakeholders towards these schemes, given China's approach to environmental governance within a neoliberal authoritarian regime?* Likewise, reviewing how hydropower and energy crop projects have been physically implemented in my research area contributes further to answering this question. Finally, this chapter also sets the scene for my following results chapters, in which I address the inconsistencies between the initial objectives of the renewable energy schemes and their actual on-site impacts.

4.2 THREE NATIONAL CAMPAIGNS AND THEIR IMPACTS IN THE RED RIVER VALLEY

The villages where I carried out my research are located almost as far as one can get from Beijing, while remaining in China. Nonetheless, political campaigns initiated by the Communist leadership decades ago have had long-lasting impacts in Xiaocun, Zhongcun and Dacun villages. This contradicts the old idiom that 'the sky is high and the emperor is far away' (天高皇帝远 – *diangao huangdi yuan*), which refers to the decreasing influence of central power (whether that of the Emperor or the Central CPC leadership) as one gets farther from the capital. The central government has long been particularly efficient at mobilizing wide-ranging social forces towards a common aim throughout China. Scholars have labelled such governance as a type of 'campaign

mentality', and demonstrated that the rhetoric that CPC campaigns employ has barely changed since Chairman Mao's rule (1949-1976) (see Economy 2004; Sturgeon 2010).

Among the utopic stances that Mao Zedong promoted during his three-decade tenure was that "the conquest of nature and prosperity of humankind were believed to be at hand through the miracle of socialism" (Shapiro 2001: 67; see also Schmidt et al. 2011). The infamous Great Leap Forward (大跃进 – *da yuejin*, 1958-60) epitomizes this approach. During this period, steel production became the standard for measuring the contribution of individual communes to a strictly enforced communist ideal. However, the national priority to maximize the output from rural furnaces throughout the country occurred to the detriment of both human life and forest cover, among other catastrophes. The urgency to fire furnaces first led to the decimation of forests. Second, too tired from felling trees – as well as implementing irrational land-reclamation projects – peasants neglected their fields. This catalyzed the worst famine in China and world history, with between 30 to 50 million Chinese people starving to death during this period (Becker 1997; Economy 2002, 2004). When I asked about these "difficult times", the elderly in the villages argued that people never starved in the area, and "that although meat was scarce, we could always eat the rice we grew and we always had enough of it" (X-1; X-9; 29 November 2011). Unfortunately, such was not the case everywhere else in China.

The same interviewees also explained that during this period, locals started cutting the forest that used to cover areas that have since become barren lands (ibid.). Another informant explained that the villagers draw a direct relationship between forest cover and water availability, and the Great Leap Forward is remembered as a very dry period (X-23, 2 April 2012). The late 1950s are also remembered as the moment when game, including big mammals such as tigers, rapidly became scarce, as the forests that used to surround the villages were cleared (ibid.). The Red River valley was no exception in Yunnan, as rural furnaces, commune kitchens and agricultural expansion took a very high toll on provincial forest cover rates. It is estimated that forest cover in Yunnan fell from 48 to 38 per cent between 1958 and 1960 alone (Shapiro 2001). In many areas, forest and the local fauna have not yet recovered. Such is the case in Xiaocun, Zhongcun and Dacun villages (D-86, 13 December 2011).

Another policy with long-lasting impacts in my case study villages was the decollectivization of agriculture in the early 1980s, bringing an end to three decades of communal agriculture. After seizing power in 1949, the CPC first implemented policies beneficial to peasants. Notably, land reform was rapidly undertaken to redistribute the massive estates from landlords that predominantly supported the nationalist Guomindang troops led by Chiang Kai-shek. However, this 'remunerative' (Kueh 1995: 23) approach did not last long and agricultural collectivization became the core Maoist project to speed up socialist reforms and development from the mid-1950s onwards. Under this system, peasants had to cede their farm assets, including land, animals, and tools, to the commune. They would also contribute their labour to the commune, which controlled production, harvest and allocation of the grain, as well as the distribution of the coupons needed to acquire household goods through a rationing system (X-23, 29 November 2011; see also Unger 2002; Xu and Ribot 2004; Zweig 1997).

As Deininger (1995) discusses, China is among the many places where collectivization failed, alongside Cuba, Ethiopia, Nicaragua, Peru, and Vietnam. One villager reiterated the well-known arguments against the collective system in the following words: "It did not work well because there was no incentive for people to work hard. As such, some did work hard while others did not. There were many people who were stealing crops and this was also a big issue." (D-118, 2 April 2012). Day (2013) also highlights that the collective system suffered high supervision costs that translated into further food production losses. Deng Xiaoping too acknowledged collectivization as a failure after he gained complete control over the CPC leadership a few years after Mao died in 1976. Deng therefore implemented a wide-ranging reform package known as Reform and Opening (改革开放 – *gaige kaifang*), toning down the class struggle rhetoric that had justified collective agriculture in the first place.

The Household Contract Responsibility System (家庭联产承包责任制 – *Jiating lianchan chengbao zerenzhi*) was one of the main measures implemented through this policy re-orientation. Notably, this programme led to the redistribution of farmland to households through long-term leases that allowed peasants to use land as they pleased and make a profit from their agricultural activities. However, all land remains state property in China, and while the household contract scheme formalized access and utilization rights over that resource, it did not grant peasants formal

ownership rights over their lands (see Kung 2000). Accordingly, while peasants are allowed to rent – or, more precisely, sublet – their contracted lands, they cannot sell parcels nor use these resources as collateral for obtaining a loan. The household contract reforms also required villagers to pay an agricultural tax in cash or kind until 2004, when the tax was abolished (Ho 2001; Yot 2011). According to one villager, the agricultural tax required that "a household harvesting 20 bags [about 800 kg] of rice a year pay three or four bags [120-160 kg]" (D-118, 2 April 2012), which my interviewee found quite reasonable (see also Göbel 2010).

Deng Xiaoping's ambition to 'unleash productive forces' reached its objectives in the countryside: farm yields increased dramatically, driven partly by crop specialization and increased utilization of modern farming inputs. However, the economic reforms have also been understood as the moment when inequalities came back with a vengeance in rural China, partly because the reforms also involved the state halving its public works and social welfare policies (Day 2013; Lu 2012). The same perception is present in the villages, where an older informant confided his nostalgia about some aspects of Maoist times: "Things were very difficult under Mao. Meat was scarce and we did not have much in our house. Yet, because we are peasants, we always had enough rice to eat. Also, there was more equality and robbing did not exist. There was nothing to steal in those days anyways!" (X-1, 29 November 2011). As I investigate in Chapter 6, the reform period also marked the moment when the populations from Xiaocun, Zhongcun and Dacun villages had their first contact with commercial agriculture along with some agricultural intensification strategies. These same technologies have diffused very rapidly since renewable energy schemes were implemented in the Red River valley.

The third policy campaign I introduce here, namely the Go West Campaign (西部大开发 – *xibu dakaifa*), was implemented by the so-called third generation of Chinese leaders, who followed Deng and aimed to correct some of the imbalances that reform policies created. Deng famously suggested that it was acceptable and beneficial to society "to let some people get rich first" (Naughton 1993: 501). Deng indeed promoted a "ladder-step theory" that epitomized what modernization theorists call the "trickle-down effect" (Holbig 2004: 338; see also Glassman 2010). According to this effect, as one gets richer welfare increasingly percolates towards actors belonging to lower socio-economic classes. Unfortunately, the redistribution process Deng

envisaged did not materialize as fast as he had hoped, while inequalities rose steadily. Notably, at the individual level, socio-economic inequalities between rural/urban and Han/minority nationality became aggravated. Likewise, at the national scale, the reforms Deng implemented privileged eastern China provinces over western areas. Foreign industrial investment was first allowed and encouraged in Special Economic Zones (SEZ) all located along the Eastern seaboard (Goodman 2003, 2004; Holbig 2004). As such, SEZs rapidly became one of the core drivers of the Chinese economic 'miracle', attracting increasingly mobile foreign capital and manufacturing (Summers 2013).

By the late 1990s, the success of the reforms had driven East-West imbalances to previously unseen levels, which themselves increasingly threatened social stability. In order to address this situation, the government drafted another policy, the Go West Campaign, with the aim to facilitate western provinces jumping on the development bandwagon. From the year 2000 onwards, the Go West Campaign aimed to create a "prosperous and advanced new West where life is stable, ethnic groups are united, and the landscape is beautiful" (Holbig 2004: 349, see also Lai 2002). In other words, the campaign officially stressed economic development, social cohesion, and environmental protection. Yet Goodman (2003) reads the campaign differently, arguing that an emphasis on regional inequalities mostly facilitated nation-building and internal colonization endeavours (see also Summers 2013).

In particular, the Go West Campaign targeted public and private – both domestic and foreign – infrastructure investment in the energy, transport, communication and irrigation sectors, and stressed support for investment in 'minority autonomous regions' and 'remote border areas' (Yao 2009). According to official figures, the Campaign yielded public investment in excess of one trillion RMB (about $165 billion) over the 2000-05 period (Yao 2009). However, many infrastructure projects planned before 2000 were bundled up in the Campaign, raising doubts about its actual cohesiveness and investment levels (Goodman 2003).

The objective of the Campaign to enhance local livelihoods also failed to materialize into a cohesive social development programme. For instance, the education sector allegedly received investments totalling only 15 billion RMB ($250 million) during the 2000-05 period, out of the

above-stated one trillion RMB investment figure (Yao 2009). Healthcare investments concurrently stood at eight billion RMB ($133 million). Moreover, as is often the case with official statistics, doubts have been cast on the accuracy of all the above values (see Section 3.3). Also, whatever the real figures are, living conditions in the West have not caught up with those in the East. Rather, regional imbalances have persisted or increased since the Go West Campaign began (Yao 2009).

The Go West Campaign also encompasses two core environmental campaigns, namely the 'Land for Forest' and the 'Land for Grass' initiatives, which seek to incentivize reforestation/afforestation and grassland restoration, respectively (Yao 2009, Yeh 2009). Normally, such initiatives should fall under the mandate of the State Environmental Protection Agency (SEPA).[80] However, SEPA representatives were not invited to participate in governing the Go West Campaign, which is steered by economic actors including, first and foremost, the National Development and Reform Commission (NDRC).[81] Holbig (2004: 345) suggests that SEPA cadres had made "early critical assessments of the ecological damage that could be caused by an irrational development craze" of the kind Go West promoted. These claims conflicted with the ecological modernization agenda the Campaign promotes, and therefore explain why SEPA representatives were labeled *personae non gratae* by the campaign steering committee (ibid., see also see Yeh 2009). Economy (2002) argues that this absence of SEPA stakeholders increased the risk of Go West-sponsored environmental campaigns repeating the mistakes of past campaigns with similar objectives, such as promoting poor reforestation and forest management techniques, and planting tree species unsuited to local circumstances (see also Yeh 2009). Many authors also pointed out that Chinese environmental efforts associated with the Go West Campaign resulted in massive livelihood impacts for targeted populations – including a proportionally large number of people from minority nationalities. Such social consequences remain unaccounted for by Western governments and Chinese stakeholders lauding the massive investments that China allocates to environmental efforts (ibid; see also: Bennet 2008; Grosjean and Kontoleon 2009; Melick et al. 2007; Uchida et al. 2007).

[80] The SEPA was the forerunner of the current Chinese Ministry of Environmental Protection, created in March 2008 (see Qiu and Li 2009).
[81] The NDRC was created in 2003 in a reshuffling of planning authorities dating from Mao's era (see Martin 2014). The NDRC's predecessor between 1998 and 2003, the State Planning and Development Commission (SPDC), was a key actor in the early phase of the Go West Campaign.

In sum, the three political campaigns reviewed above have perpetuated mistakes common within campaign-oriented Chinese governance. Notably, 'development' and 'modernization' campaigns typically prioritize important up-front investments in combination with little medium- or long-term follow-up (Economy 2004). Furthermore, campaigns tolerate little input from local populations or local authorities, and often promote ill-suited technologies or behaviour change. Campaigns therefore seldom meet their objectives, and when they do not, the blame usually falls on local actors rather than on the campaign itself (Sturgeon 2010). These local actors are also those who have to bear the long-term consequences of such campaigns.

The Great Leap Forward, the Household Contract Responsibility System and the Go West Campaign had immediate social and environmental impacts in the Red River valley and/or influenced how development projects unfold in this area. Likewise, the campaigns have both driven livelihood changes and retroactively influenced people's ability to cope with such changes. Since the mid-2000s, renewable energy schemes have driven livelihood transformations more intense than any other development project in Xiaocun, Zhongcun and Dacun villages. The Go West Campaign has played a key role in facilitating the implementation of hydropower dams and jatropha plantations near these villages, as such projects served the main objective of the Campaign to promote economic growth in a frontier region. Emphasizing the ecological modernization-inspired argument that such projects reconcile environmental and economic objectives, Go West allocated little importance to the externalities these 'green energy' schemes catalyzed at the local scale (Section 2.3.1). Other political mechanisms also perpetuated the same vision at various scales, as I uncover next.

4.3 Green is better: Renewable energies promotion at the global and Chinese scales

As Gupta (2012) points out, although energy procurement strategies have profound geostrategic, economic, social and environmental implications transcending national borders, UN-based organizations have instituted very few policies and legal instruments to oversee and regulate the energy sector. Gupta adds that the Clean Development Mechanism (CDM) is one of the very few

institutions that exerts, since its implementation in 2000, an important influence upon global energy policies. The CDM is one of the three 'flexible mechanisms' set for countries that have committed to greenhouse gas (GHG) emission reduction goals under the Kyoto Protocol.[82] In Section 4.3.1, I investigate the domestic and global implications of the CDM. I demonstrate that framing renewable energy sources as a solution to climate change makes a strong incentive for the development of this sector both at the Chinese and global scales. In Section 4.3.2, I scrutinize how the Chinese government replicates this vision, in which renewable energy development is promoted as contributing to various policy objectives regarding the environment and energy security. I also unpack how the structure of the Chinese energy sector, too, facilitates the rapid development of energy projects in China's frontier regions. Finally, I argue that all these circumstances mean that livelihood impacts from such renewable energy schemes receive less attention than what they deserve. Therefore, this section adds to my ongoing investigation into the political processes that facilitate the implementation of renewable energy schemes in the Red River valley, introducing further insight into Research Question 1.

4.3.1 The CDM: The UN stepping in to overcome business as usual in China?

The CDM allows Annex 1 countries that cannot achieve their GHG reduction objectives to compensate by buying 'carbon credits', officially known as Certified Emission Reductions (CERs), from non-Annex 1 developing countries. Within the latter countries, CERs emanate from CDM-financed development projects that produce less GHG than 'business as usual scenarios' that would allegedly have prevailed without the 'additional' financial contribution from the CDM (Grubb 2003; World Bank 2010). As of 1 January 2013, renewable energy projects constituted almost 70 per cent of all 1,986 CDM projects active globally, confirming the above statement that the CDM has indeed become a powerful energy policy instrument (UNEP Risoe Centre 2013). In regards to the case studies I focus on here, Nansha and Madushan dams participate in the CDM, while Sunshine Technology had plans to register its jatropha plantations in the mechanism before the project failed (K-6, 2 September 2011).

[82] The countries that have adopted GHG emission reduction objectives are officially known as the 'Annex 1 countries'. The other two flexible mechanisms are Emissions Trading and Joint Implementation. Through Emission Trading, also known as Cap and Trade, a central authority allocates maximum GHG emission permits to enterprises from Annex 1 countries: enterprises that pollute less than authorized can sell their unused GHG permits while those that exceed their cap must compensate by buying such rights. The basis for joint implementation are similar to those from the CDM, but the former scheme oversees investment from any Annex 1 to Annex 1 countries classified as 'economies in transition', all of which are located in Eastern Europe.

The CDM introduces a new multi-level energy governance model and creates original networks between place-based, national, regional, and global actors (Section 2.3.1; see also: Boyd et al. 2011; Gupta 2012; Smits and Middleton 2014). This vertical model involves a global institution, namely the Mechanism itself, which cooperates with national institutions to enable project design and accreditation. In China, the National Development and Reform Commission is the 'Designated National Authority' (DNA) responsible for assessing whether potential CDM projects meet the guidelines of the Mechanism. The NDRC also handles submitting eligible proposals to the Bonn-based Secretariat of the CDM and levies a tax on CER sale value (K-3 August 2011). Local-level institutions participate in project design and are often involved in implementation as well. In Yunnan, such institutions include local and provincial government bureaus along with state and/or private enterprises. In addition to these actors are foreign governments that commit to purchasing CER along with local, national and international private consulting firms responsible for monitoring active CDM projects (Bäckstrand and Lövbrand 2006).

CDM policies and investments have become a powerful driving force for the institutionalization of environmental discourses framing climate change as the first and foremost global environmental priority (Section 2.3.1; see also Bäckstrand and Lövbrand 2006; Swyngedouw 2010). Also, the fact that hydropower is the sector that currently accounts for the greatest number of active CDM projects testifies to a thorough reversal of perceptions surrounding this industry globally. Before CDM policies were taking of in the late 1990s and early 2000s, members of the international community were seriously scrutinizing the socio-political and environmental consequences of hydropower development. Notably, the main stakeholders involved in this sector, including the World Bank, convened the World Commission on Dams (WCD) and drafted a report that questioned the environmental, social, and environmental benefits associated with hydropower development, concluding that the cons often outweigh the pros (WCD 2000). This convinced the World Bank to re-evaluate its dam financing guidelines and adopt a more restrictive approach towards this industry. Yet, a decade later, with the popularity of the CDM

hydropower is back on top of the agenda for policy planners and development banks, while dam projects shelved for decades are now being revisited (Hirsch 2010; Osborne 2009).[83]

Apart from participating in reframing hydroelectricity as an environmentally-sound activity, the CDM also adds financial arguments into the balance. Indeed, the Mechanism specifically focuses on facilitating development projects considered financially unsound. Therefore, in order to meet the financial 'additionality' at the core of the Clean Development Mechanism guidelines, project developers must demonstrate that their projects would not occur without CDM revenues (Figure 4.1). Besides such financial considerations, the demonstration must also be made that projects joining the CDM achieve the environmental 'additionality' criterion, namely that potential projects contribute to reducing GHG emissions in comparison to what would have potentially been released if the Mechanism did not exit (see Bumpus and Liverman 2008, 2011).

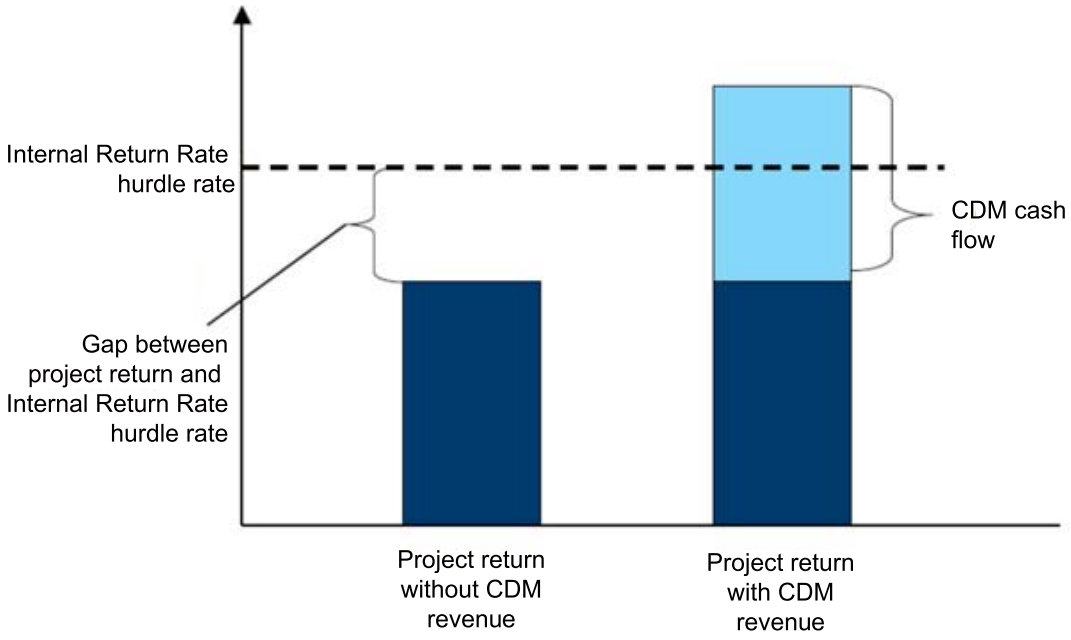

Figure 4.1: Financial additionality (source: UNEP et al. 2007: 15)

[83] While the complete global energy outlook that explains this reversal falls outside of the scope of this thesis, I argue here that associating hydropower development with GHG emission reduction was an important step towards the rejuvenation of this sector. That being said, arguments about the contribution of hydroelectric dams to climate change alleviation efforts are typically silent on the methane emissions that reservoir creation causes; in reality hydroelectric reservoirs create at least four per cent of anthropogenic GHG (Lehner et al. 2011; McCully 1996; WCD 2000). Likewise, recent demonstrations that hydropower has a higher water footprint – or, in other words, it uses more water – than other energy sources due to reservoir evaporation raises questions in regards to hydroelectricity genuinely being 'renewable' (see Chenoweth et al. 2014; Fulton et al. 2014; Mekonnen and Hoekstra 2012).

In order to make the case that a potential CDM project fulfills both the financial and environmental additionality criteria, its developers must submit extensive Project Development Documents (PDD) to the UNFCCC. Yet Bumpus and Cole (2010) are sceptical of this process. First, they claim that there is currently no way to ensure that decisions from the Mechanism rest on information that "contains no material errors and omission" (Bumpus and Cole 2010: 544). As I uncover in Section 4.4.1, these critiques appear justified for the Nansha and Madushan dams, as publicly available information from the CDM supplies scarce details about the political, environmental and social impacts associated with these projects at various scales, including transboundary hydrological changes and local livelihood impacts. Moreover, the lack of nuance this information most often conveys testifies to the strong bias of its authors in favour of the dam projects. A second critique from Bumpus and Cole (ibid: 544) argues that "PDD focus on GHG emission reductions issues, and largely only provide cursory information regarding non-GHG emission reductions-related SD [sustainable development]" (ibid.; 544; see also Smits and Middleton 2014). This recalls critiques of ecological modernization, pointing out how the 'reconciliation' of environment and development often fails to hold when addressed locally, where such 'non-GHG emission related SD' should notably take place (see Sections 2.3.1 and 4.2).

Harsher critiques of the CDM frame the scheme as a neo-colonialist 'greenwashing' instrument only serving the interests of a handful of project developers (Bachram 2004; Bäckstrand and Lövbrand 2006). In less radical terms, the World Bank (2010: 285) admits that the social acceptability of some CDM projects is indeed an issue, as "some nongovernmental associations have found flaws in the acceptance of certain project types (such as hydropower, palm oil plantations, and the destruction of industrial gases)". In regards to critics portraying the Mechanism as a greenwashing instrument, the World Bank also agrees that the CDM has been more effective in "reducing mitigation costs than in advancing sustainable development" (ibid.).

China is by far the most active participant in the Clean Development Mechanism. By 1 January 2013, 53 per cent of all active CDM projects were located in China, while the country had sold 61 per cent of all Certified Emission Reductions (CER) ever traded through the scheme (UNEP Risoe Centre 2013). There are no less than 456 Chinese hydropower dams registered with the

CDM, accounting for 43 per cent of all the China-based CDM projects. Over a quarter of CDM-subsidized hydropower dams in China are located in Yunnan, making the Mechanism a strong ally for achieving the hydroelectric ambitions of the state and provincial authorities.[84]

The geography of CDM projects within China replicates some of the imbalances between the highly industrialized eastern provinces and resource-rich western provinces (Figure 4.2; see also Section 4.2). Indeed, while 52 per cent of all Chinese CDM projects are located in western China, western provinces only account for a quarter of the national CER sales figures. This is because most CDM projects located in the 'Far West' involve extractive industries and low CER intensity. Meanwhile, the handful of HFC-23 recuperation projects based in the eastern provinces has generated 35 per cent of all CERs produced in China so far.[85]

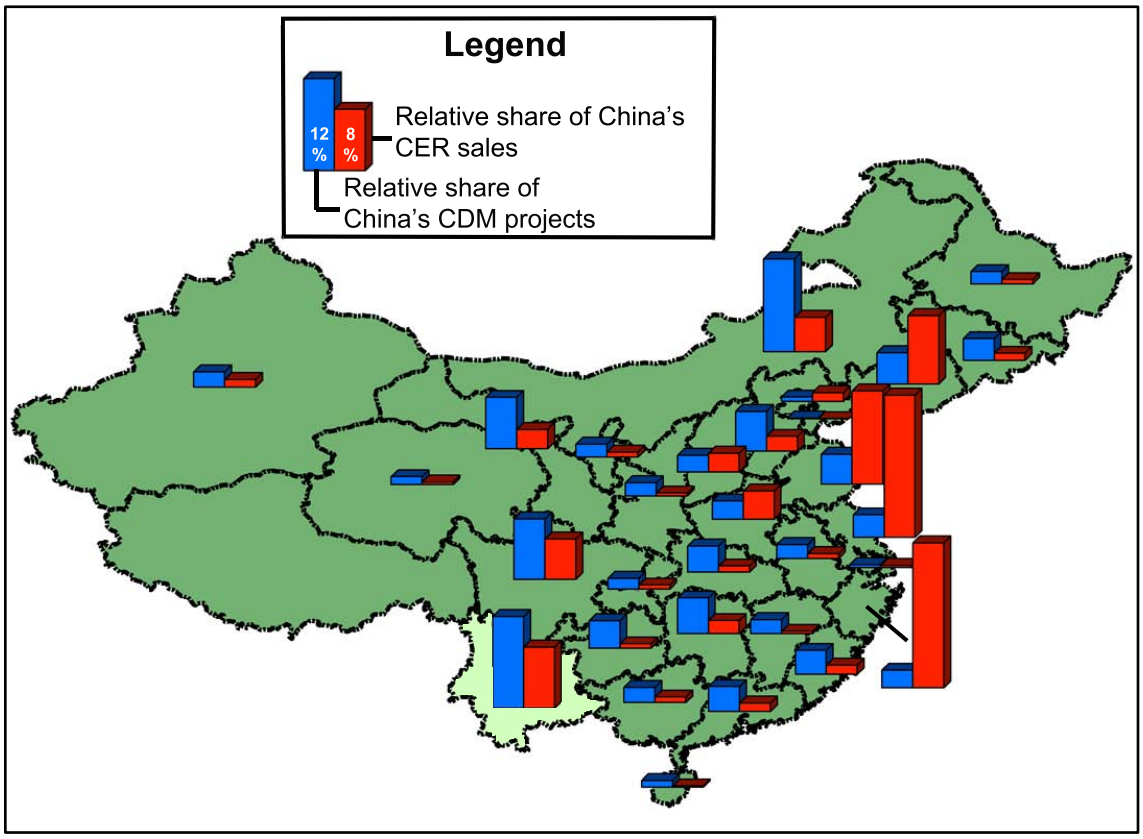

Figure 4.2: CDM projects and total CER sales by province, as of January 2013 (raw data compiled from: UNEP Risoe Centre. 2013)

[84] Wind energy generated the second-highest number of CDM projects in China (378); Inner Mongolia is the most active province in that sector.

[85] HFC 23 is a by-product of the production of HFC-22, a cooling gas found in household appliances. HFC-23 has a significant global warming potential, and HFC-23 recuperation projects generate important CDM revenues, arguably subsidizing the production of HCF-22 and impairing research on alternative products (Schneider 2011).

As such, the similarities between the CDM and the Go West Campaign (Section 4.2) are stark: both schemes subsidize renewable energy schemes and hence help developers to overcome the added costs associated with frontier formation in western China. Likewise, both structures attach much less importance to the local livelihood consequences than to 'developing' western Chinese provinces or combatting global climate change. More specific policy instruments reviewed next replicate this approach, further contributing to turning Honghe Prefecture into a new frontier for renewable energy development.

4.3.2 Climate change and renewable energies in China

China faces significant energy challenges, and the National Development and Reform Commission foresees the CDM as partial solution to this, prioritizing CDM project applications with a renewable energy component (NDRC n.d.; Wang 2006). More particularly, the NDRC sees in the Mechanism a channel for acquiring both the financial and technical means to partly cope with rapidly growing national energy needs (Wang 2006). Between 1980 and 2010, energy production grew, on average, five per cent annually in China (NBS 2010, 2011). This rate is much lower than the average economic growth the country achieved over that same period and testifies to substantial increases in energy efficiency. Nonetheless, over those same three decades, annual energetic production grew in China more than fourfold, reaching 3.1 billion tonnes coal equivalent (TCE) in 2010.

In order to cope and avoid blackouts, China increasingly relies on coal, which accounted for 77 per cent of the national energy consumption in 2010, compared to 69 per cent in 1980. However, coal is no perfect solution, as its skyrocketing consumption creates major logistical challenges for China's transport network, increases dependence upon foreign suppliers and, of course, drives greenhouse gas emissions. Carbon dioxide emissions from China surpassed those from the United States in 2006 and now account for some 25 per cent of the global total (Worlddatabank 2013). This has social, financial, and environmental consequences, all of which now figure into the priorities of the Chinese leadership.

It is within this context that China published a white paper on climate change alleviation in 2008, and dedicated a chapter from its twelfth (2011-15) Five-Year Plan to this issue (IOSCPRC 2008;

PRC 2010). Both documents pinpoint energy as a key sector for achieving climate change alleviation goals and promote energy procurement diversification strategies. Similarly, the 2005 Renewable Energy Law (PRC 2005; amended in 2009, see PRC 2009) sets the objective of doubling the share of total energy needs that renewable sources fulfill in the country from seven to 15 per cent between 2005 and 2020.[86] This appears as especially ambitious, since overall Chinese energy needs are projected to double over the same period. By 2010, China met 8.3 per cent of its energy needs from non-fossil energy sources (PRC 2010) and was still a long way from achieving its 2020 goal.

In 2008, hydroelectricity output in China accounted for over 80 per cent of the overall renewable energy production, or some six per cent of the total energy production (Mastny 2010). Current plans aim to raise this indicator to 10 per cent by 2020 (ibid.). The overall capacity of Chinese hydropower stations is then expected to reach 290 GW – almost twice their 2007 capacity (IOSCPRC 2012; Martinot 2010). Yunnan is key to achieving these ambitions, as its six water basins encompass 600 rivers that account for a quarter of the national 542 GW hydropower capacity (Dore and Yu 2004; Mastny 2010).

Electricity production in China is dominated by five main Independent Power Producers (IPPs) that also lead hydropower production, namely China Huaneng Group (中国华能集团公司 – *Zhongguo huaneng jituan gongsi*), China Datang Corporation (中国大唐集团公司 – *Zhongguo datang jituan gongsi*), China Huadian Corporation (中国华电集团公司 – *Zhongguo huaneng jituan gonsi*), China Guodian Corporation (中国国电集团公司 – *Zhongguo guodian jituan gongsi*) and China Power Investment Corporation (中国电力投资集团公司 – *Zhongguo tianli touzi jituan gongsi,* CPIC). The big five and a host of smaller IPPs are the brainchildren of a restructuring of state organs and state-owned enterprises initiated in 1998 by former Prime Minister Zhu Rongji (see Andrews-Speed 2012; Andrews-Speed et al. 2000; Zweig 2001). The reforms meant to unleash competition and reduce the electricity sector exposure to political influence, so as to make the industry more efficient.[87] Notably, the State Power Corporation of China (SPCC), the former

[86] For an exhaustive list of renewable energy policies and related laws in China, see Zhao et al. (2011).
[87] The son and daughter of former Prime Minister Li Peng – the most active proponent of the Three Gorges dams (Section 2.3.2) – were both named on among the high leadership of two of the 'big five' IPPs, namely, respectively, Huaneng and CPIC. This remains a strong argument for those arguing that the close links between the state and the

monopoly overseeing both electricity production and distribution, was formally dismantled in 2004, with most of its productive assets distributed between the five main IPPs (see Magee 2006a; Xu 2002).[88] Electricity transport, long understood as a 'natural monopoly' sector, remains more concentrated than production (Künneke 1999). Therefore, two main regional monopolies oversee most of the Chinese grid, namely the State Power Grid and the South Power Grid (Karhl et al. 2011; Ma and He 2008; Yeh and Lewis 2004). Yunnan Province falls within the jurisdiction of the latter.

Besides hydropower, China also promotes other renewables, including biomass-derived alternatives to oil. Among these are ethanol and biodiesel, two biofuels made from agricultural products along with by-products from the farming, food, and forestry sectors. The government set the objective that biofuels fulfill 15 per cent of the transport sector energy needs in China by 2020, compared to six per cent in 2006 (NDRC 2007; USDA 2006). Yet the government rapidly imposed limits to the expansion of energy crop plantations so that the biofuel industry did not become a direct threat to food security. Notably, China banned the expansion of grain energy crop plantations in 2006 and has since limited non-grain energy crop expansion to lands designated as 'barren lands' or 'wasteland' (Weyerhaeuser et al. 2007; Yang et al. 2009). As for hydropower development, Yunnan Province is well positioned to take advantage of this policy, barren lands totalling no less than four millions hectares in the mountainous province (Section 4.4.2; see also Wang et al. 2010).

Just a few companies dominate fuel and oil product extraction, refinement, and distribution in China. These include two vertically-integrated conglomerates active in all fuel sector industries, namely Sinopec (中华石化 – *Zhonghua shihua*) and the China National Petroleum Company (CNPC, 中国石油 – *Zhongguo shiyou*) (Andrew Speed 2012).[89] As in the electricity transmission sector, both vertically-integrated groups concentrate their activities and assets geographically.

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energy sector did not vanish overnight after the sector underwent privatization (ibid.; see also Section 3.2.2; Andrews-Speed 2012; Yeh and Lewis 2004).

[88] The SPCC was created in 1997 as a first step towards the privatization of the electricity sector. Prior to the SPCC, the Ministry of Electrical Power was responsible for electricity policy-making, regulation, production, transmission and distribution. Most of the transmission and distribution infrastructure that belonged to the former Ministry along with about half of its former production assets were allocated to the SPCC after its creation (Andrews-Speed 2012).

[89] China National Offshore Oil Company (CNOOC, 中国海洋石油总公司 – *zhongguo haiyang shiyou zonggongsi*) is another major player concentrating in offshore oil prospection and exploitation.

Sinopec is most present in south and east China, and it was involved in the expansion of jatropha plantations in Honghe Prefecture.

The energy sector is considered highly strategic in China, and the central government maintains tight control over all the stakeholders mentioned above. It does so in at least three important ways: first, the state owns these groups and/or significant shares of the market capitalization of their publicly traded subsidiaries; second, energy giants remain highly dependent on state and/or bank money to finance their heavy investments and rapidly rising debts; and third, as discussed earlier, leading managers from these companies all have very close links with the higher strata of the Communist Party of China (CPC) (Sections 2.3.2, 3.2.2; see also McNally et al. 2009; Vermeer 2011; Yeh and Lewis 2004).

Therefore, the state remains a central actor behind any development that relates to the energy sector in China. As demonstrated above, powerful state bureaus enact policies promoting the implementation of renewable energy schemes by companies undergoing fierce competition and over which the state retains strong political and economic influences. This outlook offers very little avenues for local populations to express their concerns and/or grievances towards the impacts of such projects upon their livelihoods.

In sum, renewable energies are at the forefront of global and Chinese initiatives promoting various policy objectives, including alleviating anthropogenic greenhouse gas emissions and ensuring the PRC's energy security. These programmes create strong political and economic incentives for the execution of renewable energy schemes such as the dams and jatropha plantations I investigate in this thesis. To this are added claims that green energy participates in an ecological modernization agenda reconciling economic and environmental objectives. Local externalities are not central components in these overarching goals, and the local livelihood consequences that renewable energy projects drive in the Red river valley are given scant attention. While I bring these issues to centre stage in Chapters 6 and 7, I now turn to the dams and plantations implemented in the Red River valley themselves, providing insights into another component of my first research question.

4.4 RENEWABLE ENERGY DEVELOPMENT IN THE RED RIVER VALLEY: DAMS AND JATROPHA IN THE FRONTIER

Many factors complicate gathering precise technical information and/or GIS data about the renewable energy schemes I discuss in this research. In general, China remains what Mol (2009: 115) calls an "information-poor environment" with a low tolerance towards NGOs and independent press. The Chinese military maintains strict control over GIS data, which remain virtually inaccessible for civilian stakeholders, including governmental bureaus (Leipnik et al. 2011). Further, Honghe Prefecture's location in the China-Vietnam borderlands means that military control is stricter than in similar non-borderland locales.[90] Adding to this lack of data is the relatively small size of the dam and plantation schemes I discuss in this research, along with that of the financial investments they entail (by Chinese standards). Each of these aspects adds difficulties to obtaining any existing information about the Red River valley dams and plantations. For the same reasons, it is also conceivable that comprehensive information on the projects actually does not exist at all (Magee 2013).

In contrast, there are also factors specific to these projects that facilitate obtaining details about them. For instance, the participation of Nansha and Madushan dams in the Clean Development Mechanism (CDM) compels China to abide by the information disclosure rules of the UN Framework Convention on Climate Change (UNFCCC) Secretariat overseeing the CDM. This does not force Chinese stakeholders to reveal all pertinent information about the dams, nor does it guarantee that whatever information they disclose is unbiased (Section 4.3.1). Likewise, it does not compel individuals and firm to comment information publicly available from the CDM, as I found out after repeated attempts to obtain precisions regarding such data. Nonetheless, unlike other dam schemes in Yunnan, there is at least some publicly available official and somewhat standardized information about these projects (Rousseau 2007).

The outlook is quite different in regards to obtaining information on jatropha plantations. Indeed, researchers could easily visit the premises Sunshine Technology operated while the plantations

[90] For instance, during my fieldwork period, the identity of anyone travelling to and from counties that shared a land border with Vietnam was controlled at military checkpoints.

were active. In the early 2010s, the sudden closure of the company created unease among officials and businesses involved in jatropha development, resulting in an official information blackout. However, the same sudden failure also encouraged a host of stakeholders previously close to the project to share their grievances towards Sunshine Technology, and especially towards the foreign stakeholders involved in the company. This made it quite easy for me to uncover the 'hidden transcripts'[91] that surrounded this endeavour as it unfolded in the area this research documents. As such, in this section I review specifics of the Red River valley dams and jatropha plantations, along with those of their actual implementation.

4.4.1 Hydropower development: The Red River dam cascade

In the early 1980s, a provincial investigation was carried out to document the hydropower potential from Yunnan's main rivers, including the Red River (KHIDI 1985, Figure 4.3).[92] Participants in the mission identified five potential hydropower dam sites along the Red River. In the late 1990s, another provincial water resources assessment concluded that the theoretical hydropower potential of the Red River watershed amounts to 9.8 GW, of which 3.6 GW was considered exploitable, representing five per cent of the provincial total (Table 4.1; see also Lu 2006; Magee 2006b).[93] Then, in 2006, the China Southern Grid company published information about a dam cascade project along the Red River comprising 12 dams (Lu 2006). Zhai et al. (2007) relayed the same information the following year and as of today, this plan still appears as valid (Figure 4.4).

If such a master plan is ever completed, the Nansha and Madushan dams would become the ninth and tenth dams one would encounter while travelling downstream. However, as of today, they are the only operational dams along the Red River: the Nansha dam has been producing hydroelectricity since 2008, and the Madushan dam since 2011. By the time I completed fieldwork in the summer of 2012, a third dam was under construction at Daheigong, upstream

[91] I borrow this concept from the writings of James Scott (1990: 6) on resistance stipulating that hidden transcripts "characterize discourses that take place 'offstage', beyond direct observation by powerholders".
[92] This is the earliest information that I could find regarding such investigations.
[93] Li (1998) holds that hydropower potential amounts in Yunnan to 103.7 GW, or some 15 per cent of the national total. The same author suggests exploitable potential in the province reaches 71.1 GW, representing one fifth of the national potential and about half of the exploitable hydropower capacity of the United States (see also Dore and Yu 2004).

from Nansha. Work had also reportedly begun for a fourth dam at Xinjie (Energy world network 2011).

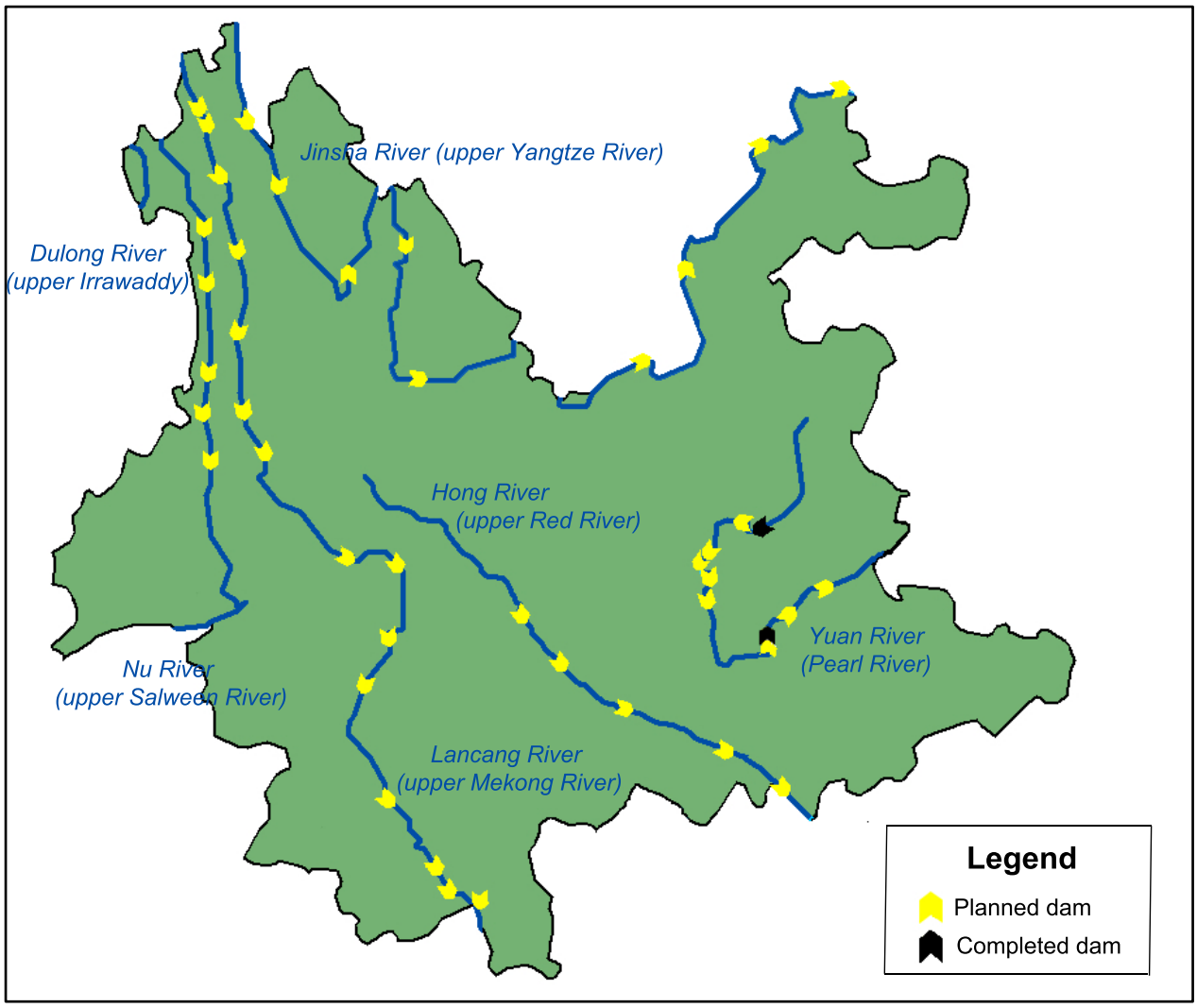

Figure 4.3: Dams planned and completed along Yunnan's main rivers in 1985 (adapted from KHIDI 1985 : 18)

Table 4.1: Hydropower capacity in Yunnan watersheds (source: Li 1998 : 156)

	Theoretical potential (GW)	Exploitable potential (GW)
upper Yangtze River watershed	40.283	35.435
upper Mekong River watershed	25.501	19.740
upper Salween River watershed	19.741	10.306
upper Red River watershed	9.800	3.575
upper Pearl River watershed	4.247	1.870
upper Irawaddy River watershed	4.102	0.295
Provincial total	103.672	71.168

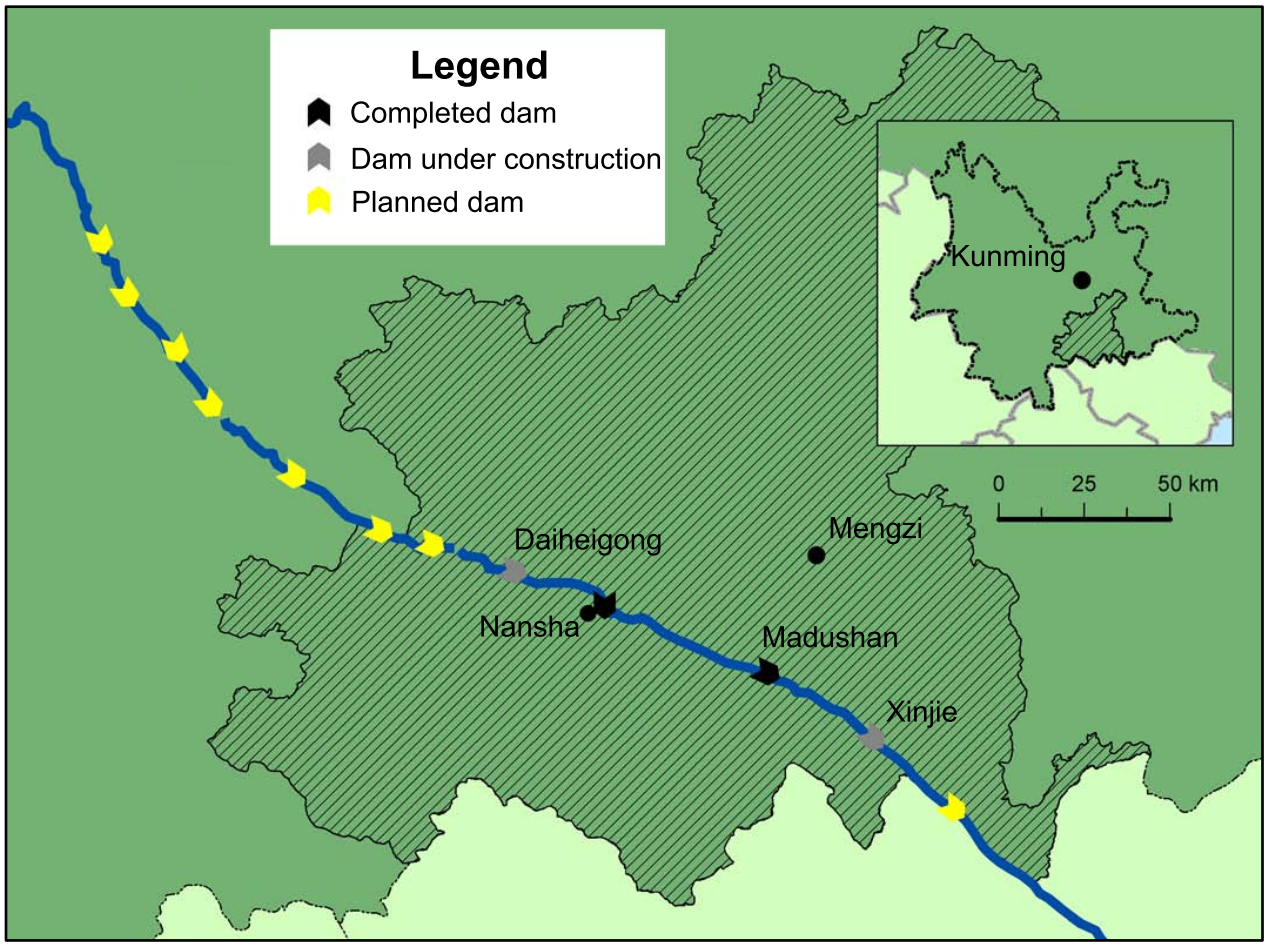

Figure 4.4: The Red River dam cascade (adapted from Lu 2006; Zhai et al 2007)

A consortium called Honghe Guangyuan Hydropower Development (红河广源水电开发有限公司 – *Honghe guangyuan shuidian kaifa youxian gongsi*) built and continues to operate both the Nansha and Madushan dams. None of the villagers I interviewed have ever worked for this company. Honghe Guangyuan brings together three state-owned enterprises based in Guangdong Province, one belonging to the Guangdong Provincial government (广东省水利水电第二工程局 – *Guangdong sheng shuili shuidian dier gongcheng ju*), one from Shantou City (汕头市盈源工程有限公司 – *Shantoushi yingyuan jianzhu gongcheng youxian gongsi*) and one from Dongguan City (东莞市常源实业有限公司 – *Dongguanshi changyuan shiye youxian gongsi*). This ownership structure and the fact that the Red River dams are promoted as contributing to the 'West Electricity Send East' initiative recalls the influence that Guangdong stakeholders exert upon hydropower development in western Chinese provinces (Ministry of Commerce 2012; see also Section 2.4.3;

Magee 2006a; 2006b; Oakes 2004). In other words, as is the case elsewhere in Yunnan, the Red River hydropower schemes are developed by and for Guangdong stakeholders.

The International Commission on Large Dams (ICOLD) defines large dams as dams a) taller than 15 meters, b) between 10 and 15 meters tall, over 500 meters long and having a spillway discharge in excess of 2,000 cubic meters, or c) between 10 and 15 meters tall and forming a reservoir with a capacity of over one million cubic meters (Oud and Muir 1997). Since Nansha dam is 85 meters high and Madushan dam stands at 107.5 meters, both structures meet this internationally recognized benchmark by a wide margin (Figure 4.5).

Figure 4.5: Nansha (left) and Madushan dams (right)
(sources: engineer sketches; photographs by author, 2011)

While ICOLD defines dams by their physical size, Chinese guidelines categorize hydropower dams based on their installed capacity: small dams have a capacity below 50 MW, medium dams range between 50 and 300 MW, and large dams produce over 300 MW (K-5, 30 July 2012; see

also CDM 2008; SETC 2003).[94] Hence, according to Chinese standards, Nansha (150 MW) and Madushan (288 MW) are medium hydropower dams. Such classification is important, as it influences the requirements that dam developers must satisfy in order for hydropower projects to receive approval from the authorities.

While accreditation guidelines vary from one dam project to another, the overall rule of thumb is that more 'red stamps' are required for larger dams and/or dams planned along international rivers where hydropower development is most sensitive. For the most important and/or sensitive dams, approval from the State Council (the Chinese cabinet) or the National People's Congress (NPC, the Chinese Parliament) is necessary. For less important/sensitive dams, a green light from the National Development and Reform Commission (NDRC) suffices. Smaller projects only require approval from the local or provincial authorities (K-5, 30 July 2012; see also Beck et al. 2012).

A NGO campaigner informant well aware of dam accreditation procedures explained that the success of the campaign against the damming of the Nu River (Section 3.2.2) created a "commotion" in the Beijing leadership (Kunming NGO worker B, 30 July 2012). This allegedly made former Premier Wen Jiabao and the State Council particularly reluctant to consent to dam projects proposed from the mid-2000s onwards (see also Vermeer 2011, 2012). This *de facto* moratorium coincides with the period when authorities endorsed the Red River dam projects. Therefore, this same NGO informant concludes that Nansha and Madushan dams "most likely" received a final go ahead from the NDRC rather than from the NPC.[95] This is important because it testifies to the confidence of the government that upstream damming along the Red River would not prompt any significant political consequences outside of China. Asked about the reasons behind this attitude, the same informant argued: "Although the Red River is an international river, it is not as sensitive as other waterways such as the Lancang [Mekong] or Nu [Salween] Rivers, because it is much smaller, fewer countries are involved, and half of the river length is located within China." (K-5, 30 July 2012).

[94] Magee (2006b) introduces a slightly different categorization according to which small dams have a capacity below 50 MW, medium dams range between 50 and 250 MW, and large dams produce 250 MW or more.
[95] Evidence from the NDRC indeed confirms this for the Nansha dam project (NDRC 2007). While I do not possess similar evidence in case of Madushan, it appears most likely that both projects underwent similar bureaucratic procedures.

Excerpts from the environmental impact assessments (EIA) drafted for Nansha and Madushan dams publicly available from the CDM confirm the government's lack of concern for international consequences.[96] Regarding the impacts of the Nansha dam, the EIA concludes that "the proposed project will result in little impact on Hong [Red] River and there is none of transboundary impacts [sic]" (CDM 2008: 38). CDM documents about the environmental impacts of the Madushan dam reach favourable conclusions for the dam, stating that "the proposed project will not cause significant reverse impacts" (CDM 2011: 36). Likewise, the EIA silences the potential transnational impacts of the dam, let alone the fact that the Red River is an international waterway. No mention is made either of the GHG emissions emanating from Nansha and Madushan reservoirs.[97] Similarly, CDM documentation conveys only sporadic information about the social impacts of both dams, mostly focusing on resettlement issues. Therefore, the Mechanism turns a blind eye to issues of land flooding, which stand out in my inquiry as the chief preoccupation of the reservoir population I surveyed, as noted in Chapter 6.[98]

The technical details available from the CDM are as follows for Nansha dam: as mentioned already, the installed capacity of the Nansha power plant stands at 150 MW, powered by three 50 MW turbines. These turbines can generate over 700,000 MWh of electricity yearly, and the potential annual income from electricity sales, based on a 0.215 RMB/kWh grid tariff ($0.036), was set at 113.2 million RMB ($18.9 million) in 2009. The reservoir behind the dam covers an area totalling 8.9 square kilometers and can contain up to 208 million cubic meters of water. Reservoir creation involved the flooding of 3.5 square kilometers of "previously used land" (CDM 2008: 38) and forced the relocation of 853 persons. Almost 100 million RMB ($16.7 million) were set aside to pay for post-flooding compensation, out of the 977 million RMB ($162.8 million) final price tag of the project. According to documents available from the CDM, Nansha produces just under 520,000 CERs per year, and average annual income from the sale of

[96] Chinese regulation only requires public disclosure of EIA summaries (Hennig et al. 2013). For further information on the EIA processes in China and their caveats, see Wang et al. (2003).

[97] This is standard procedure since both projects achieve a power density above 10 W/m^2 and CDM calculi by default consider GHG emissions from reservoir above that threshold to equal 0 (UNFCCC n.-d.). Power density values are obtained by dividing a hydropower station capacity (in watt) by the reservoir surface in m^2. Nansha and Madushan stations power density values reach 16.8 W/m^2 and 15 W/m^2 respectively.

[98] The same goes for typical effects with potential indirect societal impacts, such as flow regulation, habitat fragmentation, sediment trapping, detoriation of chemical quality of downstream water (temperature, oxygen content), and so on (see WCD 2000).

CERs in the 2009-15 period is expected to reach $5.2 million, based on an average CER price set at $10. If these expectations materialize, carbon credit sales would increase the annual income of the dam by more than 25 per cent.[99] Finally, the company guarantees that dam operations will ensure a year long minimum ecological flow of 26.1 m^3/s. As hydrological information is considered a state secret in China, there was no way for me to assess how this value compares to natural seasonal water flow values.[100]

As for the information available from the CDM about Madushan power plant, it states that its 288 MW installed capacity rests on three 96 MW turbines, designed to produce some 1.3 million MWH of energy yearly. Electricity grid tariffs are the same as Nansha station, and CDM documentation states that this 0.215 RMB/kWh price is 15.3 per cent below the price that would allow making the 2 billion RMB ($333 million) Madushan dam financially sound (CDM 2011). CER sales compensate for this shortfall: Madushan dam contributes 0.79 CER per MWH of power it produces, and based on an expected average price of €8 ($11)/CER, CDM revenues were forecast in 2011 to reach some 80 million RMB ($13.3 million) yearly. The capacity of the Madushan reservoir amounts to 500 million cubic meters and covers an area in excess of 19 square kilometers, including undisclosed areas of land previously cultivated within the villages where I undertook this research (GHPDI 2011). CDM documents acknowledged that people would need to be relocated as a result of reservoir creation but provided no more details as to their numbers, current locations and or compensation (CDM 2011). No such resettlement occurred in the villages of Xiaocun, Zhongcun and Dacun where this research is set. Finally, the minimum water discharge of the Madushan dam is set at 30.2 m^3/s.

Obviously, the above specifications speak mostly to governmental and private stakeholders responsible for developing dam projects, promoting them, or making sure that they fulfill well-defined technical, financial, or environmental criteria. As for the actual impacts of the dams on the peasant communities I discuss in this research, two consequences stand out as the most

[99] The market price of CER has crumbled since July 2011, mostly as a result of market oversupply (Magnusson 2014). Due to the reluctance of authorities to participate to this research, I could not grasp the implications of this price drop on the dam projects at the core of my case study. What is certain though is that the dams are still producing energy in spite of lower CER price.

[100] I also tried to obtain similar data for the Vietnamese section of the Red River, but my attempts to do so with Vietnamese colleagues also remained in vain, apparently for similar reasons.

immediate causes of dam-induced on-farm and off-farm livelihood changes. First, the creation of a reservoir between Madushan and Nansha dams has had drastic implications on land availability, as it has led to the temporary or permanent flooding of significant sections of the floodplain on both banks of the Red River (Figures 4.6 and 4.7).

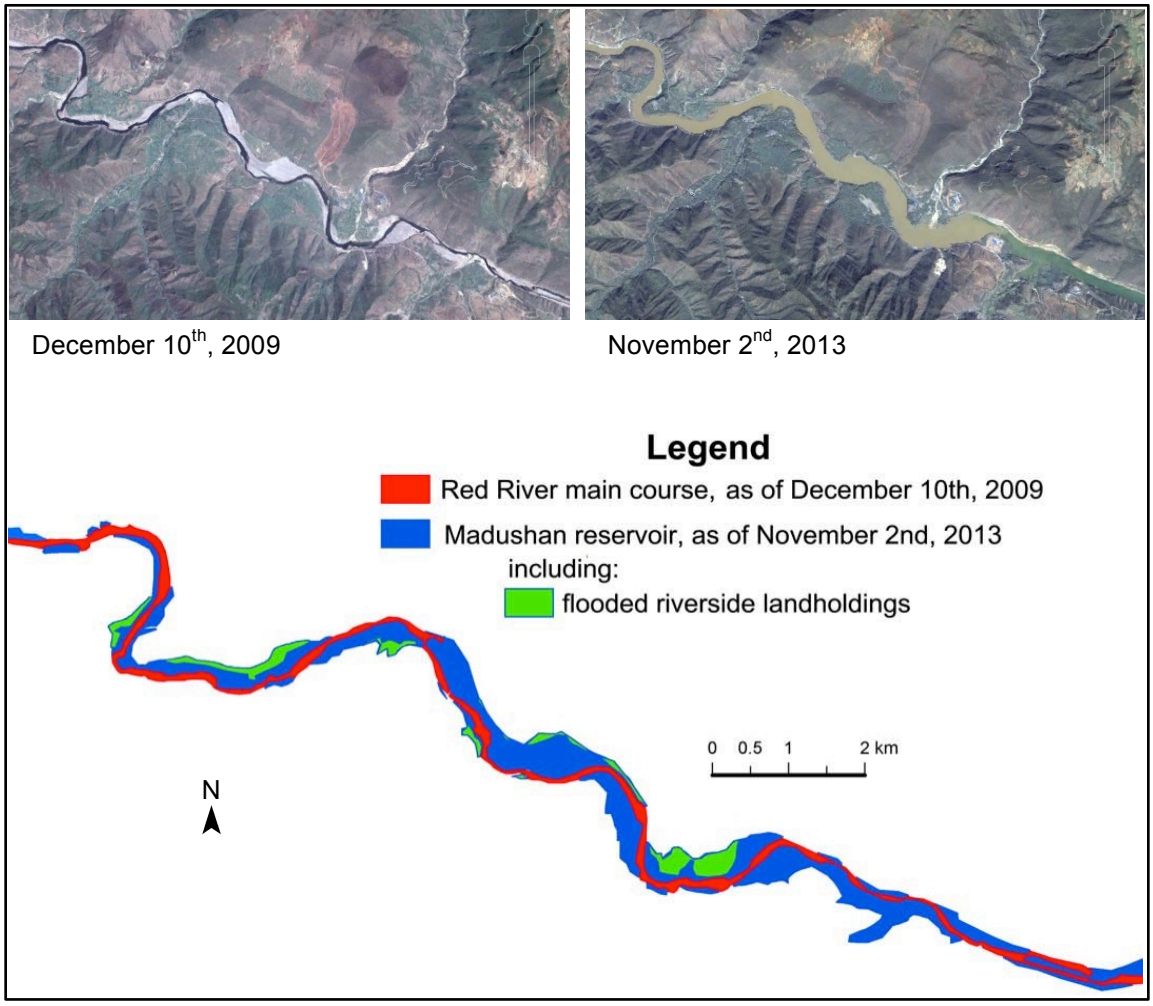

Figure 4.6: Satellite imagery and map of reservoir extension in research area (sources: Google earth and ground truthing by author)

Figure 4.7: Flooded arable land in Zhongcun (top) and flooded mango trees in Dacun (bottom) (photographs by author, 2011)

This impinges on the most important aspect of the physical capital of the local populations, and forces them to initiate livelihood diversification strategies (which will be analyzed in Chapters 6 and 7). Second, the government offered financial compensation of 21,000 RMB ($3,500) per mu[101] of flooded farmland to the peasants who lost land to the reservoir. Affected households thus received in 2008-09 a lump sum that averaged some 53,300 RMB ($8,892) according to the conservative estimates I detail in Section 7.2. This figure corresponds to over four times the average annual income in the villages, while many households received compensation payments greater than all the money their members had ever earned before. Compensation payments therefore had an unprecedented role in boosting access to financial capital for the villagers. While I document the ensuing livelihood decisions and changes later in my thesis, I first investigate how jatropha plantation development occurred.

4.4.2 Jatropha plantation expansion: The failure of Sunshine Technology

Jatropha is a shrub that grows in particularly unfavourable conditions, tolerating both very dry climates and poor soil conditions (Carels et al. 2012). The fruits of the shrub contain a high content of inedible oil, which can be refined into biofuel products, including biodiesel and jet fuel (Figure 4.8).

Figure 4.8: Jatropha plant and fruit (photographs by author, 2012)

[101] The *mu* (亩) is the most widely-used unit for measuring farmland area in China. One mu equals 1/15 of a hectare (ha).

Because of these characteristics, jatropha was deemed the "green gold of the desert" (Campa 2012: V) in the 2000s, as the world experienced the side-effects of the rapid development of so-called first generation biofuels. Indeed, biofuel development first focused on edible crops, including maize and sugarcane-derived bioethanol as well as biodiesel produced from rapeseed, soybean, and palm oil. Concurrently, state subsidies to the biofuel sector along with mandatory addition of biofuel to gas and diesel sold at the pump drove a new demand for agricultural products and destabilised world food markets. This outlook contributed to a rapid rise in food prices in the late 2000s (see Conceicao and Mendoza 2009; Rousseau and Durand 2009).

Food security pressures in China conflicted with the government aim to diversify energy procurement strategies and its effort to reduce GHG emissions, as both these objectives encouraged the use of biofuels (Section 4.3.2; see also: NDRC 2007; USDA 2006).[102] Hence, Chinese leaders decided to further promote the expansion of energy crop plantations while simultaneously adopting strict guidelines to oversee it. Therefore, since 2006, new plantations can only be developed on barren lands, and as noted earlier, plantation expansion is restricted to 'non-grain' crops, including jatropha, sweet sorghum, cassava, and sweet potato (Che and Li 2006; Wang 2012; Wang et al. 2010; Weyerhaeuser et al. 2007; Yang et al. 2009).

Chinese guidelines overseeing energy crop expansion have re-framed barren lands by confining particular economic functions to such environments. This has had significant implications in mountainous Yunnan, where barren land areas allegedly cover over four million hectares. Of this area, at least 700,000 ha are said to be suited for jatropha plantation expansion, and a quarter of these exploitable barren lands are located in Honghe Prefecture (Che and Li 2006; Li et al. 2007; Wang et al. 2010; Zhuang et al. 2011). Interestingly, this re-framing of the barren lands has not yet been followed by a revaluation of the guidelines that the state utilizes for classifying an area as barren lands or not. In talking with one academic familiar this data, I learned that no one knows the exact extent or location of barren land areas in Yunnan. Likewise, the criteria on which this classification is based are surprisingly vague: "The barren land classification rests on

[102] While the combustion of biofuels indeed produces less GHG than that of fossil fuels, the complete carbon footprint of biofuel products depends on a host of variables, including what crop is utilized, growing methods, farm input intensity, previous land use and so on. When all these factors are accounted for, biofuels do not necessarily achieve carbon emission savings compared to fossil fuels (see Fargione et al. 2008; Scharlemann and Laurance 2008).

the weak prospects these lands hold for commercial agriculture development, based on eight criteria, namely land use, elevation, slope, precipitation, temperature, soil type, alkalization and effective soil depth slope. There is no precise benchmark for these aspects though" (K-6, 2 September 2011).

As is the case in most of Yunnan, the majority of the barren lands adjacent to the villages where I undertook my research belong to the village committees, and very few villagers dared to develop *ziliushan*[103] over these dry, poor and sloping lands (Section 4.2.1; Weyerhaeuser et al. 2007). Apart from barren lands availability, jatropha developers were also interested in the Red River valley because jatropha had long been grown extensively in the area. This insured that climatic conditions were appropriate for the plant to survive (K-6, 28 May 2012). With jatropha fruits and leaves toxic for both humans and cattle, villagers from Xiaocun, Zhongcun and Dacun villages have traditionally used the shrub to fence in and keep cattle away from their fields and gardens (Figure 4.9). This is the sole interest that the villagers have in the crop, and as this informant complaining about the minimal contribution of jatropha to local livelihoods explains: "It is most useless: jatropha wood can neither be utilized as firewood nor construction wood, and grass does not grow underneath the trees, making it impossible for cattle and buffalo to graze on jatropha plantations" (X-33, 22 November 2011).

Figure 4.9: Jatropha fence (photograph by author, 2012)

[103] *Ziliushan* are barren lands areas over which villagers have acquired usufruct rights (Section 5.5.1).

Accordingly, the Red River valley met the criteria set for jatropha expansion, and the Provincial Forestry Department identified this area as a key site for operationalizing the state's jatropha ambitions (K-2, 13 April 2012). Portions of the barren lands adjacent to Xiaocun and Dacun villages were henceforth made available for the expansion of the energy crop, and no compensation was offered to the villagers who previously conducted livelihood activities in these areas (See Figure 4.10).[104]

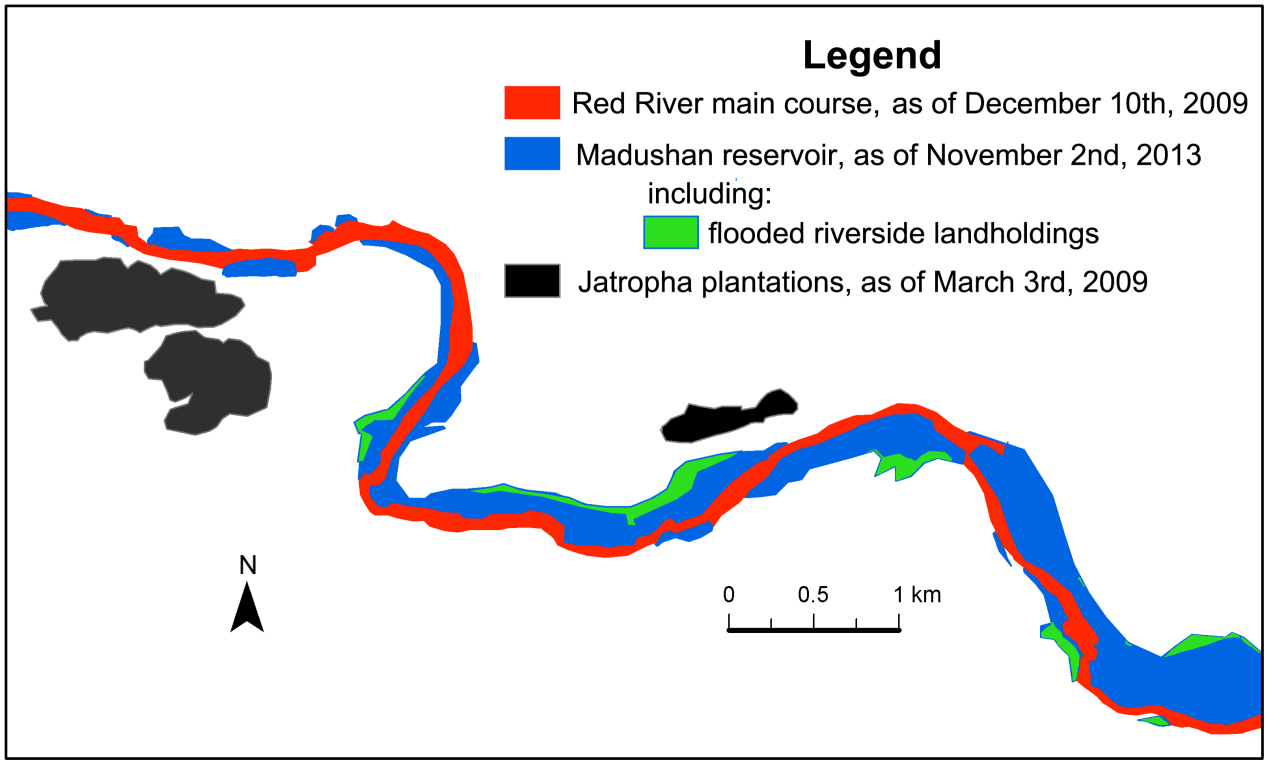

Figure 4.10: Jatropha plantations implemented in the research area (sources: Google earth and ground truthing by author)

By the mid-2000s, legal, geographic and climatic conditions all combined to promote jatropha expansion in the Red River valley. Yet, a final feature was nonetheless necessary for this expansion to take off: the establishment of financial incentives to subsidize such projects. As a Kunming-based scholar explained, although Yunnan has a long research tradition regarding jatropha, no wide-scale commercial plantations had ever been developed before in the province, and little was known about the potential financial sustainability of this sector (K-2, 13 April 2012; see also Weyerhauser et al. 2007). In the mid-2000s, the provincial government unveiled

[104] These functions include grazing cattle, non-timber forest product collection, growing crops and

its ambition to plant 250,000 ha with jatropha in 2006-10, with a further 300,000 ha sowed during the following five years. Simultaneously, the authorities instituted significant financial incentives to ensure that private stakeholders would share their enthusiasm towards the crop (Che and Li 2006). These measures included the establishment of a 3,000 RMB ($500) / ha subsidy, paid in a lump sum, along with further subsidies for fixed asset investments (warehouses, seed crushers, plant nurseries, and so on) (K-6, 2 September 2011). The provincial government hoped that this would suffice to ensure that the plantations would prosper and trigger a trickle-down effect that would stimulate the development of downstream industries, including refineries. The authorities also foresaw that jatropha actors would join the CDM in due time, and that income from CER sales would sooner or later allow reducing subsidy schemes without throwing the baby out with the bathwater. As of today, only the very first stage of this grand scenario punctually materialized in the villages where I undertook research.

A joint-venture called Sunshine Technology (阳光科技 – *Yangguang keji*) involving both Sinopec and Carbon Positive, a UK-based investor,[105] had sown jatropha over 250 ha nearby Nansha by 2005 (China Industry Energy Network 2009; Wang et al. 2010). Officially, Sunshine Technology was tasked with "developing CDM forest by Honghe Prefecture Forest Bureau" (Sunshine Technology 2010). The following year, the company committed to investing six million RMB ($1 million) in planting a further 2,000 hectares nearby Nansha (China Industry Energy Network 2009). However, I could only retrace some 100 ha of jatropha plantations through on-site visits. These plantations were established in the barren lands adjacent to both Xiaocun and Zhongcun villages, and were inactive, with no maintenance work carried out since 2009 (Figure 4.11; Jatropha demonstration site staff, 1 August 2011). Since jatropha seedlings require four or five years to reach maturity, and since there existed no jatropha refinery in Yunnan by mid-2012, no jatropha product originating from the area where I conducted my research has ever been commercialized.

[105] This company does not exist anymore, and my repeated attempts at contacting some of its former staff yielded no results.

Figure 4.11: Jatropha plantations in Xiaocun (top) and Zhongcun (bottom) villages (photographs by author, 2012)

The villagers and others informing this research were particularly talkative when asked to explain the reasons behind Sunshine Technology's failure. Their arguments first targeted jatropha itself. One NGO worker frames the prospects of jatropha in Yunnan bluntly, stating: "Contrarily to what was said about jatropha, it holds no commercial future and the objectives the government set will never be attained" (K-1, 19 July 2011). A professor further detailed how jatropha enthusiasts emphasized biased biological and economic arguments:

> There was a big hype about the fact jatropha can survive under difficult conditions. However, people were silent about how achieving high yields requires important farm inputs. Also, this is a work intensive activity, as the seeds do not ripen uniformly and the harvest period consequently lasts for a long time (K-6, 2 September 2011).

A villager also pinpointed low yields when asked about the failure, arguing that "they were never able to obtain good enough yields. There is absolutely no hope that anyone will come to buy the seeds in the future" (X-17, 18 March 2012). Finally, the above academic also criticised how financial assessments guiding jatropha investment were based on oil price scenarios forecasting significant price increases (K-6, 2 September 2011). Since oil prices have not risen has high as planned, jatropha biodiesel was never as competitive against other fuels as had been expected.

Apart from the poor on-farm and economic prospects of jatropha, my informants unanimously blamed loopholes in the subsidy regime and Sunshine Technology itself. Discussing the greed of the leaders from Sunshine Technology, one villager stated: "The Company did not care about producing jatropha. They only wanted to get the subsidies from the government" (X-36, 8 December 2011). A scholar further details the mechanisms that made it possible for Sunshine Technology to create such an empty shell (K-2, 14 April 2012):

> The subsidies are calculated based on the area of plantations rather than on their actual production. As such, people typically develop a whole lot of land, cash in the money, and create a top notch demonstration site to showcase their business to visiting officers. What goes on in other areas covered by the plantations often shares little with the situation in the demonstration centre. Further, the government pays the subsidies all at once, and this does not encourage long-term development and ambitions.

Last but not least, people pointed out that Sunshine Technology made no effort whatsoever to get the local population involved in the venture and its fate, even though it was developing its plantations over their communal lands. During plantation expansion, the company subcontracted

terracing, irrigation network development, infrastructure building, and planting operations to the local forestry bureau. It also recruited most of its permanent employees from the same bureau. Therefore, only small and temporary plantation maintenance contracts were reserved for the villagers from Xiaocun and Zhongcun. For instance, results from the jatropha census I carried out in Xiaocun state that members from 18 out of 28 participant households have worked for Sunshine Technology between 2007 to 2009. However, 12 among them only did so a few days a year, earning 30 RMB ($5) daily, and all but one participant argued that the income they received from Sunshine Technology comprised a small proportion (<25 per cent) of the financial earnings their households had achieved during these years. Also important is that the villagers felt completely unconcerned and indifferent towards the success or failure of the plantations, since, as this villager explains: "It made absolutely no difference for us if the company made money or not. How do you expect that people would care?" (X-33, 22 November 2011).

The jatropha plantations have not been taken care of since 2009. Hence, nearly all the trees planted in Zhongcun village are now dead, while grass and other shrubs not requiring as much care in this environment such as willow weed slowly claim back the former plantations. However, such is not the case in Xiaocun village, where better growing conditions mean that jatropha still occupies extensive portions of the barren lands. Likewise, a few (now abandoned) buildings built by Sunshine Technology still remain, stoking resentment within the local community: "Look at this greenhouse, it cost 200,000 RMB ($33,000) and it was never utilized. There is now an irrigation network installed in the barren lands we could use and grow mango trees, but we are not allowed to cut the jatropha trees. This is such a waste" (X-33, 22 November 2011).

4.4.3 Exclusion from below and above

The development of the Red River dams and jatropha plantations involve a particular exclusion process that first and foremost deprives the villagers of portions of their most important livelihood asset, farmland (Section 5.5.1). In addition, jatropha plantation expansion in Xiaocun and Zhongcun villages partly cut off access to the livelihood assets they derive from barren lands. These changes in local access regimes have wide-ranging consequences for many facets of the livelihood portfolios of my Handai informants.

That being said, as Hall et al. (2011: 8) document, exclusion is a "doubled-edge" process. Within this context, such a notion suggests that while exclusion does induce further livelihood stresses and burdens, it also breeds new opportunities, such as those created by a sudden influx of financial capital. Such livelihood trade-offs make one of the main threads from my results chapters focussing on the on-farm and off-farm livelihood changes I investigate in the Red River valley.

4.5 CHAPTER CONCLUSION

In this chapter, I first introduced three campaigns that have had long-lasting social and/or environmental impacts in the area where I have conducted my research. In so doing, I demonstrated that the Chinese state has long utilized such campaigns to govern its frontier regions. I also highlighted how many aspects of such campaigns are often unsuited to local circumstances and how such campaigns therefore often trigger undesirable social and/or environmental impacts. I further argued that legacies from the Great Leap Forward, the Household Contract Responsibility System and the Go West Campaign influence how people currently cope with the livelihood impacts of renewable energy development. In Section 4.3, I explored the factors that contribute to making energy development an important aspect of environmental governance in Honghe Prefecture. My argument centered on the idea that hydropower dams and jatropha plantations in the Red River valley relate to both global and national policies framing these schemes as contributing to various objectives including climate change alleviation, economic development and energy security in China. Such a process creates strong political and economic incentives for renewable energy development, and as such, local livelihood consequences hold little weight in the balance. Given this, renewable energy development is a clear component of the neoliberal authoritarian agenda that the Chinese state imposes in the frontier. Finally, in Section 4.4, I provided details of the Red River valley hydropower dams and the jatropha plantations that Sunshine Technology developed, retracing the implementation of both these schemes.

Common to both the hydropower dams and jatropha plantations is the involvement of external actors who frame and/or implement these projects in ways that fulfill requirements from global and national organizations subsidizing renewable energy development. Scrutinizing how these actors partake in environmental governance in China, along with how they promote and reinforce a state-led neoliberal authoritarian modernization project, contributes to answering my first research question. Indeed, it is blatantly clear that these same external stakeholders promote a vision that fails to account for the concrete environmental changes that turning the Red River valley into a new frontier for renewable energy development entail at the local scale, nor for how such changes influence local livelihoods. Notably, my inquiries into the physical implementation of hydropower dams and jatropha plantations and into how this process overlooked local circumstances and consequences demonstrate this and illuminate a second facet of Research Question 1.

In accordance with my research aim, I continue to acknowledge and highlight these local circumstances and consequences as I turn to scrutinize important aspects of local livelihoods in Chapter 5. Chapters 6 and 7 then unpack how my informants re-organized aspects from, respectively, the on-farm and off-farm components of their livelihoods, after they experienced the consequences of hydropower dams and jatropha plantations.

CHAPTER 5

PLACES, PEOPLE, LIVELIHOODS AND CHANGE

5.1 INTRODUCTION

Topography is heavily related to the Red River renewable energy projects while it also links the many facets of the physical and human geographies of the area in which I conducted research. First, topography has shaped the morphology of the Red River's riverbed, which, along with climate, dictates its hydrology. The hydrologic regime and the narrowness of the Red River valley have resulted in significant hydropower potential and the optimal conditions for its exploitation. Second, the steep and poorly-irrigated banks offer very poor agricultural potential. While these barren lands have traditionally tolerated extensive land uses, they have recently been re-framed as a new frontier for intensive energy crop expansion. This expansion of energy crops on barren lands is taking place in an attempt to allay the threat of agrofuel development compromising food security.

Topography also lies at the heart of scholarship centered on how ethnicity manifests itself in the Southeast Asian Massif (Section 1.1; Bruneau 2002; Michaud 2006, 2010; Scott 2009; van Schendel 2002). This approach contrasts with state-centered models that neglect the historical and cultural features that predated the creation of contemporary nation-states. Yet, as we will see in this chapter, the nation state approach still exerts much influence upon the daily life of my Handai informants.

The purpose of this chapter is to add further nuance to the contextualization of my research area, drawing upon information I gathered from secondary sources and original field data (as was the case for Chapter 4). Here I examine aspects of the physical geography of the Red River valley, along with the strategies and mechanisms that state endeavours emphasize in this area; a region located at the very margins of state power (Section 5.2). I then analyze how Handai householders negotiate both state-imposed and local understandings of their ethnic identity (Section 5.3). In particular, I address how the state frames ethnicity, how social scientists understand this framing

in Yunnan, and how these understandings relate to the everyday lives of ethnic minorities and power relations. Section 5.3 further illuminates governance regimes in China and how and why state policies fail to reckon cultural and ethnicity aspects particular to Handai populations. Then, moving to the micro-level, I introduce the villages where I conducted my research in Section 5.4 along with how their populations emphasize some assets in their livelihoods (Section 5.5). Since renewable energy schemes modified my informants' access to some of these assets, this discussion adds insights into my second and third research questions. Finally, in Section 5.6 I focus on the socio-economic factors that drive livelihood changes in the villages. The influence of these factors adds to that of the renewable energy schemes I analyzed in the preceding chapter to forge the livelihood diversification strategies my core result Chapters 6 and 7 focus on.

5.2 Geographical aspects of the Red River watershed and the research area

The collision of the Indian and Eurasian tectonic plates and the Tertiary Tibetan Uplift formed mountain massifs from which rivers carved their way southward towards the great deltas of South, Southeast, and East Asia (Brookfield 1998; Clark et al. 2004a, 2004b). The upstream sections of many of these watersheds flow through Yunnan, which Yang (2006: 25) has called "the Water Tower of Asia". While I focus on just one of these rivers, other waterways share vertical profiles and hydrological regimes similar to that of the Red River (see Schmidt et al. 2011).

The source of the 1,126 km long Red River is situated some 325 km northwest of Kunming at Dali (Le 2005). From there, the river runs southeast, enters Vietnamese territory very close to the Hekou-Laocai border crossing and reaches the South China Sea through the Gulf of Tonkin. The Red River watershed drains a total area of 156,451 km^2, 48.8 per cent of which is located in China, 0.9 per cent in Laos and 50.3 per cent in Vietnam (Figure 5.1; see also Le et al. 2007).

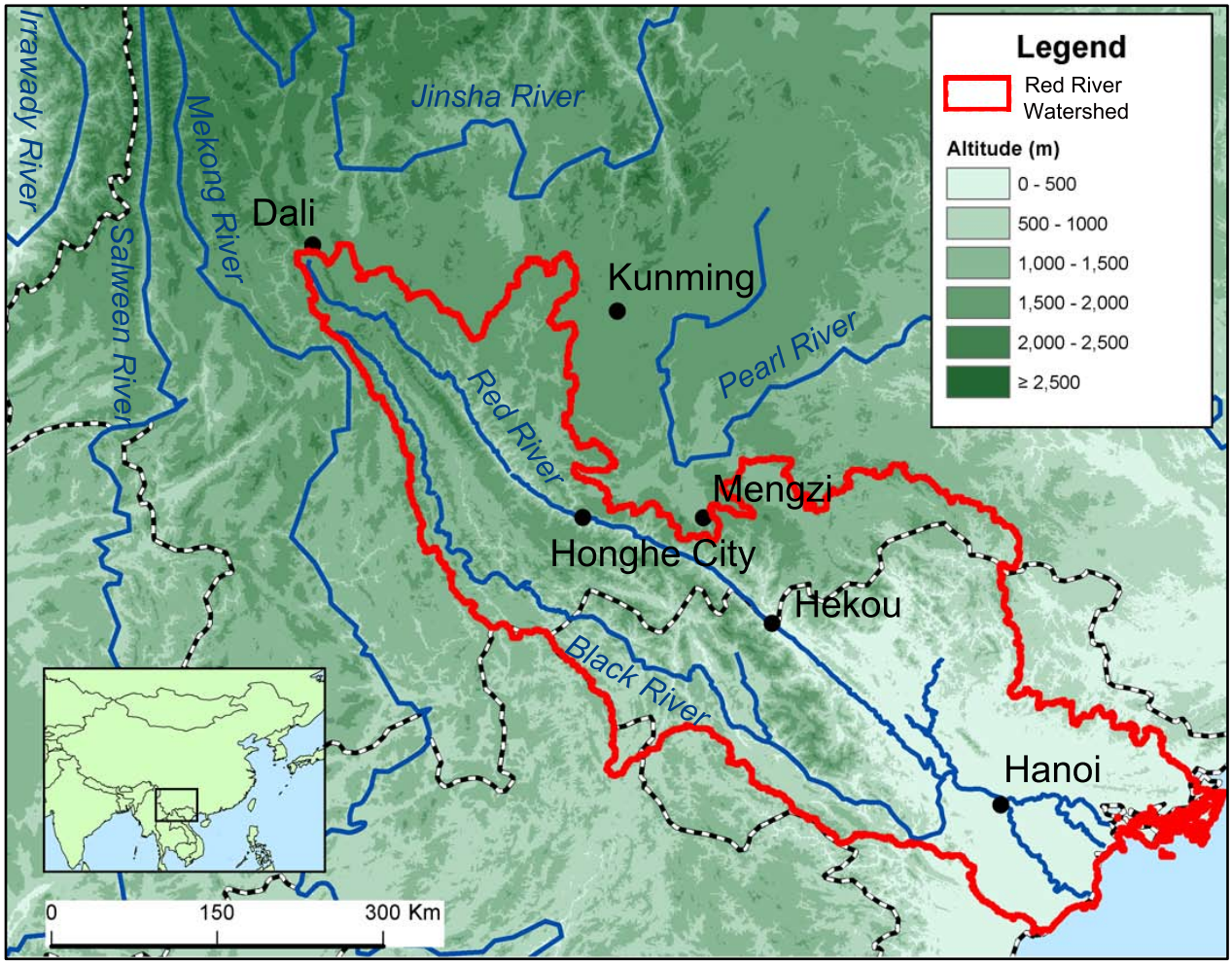

Figure 5.1: The Red River watershed (raw data from: Lehner et al. 2008)

The Chinese section of the Red River (红河 – *honghe*), or Yuan River (元江 – *yuanjiang*) as it is also known in China, is 680 km long and nourishes 83 species of fish (Wang 1997). Within the Chinese segment, the riverbed altitude drops from 2,640 m in Dali to 71.6 m in Hekou (Tang and Zhu 2006). The resulting average gradient of 0.4 per cent is much steeper than in the Vietnamese section of the river, which reaches only 0.02 per cent.[106]

The annual discharge of the Red River averages 120 km^3, making the 32nd most important river in the world based on this indicator (Moon et al. 2007). Dramatic seasonal variation, due mostly to the monsoon climate, characterized by a massive and unevenly distributed precipitation

[106] Gradient values are obtained with the formula: Gradient = (Δ H / D) x 100

regime, is a key aspect of the hydrology of the river (Dudgeon 1992, 2000; He et al. 2007a, 2007b). Over 85 per cent of all precipitation in the Red River watershed occurs between May and October (de Kort et al. 2007; Le 2005; Li et al. 2008). Such an unevenly-distributed hydrological regime has important implications on everyday livelihoods in a tropical latitude (Wolters 2007). As a result, in this particular case, the average water discharge recorded at Manhao station[107] is 257 m^3/s, while the historical low and high values range from 28,7 m^3/s to 4,620 m^3/s (He et al. 2007b).

Mountainous topography, the Monsoon rain pattern, and the Red River flood and low water regimes combine with low forest cover to make the Red River's banks susceptible to extensive and regular erosion (Brookfield 1998; He et al. 2007a, 2007b). The Red River carries a sediment load averaging 160 million tonnes per year, the world's ninth highest (Milliman and Meade 1983). Ninety-five per cent of the total sediment load passing by Manhao station, does so during the June to November wet season (He et al. 2007b). Historical mean annual sediment yield for this same station averaged 1,038 tonnes/km^2/year between 1953 to 1987 (Schmidt et al. 2011).[108] The seasonal flood pulse then deposits a great share of this alluvium over the 11,000 km^2 wide deltaic plain of the Red River spreading from Hanoi out into the South China Sea (Berg et al. 2007; Junk et al. 1989).

Within the Red River watershed, the three villages where I undertook this research are located near the town of Nansha, the seat of Yuanyang County. Xiaocun is located in Yuanyang County while Zhongcun and Dacun are situated within Gejiu City (Figure 5.2).

[107] Manhao is located 97 km upstream from the Sino-Vietnamese border and 50 km downstream from my case study villages.
[108] The authors could not access data after 1987.

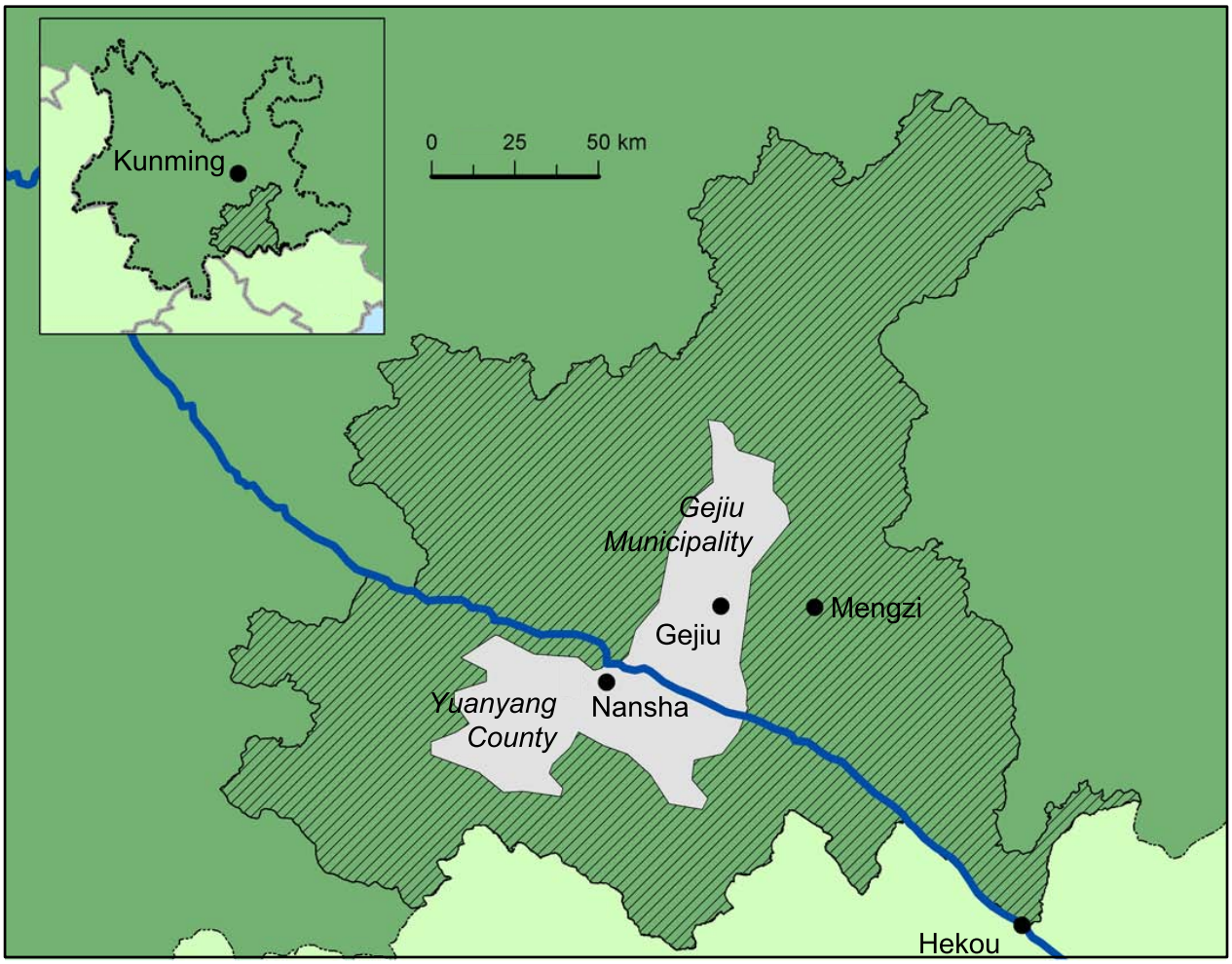

Figure 5.2: Administrative units in my case study area (source: GADM 2013)

About 135 km downstream from Nansha is the Sino-Vietnamese border at Hekou-Lao Cai, while Mengzi, the seat of the Honghe Prefecture Government, is 85 km away by road. Wang and Long (2009) cite that mean annual temperatures in Nansha reach 25.1 degrees and that average annual rainfall totals only 960 mm. However, no exhaustive climate data is publicly available for the Nansha area, and climatic patterns between the valley and nearby highland settlements for which data are available vary considerably. Data recorded at Hekou and Yuanjiang weather stations therefore represent the most similar conditions to what prevails in the villages where I undertook research, and I derived the temperature patterns shown in Figure 5.3 from data recorded in these locales.[109]

[109] Hekou and Yuanjiang are both located along the Red River. Hekou is a border town facing Vietnam and Yuanjiang is located about 300 km upstream. Nansha is located about halfway between both towns. Data shown in Figure 5.3 are average values derived from daily temperature records spanning 1957-2014.

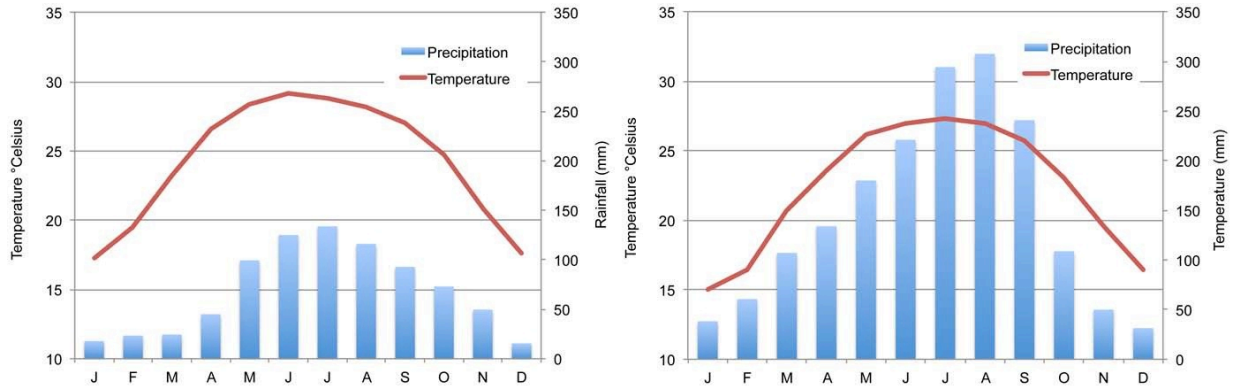

Figure 5.3: Weather graphs for Manhao (left) and Yuanjiang (right) (raw data compiled from NCDC, 2014)

As shown in Figure 5.3, average temperatures are high throughout the year; heat gets unbearable for the local population and a foreign researcher alike between April and November, when temperatures frequently reach the high thirty degrees Celsius. As a consequence, daily work schedules during the hot season typically include a long break from noon to three or four o'clock in the afternoon. Precipitation patterns are characterized by a dry season spanning November to April and a wet season during the summer months.

As is the case throughout Yunnan, a severe drought has been affecting the villages since the late 2000s (D-122, 22 February 2012; see also Champalle 2012). The situation was particularly acute during the spring of 2012, when, according to one informant "the drought is worse than last year, it is the worst we have seen so far and it will probably be even worse in 2013" (X-15, 22 February 2012). However, although scarce precipitation is an important concern for villagers, the situation is not as critical as in the neighbouring midlands and highlands, where crop failures are frequent (Champalle 2012; Chen and Rousseau 2013). Nonetheless, the lack of and/or late onset of monsoon rains can have serious impacts upon local agriculture, as it notably jeopardizes mango and litchi tree blooming. Dry weather also compels some villagers to wait before sowing their spring rice plants (X-23, 2 April 2012) and makes animal fodder scarce, in turn influencing the amount of time that large livestock owners spend fetching their cattle and buffalo roaming ever further from the villages (Section 6.4).

5.3 POPULATIONS AND ETHNIC DIVERSITY IN HONGHE PREFECTURE

Honghe Prefecture is home to substantial Hani and Yi populations. These minority nationalities respectively totalled 800,000 and 1.1 million individuals in the Prefecture in 2010, or 18 and 24 per cent of the total population of 4.5 million (Honghe Prefecture Government 2011). Due to such high figures, Honghe is considered a 'Hani and Yi Autonomous Prefecture' (哈尼族彝族自治州 – *hanizu yizu zizhizhou*) and the 2001 Law on Autonomy in Minority Nationality Areas (PRC 2001) applies in the area. This law notably provides local governments greater autonomy over development policies and prioritizes the hiring of minority nationalities in the administration. Yet, the law also reaffirms the supremacy of the central state, restricting the extent to which authorities in autonomous areas can diverge from the development trajectories stemming from Beijing (Potter 2005-06). Other positive discrimination measures apply to minority nationalities and/or minority nationality people from autonomous areas, including bonus points on the national university entrance exam (高考 – *gaokao*; see Wang 2007), along with less strict marital and birth control arrangements (Section 5.6.1; see also: Gladney 1994; Sautman 1998).

In addition to the Hani and Yi, seven other ethnic groups officially compose the minority nationality population from the prefecture, which totals 2.6 million individuals, including some 113,000 belonging to the Dai minority (Honghe Prefecture Government 2011). Han Chinese made up 43 per cent of the population of the prefecture in 2010, compared to 66 per cent of the provincial total in Yunnan (YBS 2011). While such statistics offer a glance at the importance of ethnicity concerns in Honghe Prefecture, they fail to convey how such ethnic classifications emerged and what they mean to minority nationalities. I now turn to these features, which I argue are necessary for appreciating how social relations unfold in the area where I conducted research.

5.3.1 Seeing ethnicity like a state, or like an anthropologist

Harrell (1990) explains that the identity of an ethnic group is a function of how that particular group internally defines itself, and of its external relations with other ethnic groups and the state. He argues that "in the Chinese configuration of this constellation of actors, the state has a privileged position. This happens because the state has the last word in the classification of *minzu* [nationalities, see below] and in the allocation of resources" (ibid.: 517; see also Toyota 2003).

Accordingly, I begin this section by discussing how the PRC has historically handled ethnic affairs. I then introduce other approaches to make legible the diverse societies inhabiting the Chinese portion of the Southeast Asian Massif and its proximal areas.

China is officially home to 56 nationalities (民族 – *minzu*), 55 of which are considered minority nationalities (少数民族 – *shaoshu minzu*), the other being the Han Chinese, making 92 per cent of the national population in 2000 (NBS 2000). The notion of *minzu* is a western construction unheard of in China before the late 19th Century (Toyota 2003). Yet Frangville (2007) explains that the term *minzu* is now intrinsically related to the national construction of the PRC, China being the homeland of the Chinese nation (中华民族 – *zhonghua minzu*; see also Wu 1991). When associated with ethnicity, *minzu* typically serves to highlight distinctions among people, rather than their participation in a common national project. The expression *shaoshu minzu* further reinforces these distinctions, epitomizing the cleavage between the Han Chinese majority and the other 55 minorities (*minzu*).

Fifty-four of the current 55 minority nationalities recognized in China were identified through the ethnic classification project carried out in the early 1950s (民族识别 – *minzu shibie*) and involving a team of some 50 social scientists – including ethnologists and linguists – and Communist cadres (see Fei 1979; Keyes 2002; Mullaney 2010, 2011; Tapp 2002).[110] Participants in this endeavour distinguished among over 400 groups that had requested minority nationality status to the new communist government, including some 260 from Yunnan alone (Fei 1979).[111] Based on a fourfold classification system that Stalin had utilized earlier, groups found to share common economy, language, territory and psychological makeup were considered eligible to obtain minority nationality status (Gladney 1990).[112]

[110] The Jinuo were recognized as the 55th minority nationality in 1979 (Harrell 1993).
[111] One of my informants held that one of the reasons why there have historically been so many different ethnic groups in Yunnan is that interethnic fighting was relatively rare and little assimilation occurred (M-1, 25 November 2011). This might also explain why none among the 25 minority nationalities officially found in Yunnan stand out as much more populous than others. Summers (2013) sees in this the reason why Yunnan is not considered an ethnic autonomous region such as Guangxi (Zhuang), Inner Mongolia (Mongol), Ningxia (Hui), Tibet (Tibetan) and Xinjiang (Uyghur).
[112] Early PRC leadership however did not adopt the federationist state model from the USSR, but rather made China a single nation composed of many nationalities (一个多民族国家- *yige duominzu guojia*; see Guo 2008; Harrell 2001).

Reviewing the classification project, some authors argue that this mission consisted of nothing more than a straightforward attempt at making minorities legible and regulate interethnic relations (Gladney 1994; Harrell 2001). However, Tapp (2002) argues there was more to this project than a Maoist project to consolidate authority over ethnic minorities and frontier populations. Tapp (ibid.) contends that participants to the ethnographic mission genuinely questioned minorities about their identity and desired ethnic affiliation, and meticulously recorded their findings. Hence, Tapp (ibid.: 68) holds that "emphasis on the consciousness of subjects is certainly one aspect of the project which would seem to contradict any too-simple analytic reduction of it to a mere case of colonizing representations". Mullaney (2010, 2011) also documents the role of the social scientists involved in the mission. In particular, Mullaney looks at how the strong background of these researchers in ethnolinguistics tainted the results of their inquiry. Taken together, this scholarship highlights the importance of distinguishing between the motivations that drove the classification project in the first place and those of the individuals that undertook the mission.

The classification mission concluded with a list of 54 nationality minorities, with exonyms assigned to most of these (Michaud 2009). The regime then turned to compare how *shaoshu minzu* related to the Han as well as to one another, using a Marxist historical-materialist framework. The social evolution of each *minzu* was thus assessed in regards to a four-step progress grid spanning the slave, Asian/feudal, capitalist, and socialist modes of production (Harrell 1995, 2001; Marx 1965; Sturgeon et al. 2013). This placed the Han Chinese at the top of the pyramid by default, the Manchu and Koreans a little below, paddy-growing societies such as the Dai further down, and swiddener groups at the very bottom (Harrell 1995). It also indicated to 'less civilized' groups the pattern they must follow so as to "catch up with the [Han] civilizers" (Harrell 1995: 9, see also Duncan 2004; McDuie-Ra 2011; Tapp 2010).

Tapp (2002: 67) explains that Chinese public representations "depict minorities through imaging of the feminine, childlike and natural".[113] Minority nationalities are also associated with rurality, which, as White (2010: 151) explains, "is generally a very romanticized rurality – in contrast with

[113] Micollier (1998) pushes this argument further, holding that within Yunnan, Tibetan, Yi, Miao and Dai women are central to Han erotic imaginary. This same imaginary emphasizes Dai women's beauty, and pictorial representations of half-naked Dai women are sometimes seen in public venues in Honghe Prefecture.

the 'backward' rurality that so often gets inscribed onto peasant bodies in contemporary China".[114] As such, the State confines ethnic minorities into particular livelihoods and land uses, often for the sake of ethnic tourism development (ibid.; Sturgeon et al. 2013). The state also fails to account for the diversity of minority nationalities' cultural traits, historical settlement patterns and relations with state actors (Giersch 2010; Michaud 2009, 2010; Scott 2009). It further ignores that ethnic groups pre-date the PRC and that there is more to their cultures and histories than official discourse suggests.

An alternative to this ahistorical version unpacks the reasons and processes explaining why ethnic groups and subgroups from the Southeast Asian Massif tend to occupy distinct ecological niches delineated by topography (Bruneau 2002; Leach 1960; Michaud 2009; Uhlig 1969). This approach distinguishes among groups traditionally living in the lowlands, mid-/intermediate lands, and highlands.[115] One of the explanations set forth to justify this 'ecological niche' approach pertains to migration waves. It is indeed believed that latecomer groups migrating through already-occupied lowland areas had little option but to settle in the mountains (Michaud 2006). James Scott (2009) rather argued that 'anarchist' societies willingly moved to the highlands in order to strategically escape lowland state institutions such as taxes, religion, corvée labour, and the like. The lack of tolerance to malaria, traditionally endemic in valleys but non-existent in the highlands, has also been pointed out as an explanation as to why some groups settled at higher altitudes than others (Bruneau 2002; Giersch 2006).

Harrell (1990: 519) warns that counter-examples mitigate the ecological niche explanation, arguing that "local ethnic groups, usually subgroups of *minzu*, may occupy particular niches in particular systems, but different subgroups of the same *minzu* occupy different niches in different social systems".[116] Giersch (2006: 21) reaches similar conclusions in his historical study of the Sino-Burmese borderlands, where "most groups did not occupy geographically discrete

[114] For a thorough discussion on how Chinese political and intellectual elites have framed the peasant body since the Revolution, see Day (2013).
[115] A typology Bruneau (2002) introduced situates lowlander settlements at an altitude ranging from 0 to 400 meters, midlands from 400 to 1,000 meters and highlands above 1,000 meters.
[116] Laos used to maintain an official classification system emphasizing three ethnic groups defined by the same altitude criteria: Lao Loum (Lao dwelling in the plains), Lao Theung (from the slopes), and Lao Soung (from the mountains) (Michaud 2006). As Michaud (ibid.: 135) explains, frequent migration among these three ecological niches is one of the factors that made the system irrelevant and impractical, hence the system was "quietly abolished in 2001, so quietly in fact that it is still widely used by the Laotians".

territories, but lived scattered in homogenous villages interspersed among the villages of others, a cultural patchwork of human habitations". Complementary to critiques of the ecological niche thesis and the unwanted generalizations it can induce is the notion of "compact communities" that Fei Xiaotong (1979: 20) coined. According to this Chinese anthropologist, a compact community is one "where members of a certain nationality are more or less concentrated, and not a place exclusively inhabited by a single minority" (ibid.). Applying the same notion to autonomous areas, the author explains that they do not solely encompass the ethnic group(s) these areas were designated for.

Bruneau (2002) introduces another way of differentiating among ethnic groups within the Southeast Asian Massif in distinguishing between state and stateless societies. State societies comprise groups organized around a feudal structure, kingdoms, or empires, while the main foundations of stateless societies lie in kinship ties. Michaud (2011: 216) also addresses how kinship relationships come about in forging ethnicity, but he rather distinguishes "groups with a flexible social structure based primarily on kinship ties (lineage-based groups) and non-territorial social organization" from "profoundly territorial groups (…) for whom the land they inhabit is intrinsically part of their core identity". Among the main characteristics that distinguish these two groups is how they experience their customary domain being fractioned or eradicated due to political considerations (ibid.). I will often come back to this last aspect in this thesis, as I argue that the territorial identity of my Handai informants illuminates a great many strategies these people have adopted for coping with the impacts from renewable energy development upon their livelihoods.

5.3.2 The Dai people: Generalities about a heterogeneous *minzu*

Ethnic groups in the Southeast Asian Massif speak dialects that belong to five main language families including the Tai-Kadai, which itself incorporates dozens of more-or-less related languages, many of which use an alphabet akin to contemporary Thai.[117] Over 100 million people speak Tai-Kadai dialects (Michaud 2006), including the Thai in Thailand, the Shan in Burma, the Lao in Laos, the Tay in Vietnam, and the Dai in China. In this sense, anthropologist Jean Berlie (1991: 17) states that these groups create a "*hyphen*" between South China and north Southeast

[117] The other linguistic families are Austronesian, Austro-Asiatic, Miao-Yao and Sino-Tibetan.

Asia. Nonetheless, their significant population and wide geographic distribution make Tai-Kadai speakers a very diverse group. The same goes for the 1.1 million Dai people living China (NBS 2000), half whom live in either Xishuangbanna or Dehong Prefectures (Figure 5.4).

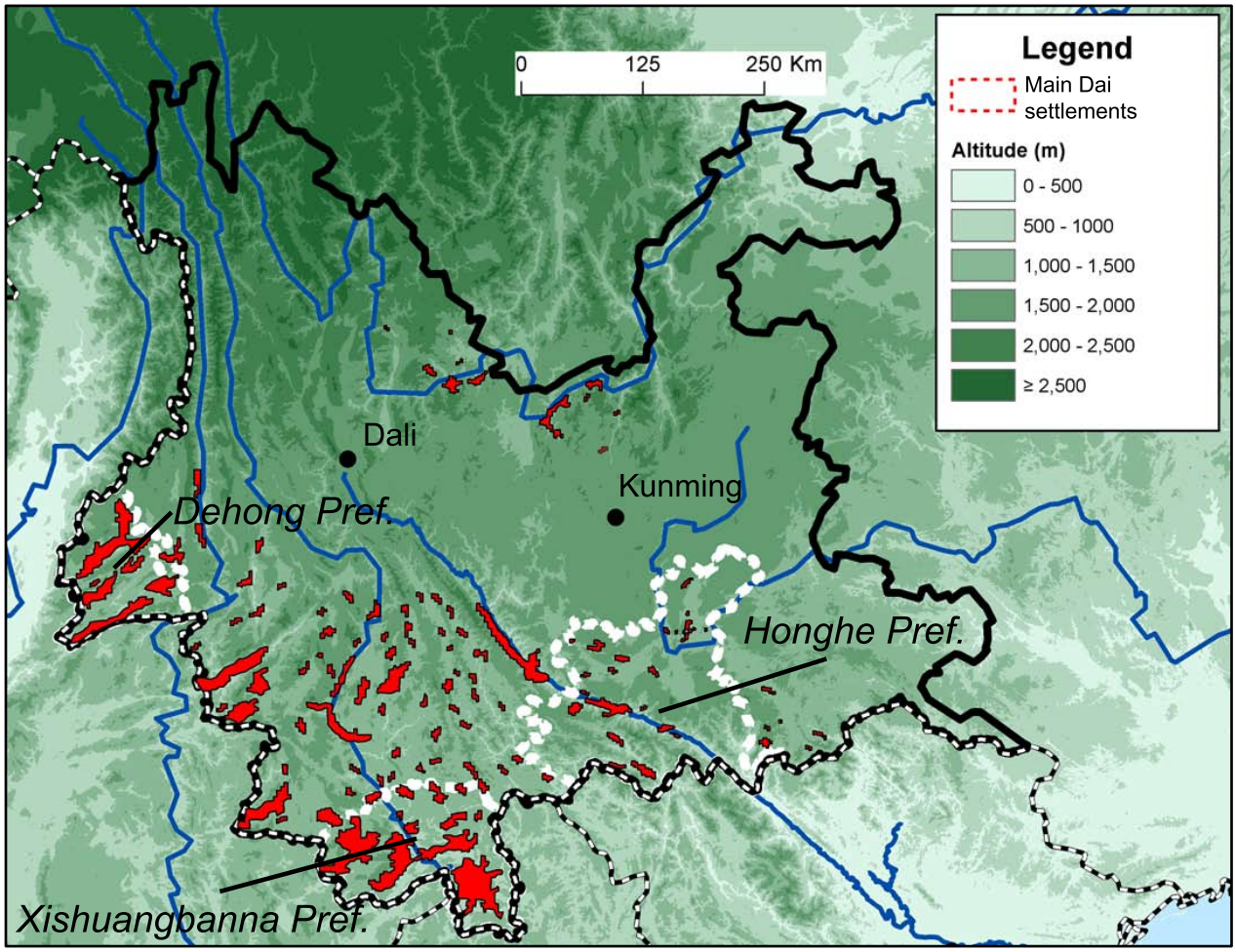

Figure 5.4: Main Dai settlements in Yunnan Province
(adapted from *Daizu jianshi bianxie zu* 1985, ii)

As one of the oldest ethnic groups in Yunnan, the Dai have traditionally inhabited previously-unclaimed flat and fertile lowland areas where their economy centred on wet-rice farming (see Section 5.3.1). The Dai are a profoundly territorial group whose identity and history strongly relate to this ecological niche and its agricultural potential. Therefore, as Yot (2011: 57) observes in Xishuangbanna, "land is of utmost importance" for overwhelmingly rural Dai people (see also Attané and Courbage 2000; Wang et al. 2013, 2014). Rice is the main staple food in many Dai societies. Wet rice tolerates annual double-cropping and yields higher returns per unit of cultivated land than any other crop when sufficient labour is available (Bray 1986; Scott 2009).

Historically, this has meant that Dai settlements could sustain relatively high population densities, facilitating the establishment of a feudal system whose main political unit was the *muang*, the Dai kingdom (Michaud 2006; Scott 2009). Dai rulers rapidly adopted Buddhism after it migrated from Southeast Asia during the first millennium A.D. (Michaud 2006; Raendchen 2007; Scott 2009). It has been argued that Dai kings strongly promoted Buddhism because they saw in the obedience values this religion emphasized a powerful asset to further assert their authority (Berlie 2010).

Beside rice, water is also a core aspect of Dai culture. Discussing the legendary origins of the Dai people, Berlie (1988) mentions the myth of Ailao, born in a river to Mother Shayi and a dragon. Zheng (2006) explains that the Dai are among the minority groups from Yunnan whose origins involve the coming together of a deity, water, and a third element. This water might have been that of Dianchi Lake, located nearby contemporary Kunming and the former seat of the Dian kingdom (4th century BC-2nd century AD), which some argue was governed by Dai leaders (ibid.; Zheng 2007). It is also believed that the Dai from Dian began migrating southwards along the banks of the Red and Mekong Rivers after the fall of the Eastern Han Dynasty in 220 AD (Zheng 2007).

Dai migration towards south Yunnan and the Indochinese peninsula intensified when the Nanzhao Kingdom (eight century to 937) and Dali Kingdom (937-1253) ruled over a great portion of contemporary Yunnan and Burma, and controlled trading networks farther south in the Southeast Asian peninsula.[118] While the exact ethnic background of the rulers of the Dali-based kingdoms remains uncertain, Dai individuals were most likely involved in governing these regimes at some point (Berlie 1988; Michaud 2006).[119] Likewise, Nanzhao and Dali had developed close links with rulers of Dai Kingdoms in Sipsongpanna, the contemporary Chinese portion of which is known as Xishuangbanna (Giersch 2006). The Mongols conquered Dali in 1253, a few decades before consolidating their power over all of China. In order to overcome

[118] Nanzhao reached its territorial apogee in the ninth century, when it spanned Yunnan as well as portions of southern Tibet, eastern Burma, northern Laos and Thailand and western Sichuan.

[119] Other hypotheses hold that Nanzhao was governed by Bai leaders (Madrolle 1908) or co-founded by Dai and Bai (Liang 2010) or Bai and Yi (He 2007). However, all agree that the Dai made an important component of the demographics of Nanzhao. A nationalistic argument between Thai and Chinese scholars claiming that the legacy of the Kingdom 'belongs' to their respective contemporary nations probably adds to the historical challenges involved in unveiling the story behind Nanzhao (ibid.).

fierce local resistance, the Great Khan allied with some local ruler, instituting, *de facto*, an indirect rule that later dynasties would institutionalize (ibid.). This system became known as the *tusi* (土司) and tolerated the existence of Dai kingdoms and states, including those from Sipsongpanna, provided that they pay tribute to the emperor. The Qing dynasty collapse in 1911 officially brought the *tusi* system to an end, although Yunnan local chieftains remained powerful from the eve of Republican China until the People Liberation Army entered the province in 1950 (Giersch 2006; Harrell 2001; Komlosy 2004; Summer 2013).

Stuart Olson (1998) explains that the Dai minority nationality is divided into three subgroups, namely the Dailü (Dai lue), most of whom live in Xishuangbanna Prefecture; the Daina, predominantly inhabiting Dehong and Lincang Prefectures (both located north-west of Xishuangbanna); and the Daija, from the Red River valley. An anonymous government-sponsored book on the Dai from 1985 (*Daizu Jianshi Bianxie Zu,* 1985) introduces the same nomenclature, though specifying that the Mandarin Chinese transliteration of these Dai subgroups is the following: Dailü is Shuidai; Daina is Handai; and Daija is Huayao Dai. Hence these sources do not list Handai within the Dai subgroups established along the Red River, contradicting the knowledge of from my informants, who self-identify as Handai.[120]

According to Berlie (1988), Dai people from the Red River valley who self-identify as Handai have internalized Chinese-imposed and ethnographically incoherent classifications. Berlie (1988, 1991) further suggests another classification for the Dai, distinguishing between Dai La (Black Dai or Dai Dam), Dai Lü, Dai Neua, Dai Ya, Dai Zang, and Zhuang.[121] Berlie explains that both the Dai La and Dai Zang inhabit the Red River valley and that black traditional clothing and flattop houses – both characterizing my research area – count among the main ethnic markers of these two groups. Berlie further contends that the Dai Zang, totalling in his estimate 2,000 people, mostly live north of Yuanjiang county, quite far from my research villages. Therefore, Berlie would most likely consider my informants as members from the Dai La / Black Dai group. Yet, there are major differences between my research population and the relatively well-

[120] The official Chinese word for Handai – 旱傣 – literally means 'dry Dai'. However, some hold that the group was first labeled as 汉傣: Han (Chinese) Dai. According to the latter version, Handai (汉傣) people were named as such because of their good knowledge of the Chinese language and the similarities they shared with the Han, with whom they have long had contacts and exchanges (M-1, 1 December 2011; see also Berlie 1991).
[121] The Zhuang are also one of the 55 officially recognized minority nationalities in China.

documented Black Tai from north Vietnam and north Laos, including that Black Tai cremate their dead, while my informants do not (see Abadie 1924; Evans 1991; Sikor 1999).[122]

All in all, combining these sources and my own research findings does not yield a definitive and undisputed categorization of my research population.[123] What is certain, though, is that my informants inhabit the Red River valley and that they self-identify as Handai. Also certain is the conclusion from Berlie (1988: 328) that "identification of each Dai Nationality is a real problem". However, maybe academics pay more attention to these distinctions than the Dai people themselves, as I was powerfully reminded in a village downstream from my research sites, about halfway between Hekou and Manhao; when asking a Dai restaurant owner (B-1, 5 November 2011) "What Dai subgroup do you belong to?", she answered: "what Dai subgroup I do not know" (什么傣族我不知道 – *shenme dai zu wo bu zhidao*).

5.3.3 The Handai of the Red River valley: Not that Dai

In 1969, Uhlig published an ethnicity transect of a section of the Red River valley at Yuanjiang (Yuxi Prefecture) (Figure 5.5).[124] This area is located 120 kilometres upstream from Nansha, where the floodplain is narrower. Nonetheless, the patterns Uhlig identified correspond to those from my research area. Indeed, Dai people have traditionally inhabited riverside settlements and thus comprise the main ethnic group in the villages I discuss here. Yet handfuls of people from other nationality minorities have also recently migrated to my study area, where interethnic weddings are increasingly frequent (Section 5.6.1). In this sense, the villages are gradually turning into Dai-dominated compact communities (Section 5.3.1). Yi people predominantly inhabit midland areas in the immediate vicinity of Xiaocun, Zhongcun and Dacun villages on both sides of the river valley. Farther to the west of the valley are Yi and Hani highland settlements, including the villages close to Yuanyang whose impressive rice terraces were added to the UNESCO list of World Heritage Site in June 2013.

[122] 'Black Dai' and 'Black Tai' refer to the same ethnic group. The difference is due to the romanization systems used to translate the Chinese, Laotian and Vietnamese names of this group.
[123] The categorization introduced above is by no means exhaustive. Other propositions within the literature include a two-subgroup model including the Dai Na and the Dai Lue (Hansen 2004) or a fourfold model that encompasses Shuidai, Handai, Huayao Dai, and Kemu (An and Liu 1985; Huang 2003).
[124] Uhlig utilizes the Wade-Giles romanization system predominantly used in anglophone literature before the Chinese government adopted *pinyin* in 1978. In the Wade-Giles system, Dai is translated as Tai. Biyo, Wobi, and Sansu are Hani subgroups, while Pula, Lolo and Lobi (Lopi) are Yi subgroups.

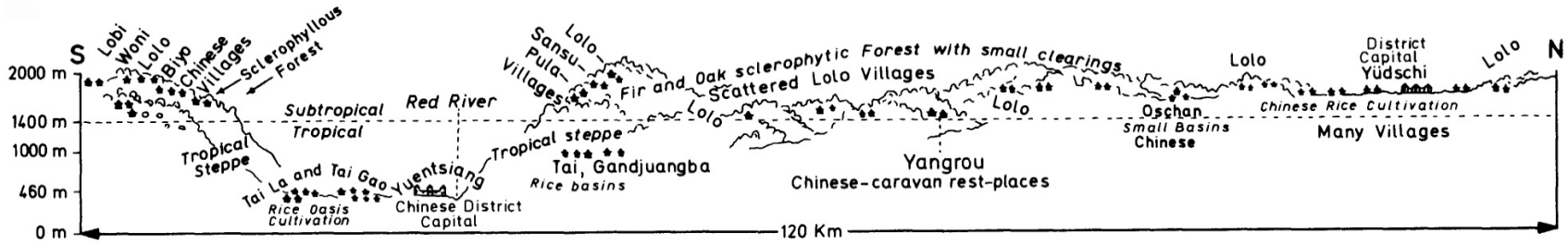

Figure 5.5: Ethnicity transect at Yuanjiang (Uhlig 1969: 9)

I regularly sought to investigate Handai history with friends and informants, though my inquiries yielded few results. This is partly because there is no writing system associated with the language spoken in my research area, whose population rather relies on oral tradition. This tradition carries memories that mostly go back two generations before the present elderly (D-122, 19 June 2012). Hence, the only answer an elder could come up with when asked how his ancestors self-identified was: "They used to call us Baiyi" (ibid., 1 December 2011). This reference to some vague 'other' is no coincidence, as Baiyi is an exonym that Han Chinese have employed to refer to Dai groups since the conquest of Nanzhao, if not even earlier under the Tang dynasty (AD 618-907) (Hsieh 1995; Wang 1991).

When asked to explain/list the main characteristics of the Handai people, my informants would first mention their language with no hesitation. Clothing, and especially the black apparel that women wear (Figure 5.6), would come second almost as naturally. In particular, one informant argued "the Hani used to fear our ghosts because we wear black clothes" (X-36, 8 December 2011).

Figure 5.6: Handai woman getting ready to celebrate her wedding (photograph by author, 2011)

After these initial distinctions, people often listed water as an important identity marker: "Water is very important for Handai. Miao, Yao, Yi, and Hani live in the mountains and grow maize. Handai live in valleys, near rivers. This is necessary for us to grow our paddy rice. Han Chinese live in the cities and do business" (D-32, 23 August 2011). Others mentioned rootedness in place and a low interest in migration as features defining the Handai: "The Handai do not like to engage in work migration. Yi and Hani are most likely to do so, but the Dai do not like to leave their land" (X-15, 28 August 2011). Handai have also long practiced sedentary irrigated agriculture, in comparison to Yi and Hani traditional livelihoods centered on swidden farming. Traditional farming regimes in Xiaocun, Zhongcun and Dacun villages were centered on paddy and rice remains the main staple food.

Arguing Handai communities are more closely-knitted than Yi or Hani, one informant stated that "contrary to people from the mountains, the Handai know people from neighbouring Handai villages" (X-23, 4 December 2011). Similarly, another villager added: "Handai people live in closely knit societies and people help each other a lot when there are big events such as funerals, house building, weddings, etc. There is no such level of closeness in Yi or Hani society. People will help their relatives, but not necessarily people from other clans" (D-118, 19 February 2012). Berlie (1992) likewise discusses the importance of Dai inter-village networks, which he argues are common to all Dai societies, with villagers exchanging work against future help. To these networks, I would add intra- and inter-village interest-free credit networks, as I discuss later in this chapter and in Chapter 7.

Little ethnographic research has been conducted by Chinese and Western scholars with Handai people from Honghe Prefecture (M-1, 1 December 2011; K-4, 19 December 2011). In comparison, much more research has been carried out in Dai settlements in Dehong and Xishuangbanna Prefectures, populations my informants labelled Shuidai (水傣, or water Dai). When discussing what differentiates Handai from Shuidai, my informants notably mentioned that "the Handai language differs from that of other Dai and we do not have a written language" (Z-55, 11 September 2011); "our houses are different and have flat rooftops" (X-23, 22 November 2011); "Shuidai are Buddhists, while we practice a local/animist [本地 – *bendi*] cult" (Z-85, 24 November 2011); and "Handai here never had a King" (X-36, 8 December 2011). Berlie (1991)

also cites rice, glutinous rice, tattoos, spices, bamboo shoots, fish, dry fish, honey, all sorts of baskets, low tables, and small stools among the markers of many Dai societies. Zheng (n.d.) adds that old-growth trees are considered as sacred in many that Dai subgroups, including some established along the Red River valley. These features indeed appear in many aspects of material and spiritual life in Xiaocun, Zhongcun and Dacun villages.

Finally, when discussing other Dai people from nearby villages along the Red River, my informants would classify these individuals as Handai. However, they would also highlight differences between themselves and people living a few dozen kilometres away. Clothing and language would again be listed among the main characteristics distinguishing these communities. Among other local particularities, it was noted that "we are the only people that eat raw pig blood in the area" (D-86, 13 December 2011). One person also explained that "our shamans sing different songs" (D-118, 10 December 2011), referring to the differences between animist rites and cults practiced in different Handai locales.

5.4 THE VILLAGES AT THE CORE OF THIS THESIS: XIAOCUN, ZHONGCUN AND DACUN

As mentioned already, my thesis focuses on three villages, which I identify with pseudonyms since my research addresses sensitive matters (Section 3.2.2). These locales are: Xiaocun (小村), the small village; Zhongcun (中村), the middle village; and Dacun (大村), the big village. These three villages have a number of similarities and differences, discussed next.

Handai is the predominant minority nationality in all three villages, though the population is slowly diversifying as inter-ethnic weddings become increasingly common. Although migration from other parts of Yunnan to these villages is rare, except for marriage on occasion, I did met one Hani household head with five children living in one of these villages and who had migrated, along with his family, to these lowlands to avoid fines from the family planning authorities in his home village (D-121, 24 November 2011).

Xiaocun, Zhongcun and Dacun villages are all situated within a narrow section of the Red River valley, and the fields their inhabitants harvest are located within the flat floodplain adjacent to the

riverbed. Therefore, my case study villages are located in the lowlands, at an altitude ranging between 255 and 272 meters above sea level. Agriculture is the primary economic activity in the three villages, with rice and banana trees remaining the first and second most widely grown crops, and the dominant food and cash crops respectively. However, as I document in Chapter 6, other commercial crops, including mangos, papayas, runner beans, sugar cane, and so on have rapidly expanded. Similarly, while the Handai traditionally raised water buffalo, cattle, poultry and pigs, large livestock has been rapidly vanishing from the villagescape over the last few years. In regards to market opportunities, peasants from all three villages either sell their goods to brokers more or less regularly visiting the villages or carry their products to markets in either Nansha or Dacun. Inhabitants from Zhongcun and Dacun can also sell their products to people driving along the main road close to their villages, as I further explain below when I introduce each locale individually.

The narrow valley rapidly turns into steep hills, which both the authorities and the local population consider 'barren lands' (荒山/荒地 – *huangshan / huangdi*).[125] To authorities, this classification relates to land with weak prospects for commercial agriculture development (Section 4.4.2). According to such criteria, barren lands amount to 130.4 million ha in China (Yang et al. 2009; Wang et al. 2010). Some 15 per cent of the national barren land area is located in Yunnan, which, due to its mountainous typography, concentrates almost twice as much barren lands than any other province. Since 2006, the state has targeted barren land areas for biofuel plantation development in an effort for energy crops not to compete with food crops (Section 4.4.2; see also Weyerhaeuser et al. 2007; Yang et al. 2009; Wang et al. 2010). For Handai peasants, the barren lands are rather areas that serve a host of livelihood functions, including collection of various non-timber forest products, funeral grounds, cattle grazing, and even cassava production (albeit with great efforts for low returns).

All three villages are close enough to the county city that I could commute from Nansha to any village daily, either by minibus or motorbike (see Section 3.2.1). Xiaocun is a natural village (自然村– *ziran cun*)[126] located on the right bank of the Red River in Yuangyang County (元阳县 –

[125] I further unpack land categories and the differences between them in Section 5.5.1.
[126] Natural villages (自然村 – *zirancun*) are rural villages that spontaneously or historically emerge, while administrative village (行政村 – *xingzhengcun*) are bureaucratic entities that usually unite one or several natural

yuanyang xian) and it is only accessible by a dirt road, making it the most isolated of the three villages. With 33 households totalling 145 people, Xiaocun also holds the smallest population. Jatropha development has also been more intense there than in Zhongcun and Dacun villages. Likewise, although jatropha plantations are now almost gone from the barren lands adjacent to Zhongcun and Dacun villages, they still cover significant areas in Xiaocun, with the impacts from this greater than in any other locale (see Section 4.4.2 and Chapter 6).

Zhongcun, also a natural village, is located on the left bank of the Red River, in Gejiu City (个旧市 – *Gejiu Shi*).[127] Zhongcun totals 86 households and 365 people. The village is accessible by a paved highway, and some villagers regularly sell locally-produced fruit from wicker baskets and backpacks on the side of the road, but at the time of my research no such trader had built any permanent stalls. Such permanent stalls are only present in Dacun village, also located in Gejiu along the same road. Dacun, an administrative village, officially amounts 120 households totalling 525 individuals, though a further dozen households with no residence permit (户口 – *hukou*, see Section 6.3.1) are also present.[128] Dacun is located at the intersection of two important roads, and there are accordingly more commercial activities there than in Xiaocun and Zhongcun. In addition to permanent roadside fruit stalls, there are a few restaurants serving local delicacies. Dishes range from five RMB (less than one dollar) rice noodles bowls to Red River catfish,[129] which locals call yellow fish in reference to the colour of its flesh, and which sells for over 300 RMB a kilo (about $50).[130] Dacun also hosts a weekly market, attended by people from all over the region buying and/or selling foodstuffs and farm and household goods.

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villages. The administrative center of an administrative village has often originally been a natural village. This process demonstrates how challenging demystifying administrative units can be in China (see Ho 2001). The most important administrative units for this thesis are, from smallest to largest, the natural and administrative villages, the county (县 – *xian*) / city (市 – *shi*) – in the case I discuss here, these units are somewhat equivalent – , the prefecture (州 – *zhou*), province (省 – *sheng*) and state government (国家 – *guojia*).

[127] Cities typically encompass both urban and rural areas.

[128] Since these households own no land, and land and farming issues are at the core of my livelihood survey (Section 3.3.3), I did not include non-hukou households in my survey. However, I did carry out unstructured interviews with some members of these households.

[129] 全荒鱼 – *quanhuangyu.* Yellow fish belongs to the *Pseudecheneis* family, see Wei et al. 2008.

[130] In such restaurants, fish are kept alive in large pools and sold by weight.

5.5 LIVELIHOOD PORTFOLIOS: HOW DO PEOPLE MAKE A LIVING?

Building from my conceptual framework, and specifically the livelihood approach, I draw from the asset pentagon and the five capitals composing it to introduce and analyze further core aspects of Handai villager's livelihoods. As Carney et al. (1999) argue, development agencies, development practitioners, and livelihood scholars alike frequently utilize this approach. Yet, as with any other framework, there are caveats associated with the asset pentagon (critiqued in Section 2.4.2). Isolating livelihood assets from one another, as I do below, poses the risk of underemphasizing the interconnections between livelihood assets pertaining to different capitals (see Toner 2003). Therefore, I first review the main components of the livelihood portfolios of the populations from Xiaocun, Zhongcun and Dacun villages and then begin exploring the interrelations among these assets. How these interrelations evolved as the villagers experienced with various drivers of livelihood change will become increasingly clear as my result chapters unfold.

5.5.1 Land, the "villagers life blood"[131]: Natural capital

The natural resource base, and first and foremost its land component, is often disproportionately important for rural societies (Scoones 1998; Whitehead 2002). This is definitely valid throughout rural China (Day 2013; Fei 1992), including in the area where I undertook research. Here, smallholding agriculture is the main occupation and financial income source for over 80 per cent of the 389 adults in my survey. Land resources hold unparalleled importance for these villagers. As Tilt (2010: 91) puts it when discussing the role land exerts within rural societies in Yunnan: "Land is the villager's lifeblood. In addition to being the source of day-to-day sustenance, it also constitutes the only real social security most farmers will ever know". A Handai interviewee, standing with me on his soon to be flooded banana plantations, strongly echoed this sentiment: "This land is our life, you will see things will change a lot here after it is flooded." (X-21, 17 December 2011).

Among all the land resources available in Xiaocun, Zhongcun and Dacun villages, flat land parcels located close to the river are the most fertile, level and irrigated. These lands encompass

[131] Tilt 2010: 91.

two types of land categories, namely contracted arable land (耕地 – *gengdi*) and plots allocated on collective lands (自留地 – *ziliudi*). Contracted arable land was distributed to households after decollectivization (see Sections 4.2 and 6.2.1). *Ziliudi* consists of land parcels that remained with village committees after decollectivization, but over which individuals and/or households have since acquired usufruct right after they converted such fallows into permanent fields and/or plantations. At first, this expansion proceeded slowly because people felt that they had enough land and that reclaiming *ziliudi* was not worth the bother. Now that land is scarcer, however, all high-quality collective land that could be reclaimed is currently cultivated. Also, while very important in the aftermath of decollectivization in the 1980s, the distinction between riverine arable land and *ziliudi* is less so for the younger generation as both types of land now serve the same functions. Indeed, developments in irrigation infrastructure, along with increased usage of chemical inputs have generally erased previous quality differences between both types of land (D-82, 27 February 2012).

The hilly and dry barren lands (荒山/荒地 – *huangshan / huangdi*) also make another land reservoir for the villagers.[132] Like for *ziliudi*, those who bother opening land parcels in the barren lands can acquire usufruct right over these *ziliushan* (自留山) landholding. Before the 2000s, cassava and sesame were usually the sole crops people grew on these steep and dry lands. Cassava and sesame do not require much work, but they also yield only marginal harvests and financial income. Nowadays, forestry bureau regulations compel the villagers reclaiming further *ziliushan* to valorize the barren lands with perennial tree crop plantations. Growing tree crops in such an environment is no easy task, as it requires both terracing work and developing mechanical irrigation networks. Hence, opening new *ziliushan* landholdings has now become a work- and capital-intensive option, as well as a risky strategy. Yet, as we will see in Chapter 6, increased land scarcity along the Red River riverbed adds new incentives for the villagers to claim such lands.

The barren lands comprise another aspect of the natural capital base of the local population, providing the villagers with a host of 'wild plants' (野菜 – *yecai*) and other non-timber forest

[132] Since I concentrate here on how the villagers utilize various land assets, I leave asides state-led projects promoting energy crop plantation expansion in the barren lands (see Section 4.4.3).

products (NTFP) such as game[133] and edible mushrooms and insects. Local people consume these products on a random basis, depending on seasonal availability and the capacity and motivation of the villagers to invest time and energy in hunting/gathering such foods. Nonetheless, the unique taste and quality of these NTFPs are the source of immense pride and an important part of the local culture. Indeed, when tasting a plant or fungus for the first time, I was repeatedly told "这是我们傣族的风味" (*zhe shi women daizu de fengwei*): "this is our local Dai taste". Furthermore, many such products can fetch a considerable amount when sold to local restaurants or passers-by. It is also within the barren lands that people collect most of their cooking wood, an activity governed by the rules from the local Forestry Department. These rules notably state that people cannot cut whole trees to obtain cooking wood. The Dai follow such directives closely – cutting trees is considered inauspicious in their culture anyway.[134] Finally, the barren hills also serve as cemeteries. People sweep the ancestor's tombs once a year in the spring during the Qingming Festival (清明节 – *qingmingjie*) to ensure goodwill from the ancestors, as is the case through most of China.

Many features of the local waterscape form important components of the natural capital base available to the villagers. First and foremost it is water from numerous mountain streams that originate far from the villages and that feed both the Red River and local irrigation networks. Except for the rather rudimentary mechanical irrigation systems some peasants have installed in the barren lands, most village irrigation systems have traditionally relied upon gravitational forces. The villagers share a general consensus that water is becoming more scarce in the valley due to decreasing rainfall.[135] However, while discussing a news report on the drought in other

[133] Hunting is forbidden in the village, but it is still undertaken on a small scale.

[134] Sometimes, other forestry laws are obeyed less strictly. For instance, Yi people from Gejiu sometimes light forest fires so that they can grow swiddens and also to force wild bees to leave their hives to collect and sell the honey and larvae. People living along Yuanyang County shore argue that this behaviour does not happen on their side of the valley since forestry laws are applied more thoroughly in Yuanyang County than they are in Gejiu (X-35, 25 November 2011).

[135] In the 1980s and 1990s, water scarcity was associated with barren land deforestation. However, airborne seed scattering programmes initiated in the late 1990s have expanded willow weed (a small bush) cover in the barren lands (K-2, 12 April 2012). Apart from being used as fuel wood, this bush serves very few livelihood functions. Nonetheless, the villagers concur that the airborne reforestation programmes in the hills have had a direct positive impact on water availability in the valley (D-118, 21 February 2012). That said, the relationship between forest cover and water availability remains highly contested within ecological science, and some have argued that increasing forest cover – an objective central to a great many environmental policies – has a negative influence upon downstream water availability (Calder 2007; Ellison et al. 2012; Malmer et al. 2010).

areas of Yunnan showing on the TV as we were eating dinner, one informant argued that people from the Red River valley are relatively privileged: "There was always enough water here, and there will always be. But people look forward to the rain coming" (D-122, 17 February 2012). Apart from fuelling irrigation networks, rainfall also fulfills specific, irreplaceable agricultural functions, such as allowing for fruit trees to bloom and grass to grow (allowing, in turn, cattle to graze).

Another feature of the local waterscape is the white plastic pipe systems that carry water from the mountain streams to houses for domestic use. Until the late 1990s, villagers used to drink mountain water only, but now they seldom do. Instead, they opt for water bought in 18-litre plastic bottles from the small village shops. Finally, the most imposing body of water around is, of course, the Madushan dam reservoir and its constantly moving shores. The main livelihood activities that the villagers carry out on the reservoir are aquaculture and fishing (see Sections 6.3.1 and 7.3.).[136]

5.5.2 [Three or] *Four generations under one roof*[137]: Human capital

When I asked people participating in my livelihood survey what ranks as the most important assets in their lives, "family" and "good household relations" were mentioned over three times more often than any other answer. Most often, household members span three generations (children, parents, grandparents), although a few households I surveyed also included members from a fourth generation aged in their late 70s or older. Brides move to the parents' house of their new husband by default when they get married to an eldest son. When there are many sons in a family, younger brothers also often stay in the same house as their parents after marriage if the house is big enough to allow for it. Otherwise, these couples move to a new house. Therefore, while the average household in my survey includes 4.7 members, the number of people living under a single roof spans from two to nine. Some 80 per cent of the 493 individuals composing the households I surveyed are aged over 16, while their average age is 32 years (standard

[136] People also leisure fish on tributary streams, but this activity is much less frequent and important than reservoir fisheries. Tributary fishing most often involves a battery and two electrodes serving as poles for an electric current. Fish passing nearby this current jump out of the water where a fish net awaits them. Given the low intensity of the electric current used, this method only allows catching fish no more than a few centimeters long. Tributary fish is considered a local delicacy.

[137] *Four generations under one roof* is the English title from a book by Lao She (1899-1966), one of China's most important literary figures from the XXth century.

deviation 19 years, Figure 5.7). As is the case throughout China, there are more men than women in the villages, here a disequilibrium of 119 men for every 100 women. This value equates to Yunnan Province average, where the sex ratio at birth stood at 120 for 100 in 2007, far above the national average of 109 men for 100 women (Wang et al. 2013).

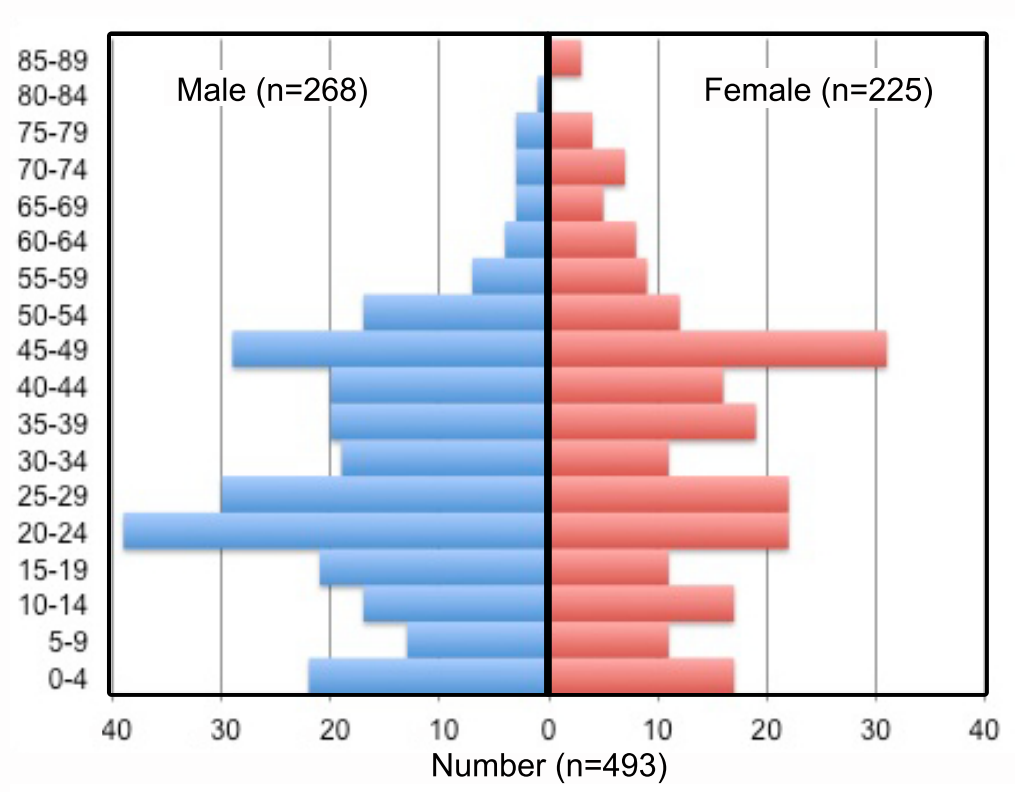

Figure 5.7: Age pyramids for the surveyed population (source: author's survey data)

Children entail extra expenses for households, mostly for food and education. Nonetheless, having boys guarantees that their parents will be taken care of in their later years. Daughters are destined to bring the household a bride wealth and contribute to expanding its social network when they leave the house and move to their in-laws. As for the elderly, while they often necessitate extra medical spending, they also yield extra income due to a new universal rural pension scheme. This scheme provides all villagers aged 60 or above with a monthly 55 RMB ($9.17) stipend, and its implementation in 2011 led one elder to proudly argue: "It is now lucrative to grow old, and it has now became an advantage to have us [the elders] in the household!" (Z-23, 24 November 2011).[138]

[138] For an overview of the importance of elderly poverty in Yunnan prior to the implementation of this pension scheme, see Lu (2012).

Elders possess an important amount of local knowledge about traditional crops, farming practices, NTFPs, culture, beliefs, rites, history, language, and so on. However, the development schemes and processes I discuss in the following subsections have triggered social change that makes such traditional knowledge less important to local livelihoods than in the past. For instance, struggling with increasingly busy schedules, villagers allocate less time to collecting NTFPs than in the past. Likewise, contemporary crops and growing methods share little with those that the elderly master (see also Section 5.6.1).

Formal education levels, often understood as a core variable of human capital (Rakodi 1999), are particularly low in the villages. Indeed, of all 391 individuals aged 16 or above about whom I gathered education level data, only three have attended college, while 265 never made it beyond elementary school. That being said, discussing the wider meaning of education, one informant explains: "There is more in education than children attending school. It also relates to the adults having access to information and mastering techniques" (D-118, 15 March 2012).

Contrary to the case in other areas of southeast Yunnan (Champalle 2012), the state offers no technical agrarian assistance at all in Xiaocun, Zhongcun and Dacun villages. Therefore, people mainly make land allocation decisions based on trial and error, and in imitation of friends and relatives who have adopted new crops and inputs they report to have high yields (X-36, 28 August 2011). This probably contributes to fuelling the overall bad opinion that the villagers have about the government, especially government levels of administration above the village. Indeed, being members of the community, perceptions of the work of village chiefs are more nuanced and generally raise far less critiques. In general, villagers acknowledged the limited powers of the village chief, especially in smaller villages such Xiaocun and Zhongcun. As this interviewee shares about cadres working at higher levels: "the government is not interested in the *laobaixing,*[139] the 'ordinary people' that live here, it is only interested in the big companies that do business here" (D-118, 13 July 2012). This echoes the comment of another informant, who points to generalized corruption as the main reason why authorities allocate little importance to the local population, arguing: "Rather than caring for the people, the leaders only want to 'eat

[139] *Laobaixing* – 老百姓, literally, the "hundred old [family] names".

money' [吃钱 – *chi qian*]" (Z-66, 9 December 2011), using a well-known metaphor people utilize to discuss embezzlement without naming it.

A final aspect of family relations that has a direct influence upon natural capital availability relates to ancestral inheritance rules. These patrilineal rules stipulate that male heirs share the assets of their family when the father dies. This means that landholdings are divided up, and in a context where most productive land is already occupied, more male heirs means more numerous and smaller land parcels.

5.5.3 The home, and the means and ends of agriculture: Physical capital

The physical asset villagers value the most is the home. Buying or renovating the family house is also the first investment they most often commit to when they own sufficient financial resources to deploy livelihood consolidation strategies. The home is simultaneously a multi-generational place where people live, a long-term investment guaranteeing that people will always have a place where they belong, and a vitrine of the social status and wealth of a household. Traditional Handai houses are two storied and made of clay bricks and wood. The ground floor is used for storage,[140] and living quarters are located on the second floor, where partition walls made of planks divide individual rooms. In contrast, increasingly common modern houses are made of concrete and include private rooms as well as a main family room for eating meals, watching television and displaying the ancestors' shrine (Figure 5.8; see also Section 7.2).

A feature common to both types of flattop house is their organization around a fenced-in square courtyard with one main gate. People raising a few chickens, ducks or pigs at home most often do so in the courtyard where they also commonly grow a garden.

[140] While animals used to spend the night on the ground floor of the house, this practice gradually disappeared starting some 50 years ago. This was the result both of houses becoming smaller and people gradually beginning to associate the proximity to animals with improper hygiene (D-118, 6 December 2011).

Figure 5.8: Traditional and modern Handai houses (photograph by author, 2012)

Other livestock include cattle (黄牛 – *huangniu,* lit. yellow cattle) and water buffalo (水牛 – *shuiniu*, lit. water cattle). Cattle are left in the barren lands to graze, and their owners periodically check to ensure their livestock are well or fetch an animal for sale or slaughter. As for buffalo, their owners must retrieve them daily from the grazing grounds and bring them back to the pen for the night. This activity can be quite time-consuming and it is often the responsibility of the elderly, men and women alike. Cattle and buffalo slaughters mostly occur during rite of passage events, the most important of which are weddings and funerals. While few households are involved in raising cattle (See Chapter 6), almost all households own a pig or two. Most pig slaughtering occurs during lunar New Year celebrations. A most common strategy to preserve the pork meat and fat is to cook pork confit, while cattle and buffalo meat is most often dried up.

Other productive agricultural assets include farm tools, the gravitational irrigation channels that bring water to the fields, natural and chemical agricultural inputs, and vehicles that people use to commute to and from the fields and marketplaces. Motorcycles are common and while there are some pedal tricycles around, gas-powered versions of the same vehicles are increasingly frequent. Also, only a few households own a passenger car, a minivan or a pick-up truck.

Villagers whose livelihoods partly or exclusively depend on activities besides agriculture also rely upon the other assets required for carrying out their diverse tasks. These frequently include fishing gear; stalls and weighing scales for people selling fruit along the road; fridges for those that sell consumption goods; and refrigerators and kitchen utensils for those operating food stalls or restaurants.

Physical assets in the public realm include the road network: Dacun village is connected to Nansha by a dust path, while Zhongcun and Dacun villages are located along a main road connecting Nansha to other county cities. This road also used to be a dust path until the early 1980s, and was modernized twice since, including in the early 2010s. The villages also have two elementary schools, one of which is located in Zhongcun and the other in Dacun, and one rudimentary health clinic in Dacun. Electricity first arrived in the villages in 1982 (X-10, 2 April 2012), and now every household is connected to the electricity grid.

5.5.4 Money, and increasing amounts of it: Financial capital

Agriculture, and most particularly selling cash crops, is the main income source for villagers and contributes some 75 per cent of the local economy (See Section 7.3). According to my survey results, the average annual income in the villages was 13,995 RMB ($2,332.50) in 2011, or 3,783 RMB ($630.50) per person aged 16 or above. This value is in line with the average value in Honghe Prefecture, which stood at 3,446 RMB in 2009 ($574) (Honghe Prefecture 2010). Access to financial resources has risen sharply in Xiaocun, Zhongcun and Dacun villages since the mid-2000s. This is mostly a consequence of financial compensation peasants have received in preparation for the partial or complete flooding of their land due to the Madushan reservoir creation. Such payments have been exceptional in two ways: first, they occurred only once; and, second, averaging 54,600 RMB ($9,100) per compensated household, they have involved huge amounts of money from the perspective of the local average annual household income.[141]

Villagers also receive some subsidies from the government. These benefits include, since 2011, the state pension scheme I introduced above, which provides monthly payments of 55 RMB

[141] I thoroughly discuss the financial compensation process and its impacts upon the villagescape in the following chapters (see in particular Sections 6.2.1, 7.2 and 7.3).

($9.17) per month to every person aged 60 or above. Adding to this is a 10,000 RMB ($1,666.67) subsidy that Gejiu Municipality offers to residents in Zhongcun and Dacun villages when they build a new house.[142] Other social benefits include a rural health insurance scheme that costs 50 RMB ($8.33) per household per year and covers a significant portion of health care and medicine fees for the villagers. For instance, one informant explained that after his wife got sick, they had to go to Kaiyuan, located about 100 km away from the villages, and spend over 6,000 RMB ($1,000) for the treatments and the 'red envelopes' they offered doctors "so that they treat her well" (X-23, 22 November 2011). Out of this amount, the public insurance scheme reimbursed them 2,500 RMB ($416,67), leading my interviewee to argue: "Even though health care is still too expensive, the insurance made it possible for my wife to be healed" (ibid.).

Many among my Handai informants were reluctant to discuss their savings openly, considering this matter to be a very personal issue. Therefore, while 46 surveyed households (out of 106) did report putting some money aside, I abstained from inquiring about how much. When asked to list up to three priorities for using their savings, investment in housing was cited most often, followed by education, paying for bride wealth and wedding expenses, healthcare, and farming expenses/investment. In regard to wedding expenses, it is the household of the groom that is responsible for most wedding-related expenses, and it is not unusual for these expenses to total over 50,000 RMB ($8,333), or over three times the average annual household income. The huge banquets characterizing Handai weddings are much more expansive than those in neighbouring midland and highland societies, although bride wealth payments are lower. The family of a Handai bride-to-be usually receives 5,000 RMB ($833) in bride wealth payment, about half of what Miao, Yi, or Hani families expect when daughters leave the household (D-118, 17 February 2012).

Most villagers do not have access to formal lines of credit from local banks or rural credit cooperative branches. However, there does exist an informal credit system, as villagers often contribute interest-free money to their relatives and/or friends for undetermined durations when they are in need, whether for getting married, opening a small store or restaurant, or coping with

[142] By default, people building a new house opt for the 'modern' concrete house type I described above. Xiaocun village is located in Yuanyang County, where such measures did not exist by July 2012.

illness. Members of 28 surveyed households answered that they had debts, of which almost 80 per cent were indebted to family members or friends charging them no interest. However, loans obtained through such informal channels are, on average, smaller than those secured in financial institutions. Hence, the combined debts from my survey participants totalled over 580,000 RMB ($96,667) in early 2012, 60 per cent of which had been borrowed from these informal networks and 40 per cent through official means.

5.5.5 Relatives, friends and *guanxi* alternatives to the state vacuum: Social capital

The informal credit scheme I describe above is a very good example of the importance and extent of social capital in the villages, demonstrating how informal social ties and connections can compensate for a lack of formal institutional support. Indeed, while Hall et al. (2011) document how access to informal credit often drives a spiralling debt process that triggers land exclusion, the inhabitants from Xiaocun, Zhongcun and Dacun scoffed at such a scenario. Likewise, my inquiries about informal loan interest rates and when debtors had to repay loans always triggered either surprise or a laugh, since such considerations are seldom part of the debts my survey respondents accrue. Another dimension that testifies to how social capital influences financial priorities is exemplified by roadside fruit sellers from villages Zhongcun and Dacun. These small traders abide by an implicit pricing regime: it is acknowledged that no trader will suddenly lower prices and conclude a big sale that could potentially 'break the market' (L-124, 27 August 2011).

Social capital also manifests itself in various in-kind and non-financial dimensions. For instance, social capital ensures that literally every villager participates in the banquets organized to highlight the rites of passage characterizing Handai culture, including weddings and funerals. Villagers also tend to help each other in their daily lives. For instance, they share the burdens and expenses related with meal preparation: through very flexible arrangements, different households often eat together and split the responsibilities involved in feeding many people at once. Villagers also pool their work capacity: relatives and friends from different households often work together in the fields, especially during work-intensive periods. Similarly, those involved in exceptional circumstances such as banquet preparation or house construction can generally count on the help of relatives and friends. The same is to be said about fishing activities, as a few villagers most often pair up to install fishing nets in the reservoir, and exchange morning turns so that one

individual does not have to fetch fish every morning. Finally, material assets, including more expensive gas-powered machines and vehicles, are also often held in common and/or borrowed from each other.

Kinship ties influence the decisions villagers take about whom they share these aspects of their daily life with. Villagers tend to privilege pooling their resources with close relatives. In other words, bonding social capital is a common strategy in Xiaocun, Zhongcun and Dacun villages. Yet, clans are not hermetic and bridging social capital among different clans, villages and ethnic groups is also frequent. For instance, everyone from neighbouring villages is expected to participate in rite-of-passage ceremonies and contribute either cash and/or rice when attending weddings, funerals, ceremonies held on the 100th day of a newborn, and so on. Likewise, villagers rely on their personal networks to obtain information on the prices that crops fetch in neighbouring Handai villages, or while negotiating land renting contracts with Yi acquaintances (see, respectively, Sections 6.3.1 and 7.2).

While Handai households rely on social capital to fulfill many aspects from their livelihoods, this does not necessarily mean that they constitute a harmonious society. There are social problems in the villages, and theft is one that villagers discuss openly. Aware of general misperceptions about theft in rural societies, one informant contended:

> A lot of people think that such things do not happen in peasant societies. They are all wrong; it is frequent. Fishnets and fruits, particularly litchis, are often robbed. People even siphon gas from motorbike tanks. However, the worst is definitely when people rob in houses, and this too occurs. Six of our ducks have also been stolen recently (D-118, 8 June 2012).

As explained before, such theft would have been impossible during Maoist rule, and the misconceptions this interviewee refers to most likely date back to the pre-reform era (see Section 4.2).

5.5.6 Livelihood portfolio conclusions

The Handai people my research focuses on are predominantly smallholder peasants who derive the bulk of their income from selling crops they grow on landholdings for which they own either formal or usufruct use rights. They raise livestock and harvest firewood along with edible non-

timber forest products from the arid sloping barren lands that confine the well-watered valley where they live. Good household relations and caring for household members are of the utmost importance for Handai populations, who see taking care of children and the elderly as much more than a set of extra expenses (see Lu 2012). In regards to physical assets, the house tops the investment priorities of the villagers. Many also favour investing in productive goods for either optimizing the output they obtain from their agrarian activities or diversifying their income sources. The compensation payments received by those whose landholdings were partly or totally flooded as a consequence of reservoir creation catalyzed such investment projects. Likewise, those committing to such ventures rely upon friend and relatives lending them money on very flexible terms. This informal credit system is fuelled by mutual trust and it exemplifies an important aspect of the social capital inventory villager livelihoods rely upon. Transcending clan and ethnic lines, the social networks Handai populations partake in allow them to dynamically compensate for the little support state institutions and authorities offer villagers for coping with livelihood change. In other words, bonding social capital is common in my case study villages, and bridging social capital also occurs. For instance, some of my Handai informants take advantage of their relationship with Yi land owners to negotiate lower rent for the land they rent (Section 6.3.1.). Yet there is little opportunity for linking social capital.

Shaking up these livelihood portfolios are two main categories of factors drive livelihood changes. On the one hand there are proximate factors that are having a direct influence upon local access regimes. No such factor has had more consequences upon local livelihoods recently than the renewable energy projects I investigated in Chapter 4. On the other hand are ultimate or distal factors driving socio-cultural changes less specific to the Red River valley, but that nonetheless bear an important influence on my Handai informants.[143] I now turn to these latter features.

5.6 Livelihood change: Becoming more Han and using more money

Xiaocun, Zhongcun and Dacun villages are experiencing thorough socio-economic change. In part, this is linked to the frontier formation endeavour discussed in the introduction to Chapter 4. Indeed, external – mostly Han Chinese – influences increasingly impact aspects of my Handai

[143] See Section 2.2.3 for a discussion of proximate and ultimate factors.

informants' livelihoods. I analyze some of the ensuing socio-economic changes in this section. I first address how my Handai informants experience and navigate Chinese ethnic policies on a daily basis and scrutinize how this affects local livelihoods and how Handai populations foresee the future of their ethnic identity. I then move to analyze similar changes pertaining to the economic realms that also exert an influence on Handai livelihoods.

5.6.1 Minority nationality status and social change: State-subsidized sinization

My Handai informants are very pragmatic, including when it comes to ethnicity issues. As explained above, belonging to a minority nationality grants them more flexible family planning arrangements (see Section 5.3). This is something that is most welcomed and tends to make, at least for some, baby girls as wanted as baby boys (D-118, 17 February 2012). As for the bonus point system favouring minority nationalities at the national university entry exam (高考 – *gaokao*), no one made mention of it in the villages, perhaps because few villagers – though more than in the past – attend college. Similarly, the local government holding autonomy over development policies and minority nationality hiring policies has had very little influence upon daily village life.

Besides the somewhat limited advantages of being a minority nationality, the villagers very seldom instrumentalize or seek to capitalize on their 'Dainess'. Apart from small restaurants located in Dacun, which have signs showcasing 'Dai taste' (傣族风味 – *daizu fengwei*), emphasizing Dai culture to achieve material gain is seldom done in the area. This stands in stark contrast with aspects of ethnic tourism that Han Chinese-run companies promote in Nansha. Most flagrant is the recent implementation of a Dai water-splashing festival held once a year in the spring to convince tourist buses heading for the rice terraces at Yuanyang to stop over in this city with little else to offer to tourists.[144] The Dai people from the Red River valley never performed water-splashing in the past, but its popularity among tourists partaking in Dai ethnic tourism in Xishuangbanna means that this rite is now recognized as a main marker of Dainess throughout China.[145] Some Dai groups now see this reframing as an opportunity to achieve financial income,

[144] This is partly because Nansha is a new city created to host the seat of Yuanyang County government. The former capital was located in the highlands, in Old Yuanyang city (原阳新街镇 – *yuanyang xinjie zhen*) and government bureaus moved in 1997 because the geography of this area did not allow for any further expansion.
[145] For a description of how this rite is practiced in Jinghong, the capital of Xishuangbanna, see Komlosy 2004.

regardless of whether they traditionally practiced water-splashing or not (Casas 2007; Huang 2003).[146] This monetization of an external approach to Dai culture has yet to manifest in Xiaocun, Zhongcun and Dacun villages. Indeed, none of the villagers I interviewed had ever attended the local watersplashing festival, nor knew anyone who ever had. My informants further argued that water splashing made no sense to them and was not worth the bother (X-15, 28 August 2011; D-118, 2 April 2012).

That being said, other aspects from Han culture do percolate into the villages, similar to the pattern Henin and Flaherty (1994: 223) uncovered in Xishuangbanna: "The Dai, as valley dwellers, live closest to the Chinese towns, which are centres of economic change and nodes for the diffusion of information and new technology. They are the first to directly encounter the forces of modernization being introduced in the region". In other words, a river valley setting and a sedentary population create fewer "degrees of friction" (Scott 2009: 166) against influences driving social change than do highlands settings and social structures. For Scott (ibid.), these influences are carried by "distance-demolishing technologies: bridges, all-weather roads, forest-felling, accurate maps, and the telegraph". Although Scott writes here about the pre-World War II Southeast Asian Massif context, this argument still holds today: Mandarin Chinese, Chinese language schools, TV programmes, modern seeds and chemical farm inputs, cellphones, internet cafes, tourist buses, and so on are all among the contemporary distance-demolishing technologies driving social change in the Red River valley, and apart from the tourist buses heading for the rice terraces at Yuanyang, all these aspects are more present in these lowlands than in contiguous mountain settlements.

When I asked one of my informants about the fate of the Handai people and their culture, he placidly answered that: "We are becoming more and more Han. The Handai as we know them today might disappear in the short- to medium-term" (D-118, 9 March 2012). Further pursuing this with the father of this same informant, I learned more about how state-making technologies (Scott 1998; see also Scott 2009) have wide-ranging cultural impacts transcending their original function:

[146] For discussions on how ethnic minorities from neighbouring Guizhou Province negotiate their participation in ethnic tourist circuits see Cornet (2012) and Oakes (1993).

> In the past, we used to tattoo newborn babies with a sign that identified their origin. Fighting was frequent, and this [tattooing] allowed us to make sure that the deceased would be brought back to the village and buried with their ancestors. However, tattooing is painful, and since we now have identity documents, there is no need to tattoo the young anymore (D-122, 17 March 2012).

Another aspect of Handai culture that the villagers are rapidly relinquishing is the influential role of the shaman in traditional village life. First, increased access to Chinese and western healthcare either in the villages or nearby cities means that villagers are relegating traditional medicine to a lower rank. As this villager explains: "When someone got sick in the past, the Shaman was the only option to get treatment. Now when someone gets sick, we will go to the hospital first, and ask the shaman to come 'sing songs'[147] in our house if it does not work." (Z-85, 24 November 2011). Second, the young generation shows limited interest towards shamanism, both as a vocation and a tradition they valorise in their life. One adult in his late twenties explained: "young people are not really interested in the shaman, but we know it is important for the elderly" (D-86, 13 December 2011). This quote highlights the importance that Handai populations allocate to respecting the elderly, which my informants ranked among their highest values in my livelihood survey (Section 7.2). Also, further detailing how this disinterest in shamanism came to be, another informant argued: "While the Cultural Revolution was the first blow to our folk culture,[148] the current period will probably have an even greater impact in making this tradition less and less important" (D-118, 10 December 2011). Traditional dances and songs, including those people sing during weddings and funeral rites, also count among the aspects of Handai culture that are now mastered by only a few elders and that the youth show no interest in perpetuating (D-122, 6 March 2012).

In addition, the Handai language is not taught at school, and teachers – all from other areas – are not proficient in it.[149] Discussing schooling language, one father of an elementary school student

[147] Shamanistic rites last for hours, during which the female shaman recites prayers in a trance. My Handai informants call this action 唱歌 – *changge,* literally: singing songs.
[148] Shamanism was among the local atavistic practices deemed 'superstitions' and thus banned during the Cultural Revolution.
[149] The 2001 Regional Autonomy Law for Minority Nationalities states that "Schools where most of the students come from minority nationalities should, *if possible*, use textbooks printed in their own languages, and lessons should be taught in those languages" (PRC 2001, emphasis added). The absence of educators trained in minority nationality languages often makes it impossible to achieving this objective (Teng 2001). To this one can obviously add the *de facto* unavailability of textbooks for oral minority languages such as that of the Handai.

argued: "They do not teach Handai at school since not enough people speak it and because it is not written. Anyways, I think it is important that my daughter learns Chinese at school, otherwise, where would she learn it?" (S-36, 15 February 2012). Television is another important window into Han Chinese culture for the Handai, and reflects how the Han majority frames the cultures of nationality minorities (see Gladney 1994). The government is keen to exploit the cultural influence and potential economic returns that access to television sets and satellite dishes makes possible and subsidizes these consumption goods in the villages (see Duncan 2004). The local population is aware of the influence that TV impels on them, and as a villager frames it: "The main reasons why we are becoming more and more Han are television and the economy" (D-118, 8 June 2012). In other words, increasing commodity ownership, in some cases sponsored by the government, participates in creating new subjectivities in the Red River valley (Chapter 7; see also Nevins and Peluso 2008).

Before I address how economic change unfolds in the following section, it is important to highlight that socio-cultural change is not a one-way affair. The conclusion from Berlie (1991: 12) that Sinization occurs side-by-side with "Daization" in the villages he studied, mirrors what I found the Red River valley. For instance, while forbidden in the past, inter-ethnic weddings are increasingly common in the villages. Partly because of sex ratio at birth values, increasing numbers of Handai men get married with women belonging to other ethnic groups, and mostly from the highlands. These women typically move into the household of their Handai husbands and must adopt the local language and abide by Handai customs (though they are not forced to negate their own). I had regular discussions with one Yi woman who had recently moved to the house of her Handai in-laws and who explained "it usually takes two to three years for people like me to be able to speak the language properly. We sometimes feel lonely and miss our homes and families" (D-123, 6 March 2012).

5.6.2 Economic change: "Water is not free anymore"[150]

Closely related to social and cultural changes are new economic realities, beginning with the rapid monetization of village life.[151] For instance, discussing how the relationship of villagers

[150] L-32, 23 August 2011.
[151] For an overview of how this process unfolded in Dai villages from Xishuangbanna, see Yot (2011).

with money has evolved, this informant explained:

> We drank mountain water until the late 1990s. We were not getting sick from it. Now, water is not free anymore and we have to buy bottled water. We have to buy everything. Our lifestyle has changed a lot. We make and own more money, but I am not sure if our situation is really getting better than it was before (L-32, 23 August 2011).

Like this interviewee, other villagers have the impression that this new economic outlook is not turning to their favour. For instance, one informant felt that the way prices have evolved over the last few years has had a two-fold negative influence upon his situation: "The problem is that inflation only affects us in a negative way: the price we pay for pig meat increased threefold since 2007, from about 6-7 RMB ($1-1.17) per *jin* (斤)[152] to about 20 RMB ($3.33), while the price of the fruit we sell has remained the same" (L-118, 16 December 2011). In regards to house prices, another villager argued: "Our income increased, but so did our living expenses. For instance, hiring construction workers to build a house used to cost 55 RMB ($9.17) per square meter in 1996. Now it costs at least 180 RMB ($30)" (L-58, 15 March 2012).

That being said, economic development also brings welcomed changes, including the enhancement of transport and road infrastructure. Tourism infrastructure development in Yuanyang, due to this area recently joining the UNESCO World Heritage list, means that vehicles traveling through Zhongcun and Dacun villages are increasingly numerous, boosting retail opportunities. Road development has been slower in Yuanyang County than in Gejiu Municipality, explaining why Xiaocun village was still connected to Nansha by just a dust path when I completed fieldwork. However, preliminary paving work had begun and was slated for completion by late 2012. While this involved the re-organization and move of his pig pen (as it was too close the road), one villager was optimistic about the new infrastructure: "Like all the other villagers, I am very happy with the new road coming. It will be easier for us to go to sell our products in Nansha. Also, there will be more traffic and less dust in the village." (X-23, 23 February 2011).

In sum, these socio-cultural and economic processes either directly drive the livelihood diversification strategies I further discuss in the following chapters, or they exert an influence

[152] One *jin* equals half a kilo. The *jin* is the most widely used weight unit in China.

upon how villagers cope with changes in their access to the assets they utilize to make a living. Also, a characteristic common to many of the processes I unpacked in this section is that actors external to the Red River valley often initiate or control the processes driving cultural change in the villages. Unfortunately, when this occurs, these actors tend to provide the local population with the bare minimum of support to adapt.

5.7 CHAPTER CONCLUSION

By combining ethnographic data with secondary sources, in this chapter I have examined the geographical and social contexts that characterize the section of the Red River valley where I undertook my research. I first highlighted a range of important physical geography features of the Red River valley, including key aspects of the hydrological regime of the Red River. Moving on to the human geography of this area, I argued that when it comes to how ethnic relations unfold in the Red River valley, the Chinese state and its ethnic classification system hold considerable sway. Then, introducing the Dai people in general, followed by Handai populations in the Red River valley in particular, I highlighted some of the obvious limits inherent to any such state classification endeavour.

To complete a nuanced analysis of the socio-economic features of the populations from the three villages where I carried out fieldwork, I adopted a livelihood studies-inspired approach. I analyzed core aspects of the ways the populations of Xiaocun, Zhongcun and Dacun villages make a living. Notably, I highlighted how land, family members, the house, personal networks and financial assets are all implicated within complex livelihoods portfolios. These findings are important for adding nuance to the answers I provide to Research Questions 2 and 3 – in the result chapters to come – relating to how my Handai informants frame the assets with which they build their livelihoods. I finally explored how Handai populations in Xiaocun, Zhongcun and Dacun villages are experiencing rapid socio-economic changes, and how, along with the renewable energy development schemes I previously scrutinized, these changes are influencing the livelihood changes that are rapidly unfolding. These features combine in forging the diversification strategies that are the focus of my second and third research questions, and which my core result chapters examine at length.

CHAPTER 6

ON-FARM LIVELIHOOD CHANGES: "THIS LAND IS OUR LIFE"[153]

6.1 INTRODUCTION

I argued in the previous chapter that the Dai people are strongly attached to their land, or as Jean Michaud (2011: 216) frames it, they are a "profoundly territorial group". Michaud further explains that for such groups, "a territorial fragmentation or the plain political disappearance of their customary domain has been, and for many still is, traumatic" (ibid.). One informant used a different vocabulary to describe this state of affairs, as quoted in an earlier chapter, "this land is our life, you will see things will change a lot here after it is flooded" (X-21, 17 December 2011). In this chapter, I investigate such changes within the on-farm component of Handai livelihood portfolios, contrasting them to literature suggesting that livelihood diversification involves land resources decreasing in importance for rural societies in Southeast Asia and elsewhere in the Global South (see Section 2.4.4).

Janet Sturgeon (2005: 9) coined the notion "landscape plasticity" when studying highlander Akha (Hani) swiddener farmer societies in the China-Thailand borderlands. This concept grasps how people perpetually re-mould their land uses and optimize their cultures to adapt to changing agricultural conditions and shifting political circumstances (see also Brookfield 2001). Yet, compared to such other ethnic groups across the Southeast Asian Massif, Dai landholdings and farming regimes have generally been stable through time.

Contrasting with Akha farming regimes, natural flooding and wet rice farming have traditionally allowed for annually renewed fertility over the Handai's permanent lowland landholdings, eliminating the need for these farmers to regularly relocate their fields or constantly reorganize their farming systems (Section 5.3.2; see also Bray 1986). This obviously does not guard Handai populations against having to adapt their farming practices to environmental hazards and social changes. Yet such adaptation strategies have not been as central to Handai livelihoods as they are

[153] X-21, 17 December 2011.

to the Akha people with whom Sturgeon works. As such, the impacts and consequences of the on-farm changes renewable energy schemes have driven and/or influenced in the villages cannot be overstated. This chapter scrutinizes how farming regimes have been transformed in Xiaocun, Zhongcun and Dacun villages since the mid-2000s, and to what extent the Red River valley dam and plantation schemes have been involved in these on-farm changes.

More particularly, in Section 6.2.1 I document the impacts of reservoir creation and jatropha expansion on farmland availability in Xiaocun, Zhongcun and Dacun. Notably, I demonstrate that land scarcity was already a preoccupation in the villages in the early 2000s, and renewable energy schemes have worsened this problem. In Section 6.2.2, I investigate how villagers reacted when they began experiencing renewable energy development-driven exclusion. A transition period occurred between the moment when the villagers learned about the upcoming flooding and the flooding itself. I find that how the villagers adapted their farming practices during these insecure times contextualizes the strategies they came to adopt when exclusion became permanent. In Section 6.3, I explore these long-term on-farm coping strategies. In doing so, I first address how peasants have expanded the cultivation of crops over any piece of land still available in the Red River valley (Section 6.3.1). I then consider the diversified ways in which they have re-organized their farming regimes in order to produce more food and derive higher incomes from their lands. These tactics have included the rapid adoption of cash crops (Section 6.3.2) along with important increases in agricultural chemical inputs (Section 6.3.3). Finally, in Section 6.4 I analyze how renewable energy development, along with other factors, has convinced many peasants to abandon cattle rearing, which now plays a far lesser role in Handai livelihoods than in the past.

As will become clear, the data I introduce in this chapter answer my second research question inquiring: *How is the implementation of renewable energy projects affecting and shaping on-farm components of Handai household livelihoods, especially access to land; and how do Handai smallholder agriculturalists perceive these changes?* This chapter sheds light on how renewable energy schemes have modified access to land, how Handai peasant farmers have reshaped the on-farm components of their livelihoods, and what they make of all these transformations.

6.2 BEFORE AND DURING LAND FLOODING

6.2.1 Historical farmland availability: A rollercoaster ride

As already outlined, China has undertaken a host of capitalist market reforms starting in the early 1980s, including, for agriculture, the implementation of the Household Contract Responsibility System (Section 4.2). In the Red River valley, the first and foremost impact from this reform was that, overnight, peasants gained usage rights over contracted land parcels. The guidelines overseeing this land reform in Xiaocun, Zhongcun and Dacun villages allocated a total of 0.8 *mu*[154] of arable land (*gengdi*) to each individual, regardless of sex or age. In order for this process to be equitable, the local authorities first categorized arable land parcels into different quality grades, depending mainly on slope and irrigation criteria (X-19, 29 November 2011). Subsequently, the authorities allocated equitable portions of each land grade to each household. Since these plots were often non-contiguous, interviewees explained that this reform initiated a land parcelling process that local inheritance rules have since amplified. Further detailing how land parcelling affected his family, one informant in his thirties explained:

> My parents have had five boys. Me and two of my brothers where born before they separated the land (分地 – *fendi*). Since my grandmother was still alive, our household received three land parcels totalling 4.8 *mu*. After my father died, we divided the land into five parcels, and each of my brothers and myself got less than one *mu* (X-31, 5 March 2012).

Further commenting on the influence of the land reform and its aftermath, another Handai informant now in his sixties argued that:

> 0.8 *mu* per person was actually quite a lot of land in the early 1980s. We then mostly grew rice, there was no rotovators and we used almost no chemical fertilizers or pesticides. However, before the reservoir was created in the late 2000s, some among us already felt that land was getting scarce, especially in households with many male heirs. Land flooding just made the problem much more significant (D-118 father, 17 March 2012).

In other words, reservoir creation aggravated an already emerging land scarcity problem. Although population growth-driven land scarcity was obviously predictable when land was decollectivized in the early 1980s, it was not a priority for the authorities then. Therefore, after Handai households obtained their contracted landholdings, remaining arable land parcels in the

[154] 1 *mu* = 1/15 ha = 0.07 ha.

valley were allocated to Yi people from neighbouring villages, as land availability and degradation were more acute in the midlands than in the valley. A few decades later, the outlook for land availability in the valley has changed drastically.

According to my survey data, arable land and *ziliudi*[155] availability totalled just 0.5 one *mu* per person in 2006. By 2011-2012, this value had more than halved to 0.26 *mu*. In the meantime, almost half of the arable land previously available has been flooded, and 52 per cent of the *ziliudi* the villagers harvested five years earlier in 2006 is no longer available (Tables 6.1 and 6.2).

Table 6.1: Total arable land and *ziliudi* availability in 2006 and 2011-12, *mu*

	2006			2011-12			Percentage loss		
	Arable land	*Ziliudi*	Total	Arable land	*Ziliudi*	Total	Arable land	*Ziliudi*	Total
Xiaocun	93.7	26.6	120.3	59	18.6	77.6	37%	30%	35%
Zhongcun	111.1	20.5	131.6	60.1	8.9	69	46%	57%	48%
Dacun	206	83.6	289.6	91.6	35.1	126.7	56%	58%	56%
Total	410.8	130.7	541.5	210.7	62.6	273.3	49%	52%	50%

(source: author's survey data)

Table 6.2: Per capita arable land and *ziliudi* availability in 2006 and 2011-12, *mu*

	2006			2011-12		
	Arable land	*Ziliudi*	Total	Arable land	*Ziliudi*	Total
Xiaocun	0.65	0.18	0.83	0.41	0.13	0.54
Zhongcun	0.30	0.06	0.36	0.16	0.02	0.19
Dacun	0.39	0.16	0.55	0.17	0.07	0.24
Total	0.40	0.13	0.52	0.20	0.06	0.26

(source: author's survey data)

Land flooding from the time water started to rise in 2010 impacted a very high proportion of the households from Xiaocun, Zhongcun and Dacun villages. Of the 106 households I surveyed, 104 owned land use rights in 2006 and among these, no less than 83 households (78 per cent) lost

[155] Non-contracted riverside land over which the villagers have acquired usufruct right.

arable land and/or *ziliudi* due to the creation of the Madushan reservoir.[156] Land flooding did not differentiate between land-rich and land-poor households (Figure 6.1).[157]

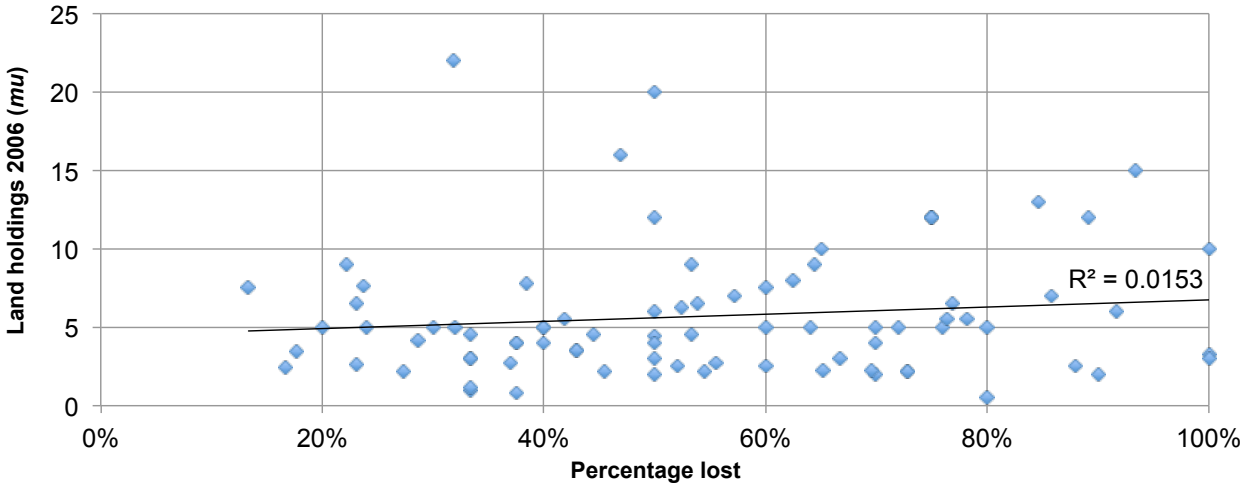

Figure 6.1: Landholdings in 2006 and percentage lost per household (source: author's survey data)

Land flooding did, however, affect the three villages in my study to a different extent. The impacts of reservoir creation were greatest in Dacun village, where no less than 56 per cent of all available lowland landholdings have vanished, compared with 48 per cent in Zhongcun and 35 per cent in Xiaocun village (Table 6.1). Further, three households out of 104 in 2011 were forced to leave agriculture altogether because all their land was flooded, one of which is located in Zhongcun and the other two in Dacun village. Discussing this situation, one informant stated: "this is quite ironic; the land closest to the river has always been the most prized in the villages, because it is flatter and more fertile. The reservoir changed this" (D-6, 9 March 2012). However, this change did not occur overnight, and I now scrutinize how the villagers coped as the reservoir gradually claimed their land.

6.2.2 Perceptions and strategies as the water rose

It was in 2008 that local authorities first told the villagers that land flooding would occur in Xiaocun, Zhongcun and Dacun and began distributing financial compensation of 21,000 RMB ($3,500) per *mu* of land that the reservoir would submerge (X-21, 17 December 2011). Differing

[156] As mentioned in Section 4.4.1, reservoir creation did not lead to households being resettled in the case study villages.
[157] The low correlation value between the area these households owned in 2006 and the proportion of it that was flooded testifies to this (r^2: 0.01).

perceptions and conceptualizations of land resources held by authorities and the peasants tainted this compensation process. As I demonstrate, these misconceptions sometimes left villagers highly unsatisfied with the compensation they were offered.[158]

An initial problem associated with the compensation process related to the criteria the authorities used when they assessed the land which was to be inundated. All contracted arable land that would disappear under the water surface was accounted for, and people that lost *ziliudi* generally received compensation for it. However, land surveying was not flawless, and a few informants complained that they have not received compensation for portions of their *ziliudi*. For instance, one peasant who lost four *mu* of *ziliudi* he used to harvest during the dry season explained:

> The government said that the land was flooded when people surveyed the area. Even though I harvest this land year after year, they would not compensate me for it. Land parcels next to mine are just a little further from the shore and were accounted for, but not mine. More than half my land is gone and I received nothing. This is very unjust, but there is nothing I can do about it (D-38, 12 March 2012).[159]

Nevertheless, such surveying miscalculations were apparently the exception rather than the rule since only a handful of villagers complained about this specific aspect of the process.

More common grievances vilified the establishment of different compensation rates based on the crops grown in soon-to-be inundated areas. Authorities first set a compensation of 21,000 RMB per *mu* of wet rice field but ruled that banana plantations would receive compensation at a rate a few thousand RMB lower.[160] This plan to value land based on which crops were grown on it faced great resistance. The main argument that annoyed villagers conveyed was that:

> Classifying land according to what is grown on it at a precise moment makes no sense, since we grow both rice and banana over the same land. We grow more bananas because we make money from it, but we still have to harvest rice at least once every two years for the land to remain fertile anyway (D-102, 7 July 2012).

[158] I scrutinize how the compensation process influenced access to financial capital for the villagers in the following chapter.
[159] "There is nothing I can do about it" is a pale translation of the Chinese expression 没办法 – *mei banfa*, often heard in the villages.
[160] While bananas and rice remain the most widely grown crops in Xiaocun, Zhongcun and Dacun today, they were even more predominant in local farming regimes when compensation payments were set (see Section 7.2).

At a certain point, the villagers felt that their grievances had remained unheard for too long, and some decided to move their protest to the prefectural capital, Mengzi. The villager quoted above took part in the overt demonstrations and explained:

> Along with about 100 villagers, most of whom came from Dacun village, we went to Mengzi and chanted slogans in front of the government buildings. Soon after we got there, there were about 200-300 policemen heading our way, so everyone got scared and started running. No one got arrested, but the protest ended there. Later, people from the government came to the village to negotiate. They agreed to level compensation payments for both banana plantations and rice fields at 21,000 yuan per *mu*. I am sure that we could have gotten better arrangements if more villagers had come to Mengzi, but people were scared (D-102, 7 July 2012).

A third concern with the compensation schemes that villagers commonly expressed was their general impression that they were entitled to much higher compensation payments. They blame corruption for the gap between the sums they felt they deserved and what they received. Many informants regularly noted that *Honghe Guangyan*, the hydropower consortium, paid the provincial government over 60,000 RMB ($10,000) for each *mu* of land flooded after the creation of Madushan Reservoir. The villagers blamed corruption for the 40,000 RMB per *mu* ($6,700) gap between that sum and what they received. An oft-repeated argument was that the provincial, prefectural, and county (Yuanyang) or city (Gejiu) authorities had all "eaten" their share of the money before the remnants trickled down to the local population (Z-75, 22 August 2011).

There is indeed evidence that supports the claims from the peasants that money has been embezzled. First, the amounts that the Handai farmers received do not correspond with the guidelines from the national policy regulating land compensation for reservoir-flooded areas (PRC 2006). The policy states that such payments should equal 16 times the pre-flooding triennial average value of the agricultural production derived from flooded land (ibid.). Based on my household survey, the value of the agricultural production grown on one *mu* averaged 2,000 RMB ($333) in 2011-12. However, this value also accounts for barren land areas totalling almost a third of all landholdings under cultivation, and where farming activities are much less productive than in the valley. Therefore, this same 2,000 RMB/*mu* figure appears as a very conservative estimate for the 2008-10 period; by this measure, these peasants should have been entitled to a compensation of at least 32,000 RMB ($5,333) per flooded *mu*, not the 21,000 RMB they received.

A Kunming-based scholar informing my research agreed that the villagers indeed did not receive sufficient compensation. Centering his argument on land rental fees, he stated: "People frequently rent land for 1,000 RMB ($166.67) per *mu* per year in Honghe Prefecture. Compensation equalling 20 times the yearly rent is definitely insufficient. People should have gotten at least 30,000 RMB ($5,000)" (K-2, 4 September 2011).[161]

Most reservoir creation-induced flooding occurred in 2010, although some riverside areas were inundated for the first time the following year. Yet the villagers first received compensation for their soon-to-be-inundated land in 2008. Since no government stakeholders accepted my interview requests positively, I cannot assert the reasons or motivations behind such procedures. That being said, one informant argued that paying peasants in advance served the government in at least two important ways (X-10, 2 April 2012). First, if the compensation value-setting mechanisms were to take the market value and/or agricultural production of the land into account, it was clearly advantageous for the government to set compensation arrangements as early as possible. Land value and farm yields rose rapidly and steadily over the preceding decade, the longer the government waited to compensate farmers for the land, the higher the payments would have to be set. Second, handling compensation before flooding served to contain protest from the villagers. As the above informant discussing the reasons why the government was eager to compensate the villagers as soon as possible explained, "it is normal that people accepted the money they were offered, since the amount was so significant and they had not experienced the negative consequences yet" (ibid.). In other words, the chosen approach presented the villagers with a *fait accompli* when the water started rising.

The villagers knew that the water would start rising at some point after they received compensation. Yet, they were never able to access information on how the hydropower company would operate the Madushan Reservoir. In 2009, workers from the Yuanyang County and Gejiu Municipality forestry bureaus cut down riverside mango and litchi trees in the villages, confirming that the water levels would begin fluctuating soon (D-86, 16 December 2011). From that moment, those who had received compensation faced dilemmas regarding what to do with

[161] I further discuss the emergence of a land renting market in Section 6.3.1.

their riverside landholdings and when. They adopted one, two, or three of the following land allocation strategies.

Firstly, some decided not to take a risk and stopped planting crops on land located close to the shore. Others sowed crops and invested both labour and farm inputs into plots near the reservoir just as they would in other areas, although they knew the outcome was uncertain. Of those who opted for this second approach, some benefited from one or several more harvests. Others were not as lucky and lost their investment altogether because their crops were not yet mature when the land was flooded. Thirdly, some villagers chose an in-between strategy, investing less work, fertilizers and pesticides in fields located on soon-to-be flooded areas and/or specifically growing crops that required less fertilizers and pesticides on these lands. For instance, some of these villagers decided not to sow new banana seedlings and rather let banana suckers grow for more cycles than they would normally allow.[162]

Trial and error was central to all three strategies, as farmers could not access any information to guide their land allocation decisions. For instance, after one informant learned that his household would eventually lose 70 per cent of the four *mu* it owned, he initially decided to keep cultivating his waterside land until the last moment. However, after one of his parcels sown with immature papaya trees was permanently flooded, he reconsidered what crops he should grow on his other land near the reservoir. Instead of opting for papaya again, a crop that requires about nine months and substantial amounts of fertilizer to start yielding fruit, he decided to sow a combination of rice, local yam (山药 – *shanyao*) and taro (芋头 – *yutou*). While these latter crops offer much lower potential financial gains than papaya, their growing cycles are much shorter and only the rice requires fertilizers and pesticides (D-108, 17 March 2012).

In sum, the period prior to and during reservoir creation was a time of significant uncertainty regarding compensation mechanisms, with villagers contesting how the authorities measured and allocated value to their soon-to-be flooded land, as well as the corruption that most likely tainted

[162] Banana suckers are the small plants that grow at the bottom of banana plants. Most often, villagers growing bananas first sow banana seedlings they buy and get a first harvest about nine months later. They then cut the plant and all but one sucker, letting this main sucker grow so as to obtain a second harvest. Since banana yields decrease rapidly after two such cycles, and in order to revitalize land fertility, peasants then usually flood their land and grow wet rice for one harvest. The banana cycle then starts again (X-21, 17 December 2011).

the distribution of compensation money. Peasants then had to cope with uncertainty regarding when their land parcels would gradually disappear under Madushan Reservoir water, and were forced to base their land allocation decisions on trial and error processes. While these circumstances and strategies were transitory, I now turn to examine how people cope with the new, permanent conditions that now characterize their farming regimes.

6.3 AGRARIAN DIVERSIFICATION STRATEGIES: THE QUEST FOR NEW LANDS AND MORE FOOD

On-farm livelihood diversification pathways often involve peasant farmers allocating additional labour and resources towards achieving agricultural expansion and/or intensification (Section 2.4.4).[163] The flooding of significant portions of arable and *ziliudi* lands in Xiaocun, Zhongcun and Dacun villages catalyzed these processes in two distinct manners. Firstly, people who lost land had to reallocate the resources they had previously invested in their riverside landholdings towards other farming activities. Secondly, flooding also compelled the villagers to compensate for the resulting losses in their livelihood portfolios.

6.3.1 Relocating agriculture: Farming anything that can be farmed

After being deprived of important portions of their farmlands, some villagers turned to three distinct environments to relocate their agricultural practices: lowland Yi landholdings, barren lands, and the reservoir. Land adjacent to the contracted plots belonging to Handai farmers were allocated to Yi individuals during decollectivization. As explained in Section 6.2.1, at that time there was more land in the valley than what the local people could farm, while populations from the midlands were struggling with land scarcity and degradation. Likewise, migration from the countryside – and especially Yi populated midlands – to urban areas was not yet as frequent as today. Indeed, the legal guidelines overseeing such movements were much more restrictive in the 1980s,[164] while the needs for cheap and malleable labour in urban areas were still widely fulfilled

[163] For an overview of the literature about agricultural intensification and how this concept evolved since Ester Boserup (1965) addressed Malthusian scenarios, see Brookfield (2001), Netting (1993) and Stone (2001).

[164] The *hukou* (户口) household registration system oversees such migrations. The *hukou* establishes the permanent residence of any Chinese resident and whether one belongs to the urban/non-agricultural or the rural/agricultural population; along with the social benefits to which that person is entitled. From the late 1950s to the 1990s, this system was a powerful tool for controlling population and labour movements in China. However, growing demands

in-situ by the local population. Accordingly, even though their lowland landholdings were located a few hours travel from their midland villages, it used to be worthwhile for Yi people to commute to the valley. Their motivation for doing so was mainly economic, as they could derive much higher yields in the lowlands than from their land in the mountains.

The perspectives for internal migration in China have changed drastically since the late 1990s, and correspondingly, so has the social structure within Yi villages. Indeed, as one Handai interviewee explains: "Now many Yi people *dagong* (打工 – engage in work migration), and most of those who remain in the villages prefer not bothering coming to the lowlands; they prefer farming the land nearby their house" (D-118, 21 February 2012).[165] Accordingly, large tracts of land that had been allocated to Yi households remained either unfarmed or very extensively farmed in the lowlands, and the announcement of the Madushan reservoir creation catalyzed a new land-renting market for these lands beginning in 2008.

In 2011-12, based on my survey results with Handai farmers, members from 38 households out of 106 (36 per cent) cultivated some land that they did not own. Thirty (79 per cent) among these tenants explained that the main reason why they rent land is that their own holdings are too small. All tenants but one rented land located in the valley, and they together rented a total of just over 100 *mu* of riverside landholdings.[166] Rental arrangements for two-thirds of this area date from after 2008. Of those 100 *mu*, 67 *mu* belong to Yi people from neighbouring villages, including some 40 *mu* under contract since 2008 or later. This last value corresponds to new farmlands Handai have been able to access since they initially learned about reservoir creation. This new land thus partially compensates for the loss of some 260 *mu* of similar lands to the reservoir (Figure 6.2).

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for cheap and malleable labour have since convinced the government to relax the *hukou* system and tolerate – if not encourage – rural to urban migration. *Hukou* changes nonetheless remain difficult, and most of the Chinese floating population, amounting to over 150 million people, lives in a legal grey zone. For instance, domestic migrants are not entitled to the same social benefits as those offered to the formally registered *hukou* population (for background information on the *hukou* and *hukou* reforms, see Chan and Buckingham 2008, Chan and Zhang 1999; Froissart 2013; Han 1999).

[165] As is the case in other areas in rural China, most migrants belong to the active population, while people that remain in the villages are mostly elderly and children. For an outlook of the social consequences from such pattern, see: Ye and Lu (2011); Ye et al. (2013).

[166] The sole exception being a person renting 1,000 *mu* of land in the barren lands. I further investigate this case in a later paragraph focusing on agricultural expansion in the barren lands.

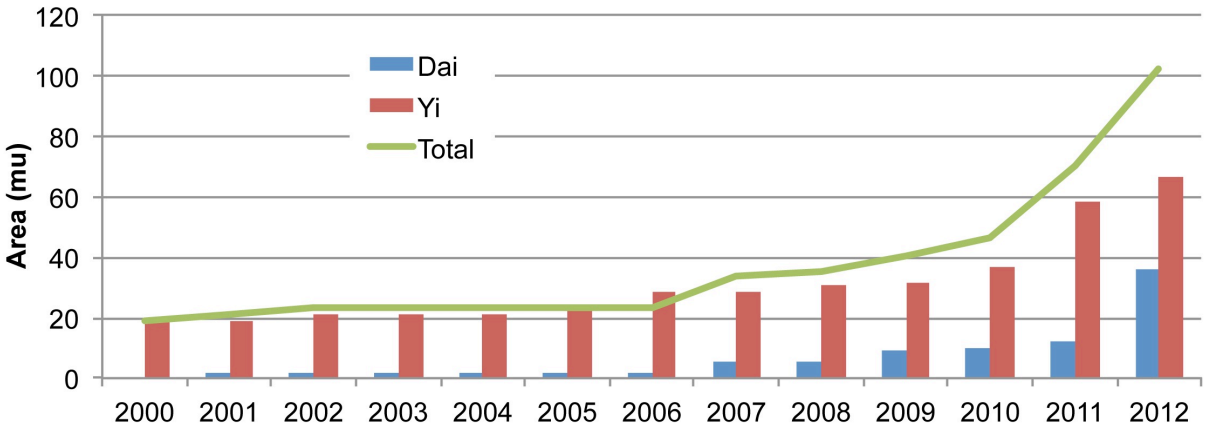

Figure 6.2: Rented landholdings and ethnicity of landlords, 2000-12 (source: author's survey data)

Thirty-two land tenants pay their landlords in cash. In 2011-12, yearly rents averaged 710 RMB ($118) per *mu*, but ranged from 200 to 1,600 RMB ($33-$267). After a dinner I attended with Yi farmers who had come to Dacun to negotiate land renting arrangements and potential Handai tenants, one Handai informant explained:

> When you personally know the Yi people you want to rent from, they ask about 600-700 yuan ($100-117) per *mu* per year. We are negotiating to rent their land for 500 yuan ($83). It is really cheap. If the Yi knew how much income we can make from their land, they would ask us for more money, and we would probably pay it (D-101, 21 February 2012).

As the above quote exemplifies, social ties – including interethnic ones achieved through bridging social capital (see Section 2.4.2) – influence land rent prices as, most likely, Yi ignorance of the productivity of lowland farm systems. Likewise, a host of other criteria relating to land conditions and agricultural potential also add to this. For instance, one of my Handai interviewees explained that he had just begun cultivating a 0.2 mu parcel belonging to Yi friends who did not ask their new tenant for a rent. This resident from Dacun village explained that such arrangement was a win-win situation:

> This land had not been cultivated for at least three years, and it was in bad shape. When we got it, there were no irrigation channels, lots of rocks and we had to level it. So we had to work hard and the land is much better now. I am quite sure the Yi owner will let us use it for free for at least the next three years. Then, he might ask for rent (D-118, 21 February 2012).

Finally, a further three households secured a contract farming arrangement under which they agreed to pay their Yi landowner in rice, with yearly dues reaching 350 to 400 kg of rice per *mu*.

Although the Handai most often consider land renting arrangements quite reasonable, the emerging rental market nonetheless adds financial obligations for tenants. This, in turn, drives agricultural intensification. For instance, only three households among the 37 renting land in the valley listed a food crop as the main produce they grow on lands they do not own. The remaining 34 tenants predominantly grow cash crops on the land they rent, a proportion much higher than the overall average (see Section 6.3.2). One informant drew a direct link among increasing market opportunities, land rental, and agricultural intensification: "Prices for some crops are higher than before, so I can now rent land and produce more food. When prices were lower, I was not able to rent land" (Z-28, 10 March 2012).

Barren lands constitute the second environment the villagers turned to for compensating for their lost lands. Conditions in the barren lands are generally unfavourable to carrying out agricultural activities due to steep slopes, thin soils, and scarce irrigation. Nonetheless, the barren land area over which my survey respondents have usufruct rights – the *ziliushan* – has soared from 163.5 to 1,178 *mu* between 2006 and 2011-12. Obviously, this figure calls for further examination.

Indeed, a single Handai individual drove almost all this growth in barren land cultivation. This person recently rented over 1,000 *mu* of sloped barren lands nearby a Handai village located downstream from Xiaocun after he somehow secured usufruct right from the local forestry bureau to develop eucalyptus tree plantation. This tenant is one of the wealthiest people living in the villages where I carried out my research, having made his fortune in the mining sector. In recent years, he has abandoned mining and become more involved in agricultural ventures. However, unable to find enough land to fulfill his ambitions in the valley, he turned to the barren lands to develop his business (Z-12, 12 March 2012). That being said, this case is definitely an exception, and does not represent usual local diversification pathways whatsoever.

Apart from this atypical case, *ziliushan* landholdings in Xiaocun, Zhongcun and Dacun villages have grown by a moderate eight per cent since 2006, from 163.5 to 178 *mu*. Of this area, over

130 *mu* are located in Xiaocun village, where overall *ziliushan* areas have stagnated since the mid-2000s. This stagnation nonetheless hides the fact that villagers who previously cultivated *ziliushan* within the area now covered with jatropha plantations opened new lands to compensate for their exclusion from the premises that Sunshine Technology controls. These individuals lost access to some 15 *mu* of *ziliushan* and have since expanded their landholdings in the barren lands by a similar area. In Xiaocun, about 50 *mu* of *ziliushan* are dedicated to growing cassava, the most extensively grown crop cultivated in the area where I carry out research.[167] Since 2011, one villager has rented a further 50 *mu* to a farming company from Chongqing municipality that allegedly aims to develop banana plantations over his *ziliushan* holdings (S-17, 18 March 2012). No such development had yet occurred by the time I last left the field. The remaining 30 *mu* of claimed barren lands from Xiaocun more or less lie fallow.

In a manner reminiscent to the notion of selective diversification Turner (2007) coined, one villager from Dacun village who owns barren lands he currently does not cultivate explained that:

> I planted agave and jatropha trees on my land a few years ago because I heard I could make money from these crops. It turned out that no one ever bought jatropha seeds, while it is not worth it to harvest my agave because I have no time and the price is very low. Therefore, I just leave it there and wait. I have plenty of land to take care of anyway (L-100, 6 April 2012).

Given the extent of land flooding, some of his co-residents are not as lucky, and most of the *ziliushan* expansion that occurred since the mid-2000s has been in Dacun village.[168] Peasants from Dacun have recently reclaimed ten *mu* of barren lands to grow mango trees, both a cash- and work-intensive endeavour that can only yield fruit after at least four years. However, as one villager who planted a few hundred mango seedlings in the barren lands nearby Dacun village during the first months of 2012 found out, the results from such a venture are highly uncertain:

> Almost all the seedlings have died about three months after I planted them. Rain arrived too late, I had problems with the gas pump I use for watering the seedlings, and since I was too busy, I could not irrigate the plantations as often as needed. I have learned from my mistakes and I will make sure not to replicate these when I

[167] Cassava is almost exclusively grown in the barren lands, and apart from labour during the sowing and harvesting periods, its cultivation requires no further input whatsoever. Yielding about 1,000 kg/*mu* per year, and selling for about 1 RMB per kilo ($0.17), cassava is also one of the less lucrative crops grown in the area.

[168] In Zhongcun, my survey participants owned six *mu* of *ziliushan* in total. I will therefore limit my discussion to the situation from Xiaocun and Dacun villages, where barren land expansion is more common and significant.

> recommence planting further mango trees over the same area next year (D-118, 8 June 2012).

While the area mango plantations cover in the barren lands remains minor, this scheme is nonetheless a new and potentially important model. Indeed, individuals who became involved in such agricultural relocation are the first to attempt to conduct both small-scale and intensive agricultural activities in the barren lands (D-118, 21 February 2012). If these smallholder farmers succeed, many of their co-residents may also consider undertaking similar projects in the barren lands still abundant near Dacun. Further, developing such plantations is also a means for the villagers to secure usufruct rights over new areas. Given how land availability criteria have changed over the last decade, such rights might become important assets in the future, and potentially justify the hardship they encounter today opening these lands up (see Barney 2009). That being said, by the time I completed fieldwork, work on these small-scale mango plantations had just begun, so their fate remains unknown.

A third environment where food-producing activities are expanding is into the reservoir itself, as fish farms started appearing on reservoir areas facing Zhongcun and Dacun villages from 2011 onwards. The hydrology of the Red River did not allow for developing fish farms prior to reservoir creation, but this has now changed. When I completed my fieldwork, four families had gotten involved in fish farming in Dacun and a further two in Zhongcun. The size of their fish pools varied between four meters long by four meters wide by four meters deep, and four meters by four meters by six meters deep. Families involved in aquaculture owned one or two pools. Such extensive fish farming contrasts with what goes on in Nansha Reservoir, some 15 km upstream from the villages. There, fish farmers live year-round on their farms and often have upwards of 20 pools (Figure 6.3). While the entrepreneurs owning such large-scale farms need to obtain operation permits from local authorities, none of the villagers that got involved with extensive and small-scale aquaculture activities had obtained such permits, as they felt that they did not need them (N-1, 24 August 2011; D-70, 6 December 2011).

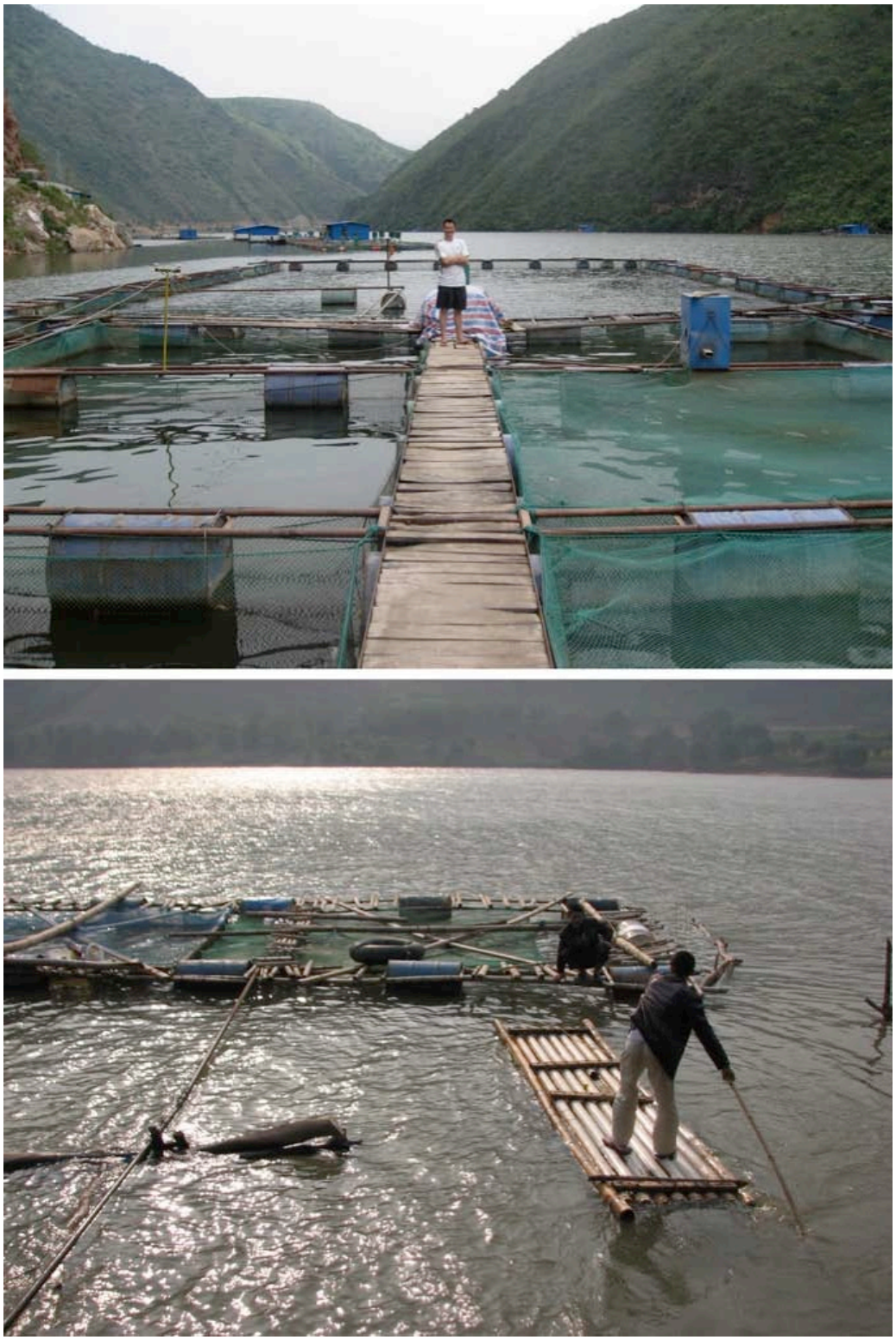

Figure 6.3: Intensive fish farm and Han owner in Nansha Reservoir (top), less intensive fish farm and Handai owner in Dacun village (bottom) (photographs by author, 2011)

Whatever the size of the fish farms, aquaculture is a work- and investment-intensive activity. Farmed fish need to be fed three times a day, while feed for a 4x4x4 meter pool containing some 600-700 fish in the middle of their growth cycle costs at least 100 RMB ($17) daily (D-70, 6 December 2011).[169] Start-up investment in infrastructure and alevins, all of which are exogenous species – mainly carp – raised in Hainan Province, represents another cost. In spite of these hurdles, by December 2011, one villager whose household had become involved in aquaculture about six months earlier felt quite confident, stating:

> We now have two pools and we want to add more next year. Of course it will be a problem if everyone gets involved in fish farming, like in Nansha reservoir, where the water quality is very bad and the fish are not as good as the ones we raise here. Nonetheless, it will become a good business and it will grow fast (D-86, 16 December 2011).

Three months later, as his fish were mature and ready to be sold, the enthusiasm of this same person had plummeted. There is a sugarcane processing plant in Nansha, and the plant often dumps chemicals into the Red River during the main sugarcane harvesting season.[170] The villagers are used to seeing dead fish and shrimp surfacing during this period, but March 2012 marked the first time such a spillage occurred while some among them were involved in aquaculture. As a consequence, about one tonne of fish belonging to the above informant died overnight, and what little he could liquidate on the local market sold for 1-2 RMB ($0.17-0.33) a kilo rather than 6 RMB ($1) as he expected. After trying to navigate opaque local bureaucracies to obtain compensation from Gejiu municipal authorities, affected fish farmers from Dacun and Zhongcun villages were reminded that the sugar plant was located in Yuanyang County, hence outside of the jurisdiction where they live. In other words, there was nothing that could be done. This brought the above-cited informant to express his desperation as follows words: “It is difficult. We worked a lot, fed the fish three times a day for almost one year and we had just begun selling these. All is now lost” (D-86, 1 March 2012).

[169] For intensive fish farms within Nansha reservoir, daily feed expenses can reach up to 4,000 RMB ($667). However, the average growth cycle in these farms lasts for seven to eight months, which is shorter than in the village farms where fish need some 10 months to reach full size. The difference is partly due to intensive farms using feed only, while extensive farms use a combination of feed and pork fat (N-1, 24 August 2011; D-70, 6 December 2011).
[170] While the Handai grow some of that sugarcane, the bulk of the local harvest comes from the midlands (see Section 6.3.2).

In sum, the inhabitants of Xiaocun, Zhongcun and Dacun villages have coped with land scarcity and exclusion caused predominantly by the dam projects, and by jatropha plantations to a lesser extent, by developing various strategies to relocate their fields over whatever land or reservoir areas that hold farming potential. The influence of renewable energy development over this process is multifaceted. First, reservoir creation has catalyzed this shift by depriving the peasants of over half of their lowland farmlands. Second, jatropha development has also excluded some people from *ziliushan* areas they used to cultivate. Third, jatropha expansion has given villagers a preview of the alleged agricultural potential of the barren lands. Despite its total failure, jatropha expansion demonstrated that an intensive plantation model could be implemented over sloping lands. Hence, the approach of Sunshine Technology paved the way for both large- and small-scale attempts to develop plantations over *ziliushan* areas.

That being said, the potential for agricultural relocation remains circumscribed and widely insufficient to compensate for the extent of the exclusion that villagers have endured. Moreover, undertaking agricultural relocation strategies such as those I discussed above often requires financial and/or labour investments that not all villagers affected by land flooding can mobilize. Therefore, villagers have engaged in further livelihood strategies to compensate for losses in their natural capital base. For many, these strategies have centered on agricultural intensification as a way to extract more food and income from the land they can still access after the flooding. I now turn to analyze these approaches.

6.3.2 Agricultural intensification (1): Producing for cash rather than food

While villagers from Xiaocun, Zhongcun and Dacun villages could alleviate some of the livelihood impacts of renewable energy development through agricultural relocation strategies, such diversification tactics alone were insufficient to provide most villagers with a complete coping solution. On the one hand, farming remains the main occupation for 80 per cent of my survey participants and provides local households with over 75 per cent of their annual income on average (Sections 5.5.1 and 5.5.4). On the other hand, new lowlands leased after the Madushan reservoir creation amount to only a small fraction of the recently flooded area. In a context where socio-economic change makes money an increasingly important aspect of their daily life, this leaves peasants who remain in these three villages with little choice but to

diversify their livelihoods and engage in non-agricultural activities (as I investigate in Chapter 7), or to produce more food on whatever land remains available.

Agricultural intensification is a strategy that villagers coping with declining landholdings commonly resort to for sustaining their livelihoods (McDowell and Hess 2012; Rigg 2005). Agricultural intensification is most often achieved by modifying three main factors of agrarian production, namely crops, farm inputs and irrigation (see Bonnin and Turner 2012; De Koninck and Rousseau 2012; Elson 1997). In Xiaocun, Zhongcun and Dacun villages, lowland farmlands are generally well-watered by gravitational irrigation networks. Therefore, while irrigation channel maintenance is a regular chore for the villagers, the development of new irrigation networks is only necessary on land that has recently come under cultivation (Section 6.3.1). However, the other two main variables to agriculture intensification are undergoing major changes in the villages where I undertook my research.

Traditional Handai farming regimes centre on local landrace rice breeds, which have long been grown once or twice a year and intercropped with other local food crops, beginning with maize. Rice is the local staple food, while maize is predominantly used as feed for pigs, ducks, and chicken most often raised in the courtyards adjacent to Handai houses. At the same time, Handai households have traditionally grown a wide range of local greens, gourds, tubers, and vegetable – including the infamous *xiaomila* chillies (小米辣) they cherish – over portions of their fields or in their courtyard gardens. Local mango and litchi trees as well as local banana breeds have long too been present in the local villagescape.

Discussing how local farming regimes have changed since the Revolution, one informant summarized: “We grew rice under Mao, bananas arrived massively with Deng, and mangoes with the road, in the early 2000s” (L-118, 1 July 2012). This highlights how local farming regimes are influenced by the political climate, and the extent to which authorities exert control over land allocation decisions. The above quote also exemplifies the importance that market opportunities, access and commodity chains uphold in shaping the decisions of villagers. For example, sowing and harvesting bananas can be done pretty much throughout the year and the fruit can tolerate a reasonably long handling time. Mango trees however, yield one large and rapidly ripening

harvest in the spring. Mangoes thus require much more efficient and flexible commodity chains and transportation infrastructure than bananas, and mango plantation expansion accordingly took off more recently than banana plantation expansion.

In accordance with the earlier quote on how farming regime evolved since Mao, my survey data indeed posit that villagers grew rice, bananas and mangoes (along with litchis[171]) more than any other crops by the mid-2000s (Table 6.3).[172] My results further highlight that the same three crops are also among those that have receded the most since the Madushan Reservoir was created. Rice is the single crop that the greatest number of villagers have abandoned since the mid-2000s. Discussing the reasons that have driven peasants to drop rice farming, one informant stated: "Growing rice is not that important anymore because we do not make money from it and we can always buy it cheaply" (X-14, 8 December 2011). Another interviewee held a complementary point of view, explaining: "We still grow some rice, but very little. We actually prefer buying it since it is quite cheap and the rice we buy from Jianshui is better than the stuff we grow" (X-23, 18 August 2011).[173] My survey results correlate with these opinions. When asked if they would keep growing rice in the future, almost 60 per cent of my survey participants considered this option 'impossible' and a further 24 per cent answered they might do so.

[171] Mango and litchi trees grow in similar conditions and yield fruit at similar intervals. Therefore, when grown extensively, mango and litchi trees are often intercropped. However, litchi trees demand more agricultural inputs than mango. Litchi tree expansion is thus a more expensive and less frequent agricultural intensification strategy than developing mango plantations (S-15; S-23, 15 September 2011).

[172] I have not collected precise information on the area the villagers allocated to each crop in 2006, since such an inquiry would have yielded inconsistent data and bothered the surveyed individuals – who would have had a hard time trying to remember such information. Following the recommendation of a Kunming-based scholar familiar with undertaking surveys in rural areas within Yunnan, I inquired instead about acreage trends for individual crops (K-2, 5 August 2011).

[173] This person is referring to modern high-yielding rice varieties. I discuss the distinction between crop varieties further below.

Table 6.3: Main crops and land allocation decision evolution, 2006-2011

			Compared to 2006								
	Main farming regime	Main purpose	HH that grew this crop in 2011-12	Area sown (mu)	HH that sold this crop in 2011-12	Hh that abandonned this crop by 2011-12	HH growing this crop over smaller areas in 2011-12	HH growing this crop over areas as wide in 2011-12	HH growing this crop over wider areas in 2011-12	Do not know	HH that have adopted this crop
Banana	Intensive	Selling	69	166.7	50	24	29	18	22	0	0
Rice	Semi-intensive	Self-consumption	60	70.5	3	32	35	20	9	0	4
Papaya	Intensive	Selling	28	50.1	24	2	3	0	25	0	0
Runner beans	Intensive	Selling	52	54.8	51	1	8	12	32	0	0
Cucumbers	Extensive	Selling	20	24.5	20	2	7	1	12	0	0
Mangoes	Extensive / Intensive	Self-consumption / selling	78	19.7	38	11	27	35	15	1	0
Litchis	Extensive / Intensive	Self-consumption / selling	65	16.5	32	17	21	32	12	0	0
Sugar cane	Intensive	Selling	14	24.8	11	1	1	1	11	1	0
Yutou (white tuber)	Extensive	Self-consumption / selling	30	10.7	19	4	6	16	9	0	1
Shanyao (red tuber)	Extensive	Mostly selling / self- consumption	30	14.6	25	4	3	15	15	0	3
Maize	Extensive	Self-consumption	28	41	7	26	9	15	5	0	1
Cassava	Extensive	Selling	9	61	6	1	1	4	4	0	0
Tamarind	Extensive	Self-consumption / selling	2	3	1	0	0	1	0	1	0

(source: author's survey data)

Contrary to what the above comments suggest, abandoning rice is not an easy and consequence-free decision for villagers (see Shen 2013; Yot 2011). All my survey participants consider growing paddy and its role within their livelihoods favourably. Land grown with wet rice is flooded through natural irrigation systems during most of the four to five month growth cycle and nutrient rich silt depositing on the land regenerates soil fertility like no other method. Rice cultivation is also deeply enshrined in the local culture, and its widespread abandonment triggers social change. One unmarried villager in his twenties conveyed a nostalgic, even idealized, version of what rice harvest periods used to be:

> Rice harvest used to be a major event, but it is not anymore since people grow so little rice. Also, they are too busy doing business and do not help each other harvest rice as before. Everybody used to participate, and even young women from other villages would come and maybe find a husband here. When the work-day was done, we used to eat huge meals and drink a lot. It was much warmer [热闹 – *renao*] then (L-101, 19 June 2012).

This quote highlights that social capital in the villages partly rest upon the peasants sharing a common agricultural calendar and associated duties.[174] It echoes the findings by Shen (2013) that rice farming socially cements rural communities more than any other farming practice and that a shift away from rice farming leads to the erosion of the social ties that characterize traditional farming systems.

Maize too has been widely abandoned for reasons similar to rice, but the decline in maize fields began prior to the mid-2000s, hence my survey results do not testify to its full extent. Among the villagers still growing maize, some pointed out that although it offers no direct commercial prospects whatsoever, maize is somewhat complimentary with bananas. When sowing bananas, the villagers often intercrop their young seedlings with maize, since both crops grow under similar conditions. Also, the growth cycle of the maize plant lasts for three months and cobs must be harvested when banana plants, which take about nine months to mature, need further room to keep developing (X-14, 8 December 2011). Villagers still growing maize also stress that maize is widely used as animal feed, which the villagers otherwise consider expensive to buy (ibid.).

[174] The "traditional" rice cycle encompasses two harvests: spring rice is sown around February and harvested around July, while autumn rice is sown around August and harvested around November. During the winter, rice fields are traditionally intercropped with crops such as winter gourds, cucumbers, or extensively-grown local tubers (*shanyao*, *yutou* or *hongshu*).

After rice and maize, bananas are the crop that the greatest number of people have abandoned or have decided to grow on smaller portions of their landholdings since the mid-2000s. Bananas are different from the former two crops in that they are cultivated almost exclusively for commercial purposes. In the aftermath of the Household Contract Responsibility System reforms implemented in the early 1980s (Section 4.2), bananas were the sole cash crop for which an important market existed. However, transport infrastructure and market development modified this outlook during the last decade. Banana prices are generally lower than those of the other cash crops grown in the villages, such as mangos, runner beans and sugarcane, and they also fluctuate more widely. For instance, during my fieldwork period, bananas prices were as low as 0.3 RMB/kg ($0.05) in July 2012 when fruit were plentiful and the hot weather impacted their maturation (and thus market value). Likewise, prices reached almost 5 RMB a kilo ($0.83) in February 2011, when ripe bananas were scarce.

Besides market ups-and-downs, land scarcity adds risk for banana growers whose landholdings are too small to allow for intercropping banana plants that have reach different stages of growth. Banana intercropping contributes to attenuating the financial consequences of annual variations in plantation yields[175] and distributing financial earnings over a longer time period. One informant argued that since he had lost land as a result from reservoir creation, his remaining landholdings were too small to intercrop banana trees at different stages in the growth cycle. He explained:

> If I grow bananas, they will all mature at the same moment and once a year only. This means that I will only have income once in the year, and this is untenable. Also, if prices are low when I have fruit to sell, it would be very difficult. And what about the next year when yields go down? What would I do then?" (Z-75, 20 February 2012).

For these reasons, the same informant drew a direct relationship between landholdings and getting involved in banana growing, stating "I own little land, so I do not grow bananas anymore" (ibid. 12 September 2011).

[175] The banana cycle lasts for some 18 months and includes two harvests. Yields from the first harvest are much higher than those obtained from the main sucker to the original plant.

In general, individuals whose mango and litchi tree holdings have decreased since the mid-2000s used to own only a few trees. Most often, these trees were located in now-flooded area, and their owners only sold the fruits randomly. While in the villages, I would often hear comments such as: "We own a few mango trees, but generally, we do not sell much fruit. Rather, we pick fruit when we want to eat some, or give some to our friends and relatives. That's it." (X-16, 19 February 2012). Hence, villagers who have lost such trees to the reservoir often chose to abandon growing mango and litchi altogether. Among those for whom mango and litchi constituted a steadier source of income, many can no longer afford to sow new seedling and wait for them to bear fruit. It takes at least four years for new mango and litchi seedlings to yield fruit and this delay discouraged many villagers to replace the trees they lost, at least in the valley – hence some trying their chance at planting mango trees in barren lands instead (see Section 6.3.1). Likewise, many old-grown mango and litchi trees that were not flooded had been planted just after the market reforms, from the mid-1980s onwards. Yields from these trees decreased rapidly with age, further encouraging some villagers to replace mango with other crops (X-76, 12 December 2011).

Complementing the above quote on the evolution of farming regimes since Mao, another informant stated: "Now growing banana is not that much of a good business anymore, and papayas are replacing bananas" (D-32, 16 December 2011). Commercial papaya plantations have expanded rapidly since the mid-2000s, and the villagers argue that the introduction of species with a higher commercial potential drove this expansion (L-121, 27 August 2011).[176] Papaya harvesting spans a longer time period than that of bananas and the villagers see this crop as a way to reduce their vulnerability regarding fluctuating price cycles. Papaya require less water than bananas, an important advantage given that the rainy season tends to commence later than in the past. However, papayas also require greater quantities of chemical inputs (D-32, 16 December 2011). Papaya plantation expansion having begun just a few years ago, its outcome remains uncertain. Some villagers explained that they are waiting to see how those that have made the switch from bananas to papayas would fare before they themselves consider making a similar decision (X-15, 28 August 2011). By spring 2012, some farmers had lowered their hopes for

[176] Although edible, local species do not taste good and most villagers only use the fruit as animal feed (see also Section 6.2.3).

papayas as unexpected problems surfaced, including a pest that provoked a harvest failure for many growers (D-83, 27 February 2012).

Since 2005-06, more villagers have decided to allocate greater portions of their landholdings to runner bean cultivation than to any other crop. Runner beans are mostly grown in the fall and winter, and most often intercropped with cucumbers, another cash crop that is expanding rapidly, and then with either spring rice or tubers (Z-65; Z-66, 8 March 2012).[177] Runner bean cultivation is almost exclusively concentrated in Xiaocun and Zhongcun villages. Cultivation has expanded rapidly since 2005 as the bean price per kilogram has risen steadily, reaching 5 RMB ($0.83) on average during the 2011-12 winter, among the highest for any crop in the area. Commodity chains followed suit, and intermediaries from neighbouring urban centers (mostly Gejiu and Yuxi) came to the villages daily to buy the beans during the harvest period.

Since runner beans are most often grown over rice lands, the opportunity cost for producing them is quite low, at least when assessed in financial terms (A-85, 24 February 2013). Indeed, runner beans are mostly sown in lieu of rice, and the peasants I interviewed obtained only a very small portion – if any – of their agricultural income from rice, since it has virtually no market potential (see Section 6.3.3). Apart from autumn rice, the crops that were replaced included local tuber crops listed in Table 6.3, along with a host of greens and gourds that the peasants did not bother to mention while we conducted the survey.

Runner beans provided me with a good example of how my presence influenced the areas where I carried out my research as well as an example of how villagers partly base their farm decisions on the successes and failures of their co-residents. Indeed, as mentioned above, runner beans are mostly grown in Xiaocun and Zhongcun as inhabitants of Dacun used to believe that their locale was too windy for growing this crop, and almost none of them had adopted this crop by summer 2012. That being said, my assistant, who lives in Dacun, was surprised to discover how lucrative runner beans had become in Xiaocun and Zhongcun: for this reason, by April 2012, he was seriously considering giving them a try on a portion of his land the following fall.

[177] Given the high prices they fetch, more and more villagers have been harvesting runner beans twice a year.

Cucumbers too are also increasingly cultivated, not so much because of their market value, which is quite low, but rather because they can easily be intercropped with runner beans. In other words, as maize and banana acreages relate to one another, so does the extent of cucumber and runner bean fields. A final cash crop which many Handai villagers increasingly prioritize is sugarcane. Sugarcane used to be grown mostly by Yi people, who predominantly harvest it in the midlands. However, Yi who own land in the valley also planted a variety nearby the Handai villages. Lowlanders learned from this that sugarcane also fares well in a hotter climate, and when sown on well-irrigated soils (D-118, 21 February 2012). Simultaneously, the current rising price cycle also makes a strong argument for convincing the Handai to allocate portions of their land to sugarcane.

Therefore, as explained above, three particular periods stand out regarding the recent changes of farming regimes in the Red River valley. First was the subsistence all-grain period. Second was a hybrid period during which subsistence food crops remained important alongside the first wave of cash cropping centered on banana, and then mango to a lesser extent. Third is the current outlook, characterized by the rapid abandonment of any subsistence food crop that remains and the rapid adoption of new exogenous cash crops. As the above quote from a villager who stopped growing bananas after land flooding occurred demonstrates, new market conditions associated with the post-land-flooding environment played an important role in the transition from the second to third period.

Parallel to these changes is a rapid decrease of agricultural biodiversity – or an increase in its corollary enhanced agricultural specialization – a pattern typical to agricultural intensification processes (see Ellis 2000a; Rousseau and Durand 2009; De Koninck and Rousseau 2012). While my survey data does not account for variations in the area allocated to each cultivar, my results nonetheless clearly demonstrate that specific crop abandonment has proceeded much faster than crop adoption since the mid-2000s (see Table 6.3). Villagers did not make much reference to decreasing farm biodiversity when discussing their main concerns with regards to agriculture. Actually, only one villager discussed agricultural diversity with me, proudly stating: “We have tremendous agricultural diversity here. We like our food and its diversity. Every week there is a new crop harvested” (Z-5, 9 December 2011). As such, this villager placed emphasis on the

importance of agricultural biodiversity for the local diet rather that its influence on land capacity. Yet farm biodiversity has important pest management and soil fertility functions that must now be increasingly be fulfilled by chemical inputs (see Altieri 1999; Gurr et al. 2003). This is definitely something the villagers would rather do without, as I demonstrate in the next section.

6.3.3 Agricultural intensification (2): Getting more from the land

An important agricultural intensification strategy adopted by villagers is to utilize increasing and notable amounts of chemical inputs. This strategy has occurred even though many villagers are fully aware of the long-term effects of chemical fertilizers on land fertility. Many are already experiencing the spiral whereby decreasing land capacity forces them to utilize greater quantities of fertilizers, which in turn further degrades their land, and they are conscious of this process. One informant was ambivalent about this, explaining: "We are aware that we always need to use more fertilizers and that this is bad for the land. There is nothing we can do about this. Income is now more important than soil fertility. There will always be a way to handle future problems: we will use more fertilizers" (X-14, 8 December 2011). Many villagers expect this same pattern to continue, half of my survey participants foreseeing that soil fertility would 'definitely' decrease in the future, while a further 33 per cent think that it 'might' do so.

According to my survey results, each household spread an average 450 kg of various chemical fertilizers and some 30 liters of chemical pesticides over its land in 2011-12. Even though their average landholdings have decreased markedly since the mid-2000s, some 75 per cent of my respondents explained that they use more chemical inputs now than they did before reservoir creation. Annual household chemical input expenses totalled on average some 1,700 RMB ($283), representing over 10 per cent of average annual household financial income (averaging 13,995 RMB [$2,332.50], see Section 5.5.4). Hence, as with the burgeoning market in land rental, the increase in chemical input usage and its associated financial costs is participating in forcing villagers to extract further cash income from the land.

Besides their higher commercial potential, the crops that the villagers increasingly prioritize require farmers to invest more labour into their fields than before. For instance, as explained earlier, papaya trees must be harvested over a longer period than banana plants. A whole 20-30

kg banana regime is harvested with a single machete strike, while obtaining as much papaya fruit from a single tree involves harvesting the tree regularly over a few weeks. The same goes for runner beans. While harvesting paddy over a few *mu* takes no more than a few days, harvesting runner beans over a similar area spans approximately three weeks. During this work-intensive period, harvesting bean plants every other day optimizes revenue, allowing for picking beans when they are biggest but not yet overripe. Discussing how runner beans increase his wintertime workload, one informant explained:

> Agricultural chores used to be less important in the winter. People used to take a two-week long break during *chunjie* [Spring Festival/Chinese New Year], and would then prepare the land for spring rice. Now, we harvest runner beans until *chunjie*, and then it's already time to flood the fields. There is no more time to rest (Z-75, 16 December 2011, see also Section 7.3).

Hence, one strategy villagers have developed to cope with their reduced landholdings is to invest further labour into agriculture, though this too brings particular social consequences.

'Modern' and high-yielding crop varieties also play a role within the ongoing agricultural intensification process in the valley. Generally speaking, all rice, banana, mango, litchi, papaya, runner bean, cucumber and sugarcane sown in the area where I conducted my research are from hybrid breeds. Discussing the extent to which modern rice seeds are both cheaper and much more efficient (Table 6.4), one informant explained: "Before, people used to grow different rice varieties. Now they just want to plant the same high yielding varieties everywhere because they produce more. However, modern rice does not taste as good as the one we used to grow" (X-19, 21 November 2011). This quote further highlights two important facets of the ongoing agricultural intensification process, discussed next.

Table 6.4: Rice variety costs and yields

	Yields (kg/*mu*)		Seed cost (RMB/*mu*)		Inputs (per mu)
	Spring rice	Autumn rice	Spring rice	Autumn rice	
Old rice	500	100	22.5	15	Dung (8-10 backpacks) Pesticides (+/- 60 RMB)
Hybrid rice	≥ 900	≥ 200	17.5	20	Fertilizers (+/- 100 RMB) Pesticides (+/- 60 RMB)

Firstly, not only is overall crop biodiversity receding (see Section 6.2.3), but the villagers also tend to sow less cultivar of each crop they grow. Secondly, as X-19 mentions above, the local population holds a negative opinion towards the taste of food produced from modern crop varieties. Villagers are also suspicious of the safety of food grown with chemical fertilizers or sprayed with pesticides. These perceptions often breed surprising results, including the coexistence of two distinct farming regimes. As one peasant explains: "I do not use fertilizers and pesticides in my garden. I know that pesticides are dangerous, and I only use them for growing the crops that I sell. Likewise, I only use natural fertilizers in the garden" (X-1, 22 November 2011).

This duality goes beyond household gardens. Many villagers owning sufficient landholdings grow different breeds of rice and bananas for different purposes. One informant discussed the difference between the local (本地 – *bendi*) small banana varieties such as *xigong jiao* (西贡蕉 – literally: Saigon banana) and *bajiao* (芭蕉 – Japanese banana), and the long *xiangjiao* (香蕉 – fragrant banana) bananas he sells:

> The longer our bananas get, the more expensive we can sell them. However, for us, the smaller the banana, the better its taste. I still have a few *bendi* plants on my land and I try only eating these bananas. I only use dung and dead banana leaves for fertilizing *bendi* plants, and do not spray pesticides on them. The *bendi* fruits are a little harder, and much more fragrant. Even though they are not perfect on the outside, they are neat inside. Also, when they ripen on the tree, the tail of the fruit remains green longer than for *xiangjiao*. The tail from the *bendi* fruit is much stronger; you can hold a bunch of bananas that weights 3-4 kilograms with only one banana. There is no way you could do this with *xiangjiao*! (X-23, 25 November 2011).

Similarly, a member from one of the only three surveyed households to sell rice (see Table 6.3) explained that his rice fields serve two different purposes:

> I grow rice twice a year over one *mu* of my land. I usually keep a small parcel for *bendi* varieties, especially for the autumn harvest, as autumn rice tastes better than spring rice. There is no way I could sell that rice at a fair price: because of the low yields, I would need to sell it for 25 RMB/kilo ($4.17).[178] No one pays that much for rice! So we eat it at home, or I offer it to *guanxi* [relations] and friends (X-19, 29 November 2011).

[178] This is over ten times more expensive than the price this interviewee gets from selling modern rice varieties.

This list could go on, as many individuals expressed sensitivity to the differences between traditional and modern cultivars. While these villagers agree that modern crops allow them to gain much higher income, either because they yield more or (in the case of tree crops) start yielding earlier, my Handai informants would rather eat as little of these as possible.[179]

6.3.4 Concluding thoughts on agricultural diversification strategies

In sum, Handai villagers in the Red River valley are now in a situation where they abide by market rules convincing them to intensify their agricultural practices. This is necessary for them to cope with both their reduced landholdings and increasing financial capital needs. From this same financial angle, the agricultural relocation and intensification strategies I have investigated above have generally been successful. Indeed, in spite of a drastic reduction in landholdings, 81 per cent of my survey respondents stated that the income they derive from agriculture is higher now than in the mid-2000s.

Nonetheless, this comes at a price. Handai households increasingly engage in farming activities and practices they do not valorize. Those who can afford it make sure that they grow as much of the food they consume as possible and focus on specific local varieties for their own needs, just like they did in the past, emphasizing safety and taste preference arguments. One informant summed up this outlook bluntly: "We are definitely conscious about market requirements for food appearance and organize our productions accordingly. However, this goes against what we value: people in the cities know nothing about what food is good and safe and what food is not" (X-14, 4 December 2011). Similarly, another interviewee noted with amusement: "it is funny that even though people in the cities are richer and their lifestyle is more modern than ours, we eat much better food then them!" (X-15, 5 March 2012). Alongside these market-driven agricultural shifts have also come changes in livestock ownership, analyzed next.

[179] Papayas are a notable exception, as the villagers did not like the local stock and only used it to feed cattle (D-fruit trader, 27 August 2011). Modern papaya varieties nonetheless require intensive inputs.

6.4 CATTLE AND BUFFALO OWNERSHIP: VANISHING MOOS

Handai households have traditionally reared buffalo (水牛 – *shuiniu,* lit.: water cattle) as work animals for ploughing fields, as well as for meat, especially during rites-of-passages ceremonies, when buffalo slaughter most often occurs. Buffalo consist a source of income, fetching an average 2,200 RMB ($367) per head in 2011-12 according to my survey results. In that sense, just as Bonnin (2011: 242) finds in Hmong societies from the Vietnamese highlands, the buffalo have traditionally served as a "multi-dimensional livelihood asset" in the villages where I undertook this research. Besides buffalo, Handai farmers also rear beef cattle (黄牛 – *huangniu,* lit. yellow cattle) for meat or investment via selling live animals. Cattle are not used for farm work but their meat is more highly valued than that of buffalo. Grown up cattle thus sell for an average 3,700 RMB ($617), according to my survey, fetching a higher price than buffalo. Moreover, cattle rearing demands less work than herding buffalo; while buffalo owners must fetch their herd daily from the barren lands where the animals graze, cattle can be left on their own for long periods.

One of the most drastic on-farm livelihood change that has occurred in my case study villages since the mid-2000s is the pronounced reduction in cattle ownership. By the mid-2000s, 73 households from my survey sample owned large livestock, including 13 households that owned both buffalo and cattle, 47 households that owned buffalo only, and a further 13 that reared cattle only (Table 6.5). The herds from my survey participants then totalled 567 animals. Five years later, the same herds had declined to 173 head, a 70 per cent reduction. In 2011-12, among the 24 households that still owned large livestock, two families reared both buffalo and cattle, eight owned buffalo only and a further 14 owned cattle only. Hence, while the overall decrease in such animal ownership is significant, it is especially interesting that the most-owned breed of livestock has also changed. The Handai have traditionally raised more buffalo than cattle because the buffalo labour was an asset necessary to rice farming. This trend lasted until the mid-2000s, when buffalo and cattle totalled 305 and 262 heads, respectively. Since then, my informants have either slaughtered or sold 85 per cent of their buffalo, with only 45 beasts remaining. The cattle herd from same villagers is now 50 per cent smaller than in 2005, totalling 128 heads (Table 6.5).

Table 6.5: Livestock ownership, 2006 and 2011-2012

	2006	2011-12	% change
Households that own buffalo only	13	8	-39%
Households that own cattle only	47	14	-70%
Households that own both buffalo and cattle	13	2	-85%
Total buffalo heard	305	45	-85%
Total cattle heard	262	128	-51%
Total large livestock heard	567	173	-69%

(source: author's survey data)

As is the case for most on-farm livelihood changes discussed so far, this trend in declining large livestock can be seen as a consequence of both proximate and ultimate causes.[180] In regards to proximate causes, decreased fodder availability was often cited as one factor convincing villagers not to renew their herds after selling or slaughtering cattle. Reservoir creation-induced flooding influenced fodder availability in all three villages, as cattle used to graze in now-flooded uncultivated riverside areas (see Figure 4.6). Jatropha expansion exacerbated this problem in Xiaocun and Zhongcun villages, as grass does not grow under jatropha trees. Finally, villagers also point to changing rain patterns as having caused grass scarcity, and specifically complain that the rainy season starts later and lasts for a shorter duration than in the past.

Reduced fodder availability has two main impacts upon cattle owners and their animals. First, as one informant who used to own buffalo explains: "Every day, I had to fetch my buffalo from farther and farther in the barren lands; it was getting really annoying and time-consuming" (Z-65, 24 November 2011). The end of the dry season marks the period when grass is most scarce: the trip from the village to the grazing grounds and back can then last well over two hours. Second, another farmer explained: "Since there is less grass, it takes more time for young buffalo to grow, and more time for the adults to get fat.[181] Hence, raising buffalo is less lucrative than it was in the past" (X-15, 15 September 2011).

[180] As I explained in my conceptual framework, while this typology is most often emphasized in land-cover and land-use change literature, some scholars participating in other fields – including political ecology and livelihood approaches – also emphasize the same categories (see Section 2.2.3).
[181] Usually, people sell their buffalo when they reach five years old (D-12, 14 March 2012).

Nonetheless, the most important factor contributing to decreasing buffalo ownership is increased access to gas-powered rotovators, which have replaced buffalo as the main ploughing farm tool, due to socioeconomic changes that transcend the case-study villages. Farm work mechanization, which also contributes to agricultural intensification, is unanimously considered a major advancement, since, as one villager explains: "It was much more difficult when we used buffalo for ploughing the land instead of rotovators" (X-1, 25 February 2012). Finally, in a context where many people have reorganized their non-farming livelihood activities (see Chapter 7), many have had to cope with more pressing cash needs than in the past, and selling cattle has been a common strategy for addressing immediate imperatives. Yet this is often only a short-term solution, as people increasingly resort to buying cattle and buffalo to carry out rites of passage that involve slaughtering large livestock.

6.5 Chapter Conclusion

Agriculture remains the main livelihood activity and income source for most of the households of the villages where I undertook this research. Since the creation of the PRC in 1949, many policies from the central government have influenced local Handai farming regimes. For instance, agricultural collectivization and the simultaneous all-grain policies gave these peasants no choice but to chiefly grow rice during some three decades. Then, since the early 1980s, villagers have been confronted with the Household Contract Responsibility System and its market logic that has convinced Handai populations to gradually allocate greater portions of their fields to cash crops. It is within this context that renewable energy development has occurred in the Red River valley.

To answer Research Question 2, in this chapter I have analyzed the impacts of the implementation of renewable energy schemes – including their influence upon access to land – upon the on-farm components of the livelihoods of my informants and what Handai peasant farmers made of these transformations. To do this, I first unpacked how reservoir creation and jatropha plantation expansion have excluded Handai farmers from a mix of landholdings. These renewable energy schemes have deprived villagers of landholdings in the riverside floodplain and in the barren lands – two settings that previously fulfilled quite distinct livelihood functions. I then examined the on-farm livelihood diversification strategies my informants initiated to cope. I

demonstrated that the importance my informants allocate to their land has shaped a great many of the strategies they adopted.

Chronologically, villagers initially used transitory strategies as they began experiencing the impacts of renewable energy development on their farming activities. These strategies included investing less inputs in fields located in soon-to-be flooded areas, and thus limiting potential losses when the water would begin rising. Now, the villagers are gradually adapting to post-renewable energy development access regimes and the decline of the overall land area they can farm. Current on-farm livelihood strategies emphasize two different – though closely intertwined – agendas. Villagers first push back the agrarian frontier within any area suitable for producing food, while, second, intensifying all their farming practices. In other words, Handai villagers now produce food in additional, new environments, while also growing crops differently. Yet common to all the strategies I have discussed in this chapter is the persistence of land as a central livelihood asset for the overwhelming majority of my informants.

After being excluded from about half their landholdings by the creation of the Madushan reservoir, my informants initiated a host of strategies to claim any area still potentially available for producing food. These approaches have even targeted portions of the reservoir where some Handai have developed fish farms. Yet, farmers partaking in such agricultural relocation strategies have frequently discovered new constraints that they had not previously experienced on the land they lost. For instance, those that now rent land must account for this new expense in their household budgets, which in turn influences their decisions about what crops to grow. Likewise, those that operate fish farms have learnt about the impacts of reservoir pollution the hard way when all their fish stocks died. Finally, some villagers who attempted to develop plantations in the barren lands have also had to cope with harvest failures due to poor agrarian prospects and weather variations in that setting.

Agricultural intensification processes in the Red River valley have involved a thorough reorganization of the inputs villagers allocate to their crops, including the seeds, fertilizers, and pesticides they use, along with their labour. As a result of this reorganization, the land allocation decisions of Handai villagers do not place as much importance on subsistence food crops as they

did in the mid-2000s and before. Villagers no longer necessarily grow the same crops as in 2005, and they also utilize much greater quantities of chemical inputs now. Finally, agricultural mechanization has catalyzed the widespread replacement of buffalo by rotovators. This, in turn, influences how local populations value livestock rearing within their overall livelihoods.

For some villagers, combining some or all of these on-farm strategies has been sufficient to cope in the new post-renewable energy access regime. For others who lost all their land, or for whom on-farm diversification was insufficient to maintain or enhance their livelihoods, another solution has been to initiate off-farm livelihood diversification strategies, as I investigate in the following chapter.

CHAPTER 7

OFF-FARM LIVELIHOOD CHANGES: DIVERSIFYING PEASANT FARMER OPTIONS

7.1 INTRODUCTION

In the previous chapter, I analyzed important changes that Handai farming regimes have undergone since the mid-2000s along with various strategies that my informants have utilized to produce more food on their reduced landholdings. With farming so central to Handai livelihoods, I have purposely addressed agrarian changes before other aspects of livelihood change. However, livelihood change in the Red River valley obviously does not end in the fields, as I demonstrate in this chapter.

As with the agrarian changes explored in Chapter 6, the development of renewable energy capacity is a proximate cause of many off-farm changes. For instance, as a direct consequence of receiving compensation for land flooded in the course of hydropower development, villagers began to privilege certain investment strategies (see Section 7.2). In other circumstances, this relationship has not been straightforward, as some livelihood changes relate to both the post-renewable energy development outlook and aspects of socio-economic change that transcend renewable energy development. The rapid growth of off-farm activities within the village economy and increased migration flows are good examples of this latter pattern (see Sections 7.3 and 7.4).

In my conceptual framework, I reviewed literature scrutinizing livelihood pathways that rural societies often undergo in the Global South, including how off-farm activities often play an increasing role within household economies. This often pairs with migration, but not always. 'Profoundly territorial' Handai populations retain a strong attachment to their villages, and many individuals I interviewed noted how they initiate various on-site off-farm livelihood diversification strategies with the hope that it will save them from migrating. This coalesces with the argument by Rigg (2001: 76) that literature on rural change often portrays "rural people being

sucked out of their home villages" and fails to acknowledge that off-farm strategies often arise *in situ*.

My conceptual framework also alerted me to the fact that among many of the off-farm livelihood strategies I witnessed in the field, there is more to a successful livelihood strategy than maximizing financial assets (see Section 2.4.2). Financial considerations are important to villagers, with the ongoing monetization of many aspects of the local economy making financial capital increasingly essential. Nonetheless, Handai households make decisions that economic rationality alone cannot explain. My earlier discussion about the coexistence of two farming regimes – a modern one yielding high income crops and a traditional one yielding crops whose quality and taste are more valued by the local people – exemplifies such a decision in an on-farm setting. As this chapter demonstrates, similar considerations also underlie many off-farm livelihood strategies that Handai villagers have pursued since the mid-2000s. For instance, the ambivalent position towards migration many of my informants expressed evocatively exemplifies this.

In particular, this chapter focuses on off-farm livelihood strategies and how they reveal efforts by the villagers to reconcile economic rationality and their local value system in the post-renewable energy development conjuncture. Such a focus on the off-farm component of livelihood diversification strategies allows me to answer my Research Question 3 investigating: *How have Handai households engaged with and forged off-farm livelihood strategies in response to changes in access to land, other assets and state financial compensation?*

Specifically, in Section 7.2, I document the wide-ranging influence that compensation money has had upon village life and the local economy. Notably, I review the main investment strategies that villagers have adopted after their access to financial capital skyrocketed overnight. I also demonstrate how the period in which compensation money was distributed closely correlates with all sorts of consumer goods becoming much more common in the villages. Then, in Section 7.3, I investigate how villagers have become increasingly involved in non-agrarian economic activities, arguing that they mostly do so to cope with decreased landholdings and their profound desire not to leave their home. Finally, in Section 7.4, I document the journey of those who

resorted to leaving the village, and how migration impacts their livelihoods and those of their household members.

7.2 COMPENSATION MONEY: WINNING AT THE EXCLUSION LOTTERY

I explained in the previous chapter that the farmers from the three case study villages who lost land to the Madushan dam reservoir mostly retain the general impression that the financial compensation they received was insufficient and that the whole compensation process was fraught with corruption (see Section 6.2.2). Here, I document the influence that compensation payments had upon the Red River valley population's access to financial capital, along with ensuing sociocultural changes. Because of my efforts not to address sensitive issues directly, my survey questionnaire did not include any questions on compensation payments *per se* (see Sections 3.2.2 and 3.3.3). Still, my assistant and/or surveyed villagers would systematically raise this topic while we were conducting the survey. Most often, inquiring about 'savings', 'house ownership' and 'consumption good ownership' would initiate a discussion on compensation issues. I will further unveil how compensation payments intermesh with these three aspects below, but before I do so, I first document the importance of the payments.

Many people who lost *ziliudi*, riverside non-contracted land over which they held usufruct right, received compensation for these landholdings. However, as I explained earlier, some villagers argue that portions of their *ziliudi* landholdings went unaccounted for during the compensation process. My survey results document that my respondents used to own 68 mu of *ziliudi* that are now flooded. Yet the extent of compensation for this land remains unknown. What is certain, though, is that all flooded contracted arable land (*gengdi*) was compensated for at a rate of 21,000 RMB per mu ($52,500/ha).

Table 7.1: Flooded land per type

Type of land	Number of households	Arable land flooded (mu)	*Ziludi* flooded (mu)
Arable land only	65	165.5	
Ziliudi only	4		17.5
Both	14	35	50.6
Total	83	200.5	68.1

(source: author's survey data)

My survey results document that 83 households out of the 106 I surveyed lost arable land to the reservoir (Table 7.1). As such, 78 per cent of my survey respondents lost variable portions of their arable land to the reservoir. On average, these households lost 2.6 mu of arable land, although this value ranged from just a few *fen* (分)[182] to nine *mu*. Accordingly, affected households were offered, on average, a lump sum of 54,600 RMB ($9,100). This represents a huge amount, equalling almost four times the local average yearly household income – not to mention that the actual compensation figure was often higher for those who also lost *ziliudi* to the reservoir. Moreover, the households that lost the biggest amount of arable land received compensation payments that neared 200,000 RMB ($33,000), representing in many instances more money than the combined lifetime income of all their household members.

Among the households I surveyed, 47 included individuals with some savings. Of these, 28 survey respondents explained that they or their co-residents began setting money aside after 2008; that is after the authorities began distributing financial compensation for expected flooded.[183] This suggests that compensation payments – or portions thereof – were the first financial assets that some 60 per cent of all villagers that own some savings had ever left aside. Most commonly, the projects cherished by people to invest in with their savings were building a house, bride wealth, education, healthcare or new business ventures. In others words, savings are understood as a vehicle to undergo consolidation, compensatory, and security livelihood strategies which allow household members to achieve long-term projects and cope with unexpected stressors. A particularity that stands out of this data is that eight among the nine persons that mentioned 'investing in a business' as an investment priority all begun setting money aside in the 2008-10 time period. This suggests that many villagers foresaw the compensation money they received for their land as an asset to achieve compensatory livelihood strategies allowing them to cope with a sudden livelihood stressor (see Section 2.4.4).

Discussing the preferred investment strategy that villagers have adopted so far, one informant explained: "The house is what is most important for many villagers, so many of them have decided to use their compensation money to buy a new house" (D-118, 28 November 2011, see

[182] One tenth of a *mu*, or 1/150 of a hectare.
[183] Members from five households began setting money asides prior to 2008, a further seven people did so after 2010, while as many respondents either did not know or preferred not to answer my questions on this matter.

also Section 4.2.2). Accordingly, the villagescape has undergone major changes since the villagers learned that they would receive compensation money. Half of my survey participants live in a modern house built since 2008, while a further 17 respondents have renovated their old clay brick houses over the same period.[184] Among those who invest in a new house, if they own a large enough courtyard, they usually save their old clay brick house, while building a new house as well. Villagers then use their old house for both storage and staying cool under the blazing summer heat. Because old houses have fewer windows and a smaller entrance door than modern ones, they remain cooler than their modern counterparts when temperatures are in the high-thirties (°C). Thus while an informant who could not afford a new house complained that her old house gets "really cold in the winter" (D-129, 17 March 2012), those who own both old and modern houses often enjoy having their summer afternoon nap in the old building.

Modern houses first appeared in the villagescape some two decades ago, as one of my wealthiest interviewees remembers: "I bought this [modern] house in 1992. By then, all houses but mine were traditional Handai houses made from clay bricks. Now old houses are very rare" (Z-12, 12 March 2012). Similarly, another informant argued: "Now almost everyone has a new house. The house where a family lives does not necessarily tell much about the wealth of its owners anymore. Most often, it means that these people had land that they lost" (D-118, 2 December 2011). Despite a certain level of pride among villagers in their new dwellings, a villager who lost all his land and invested all his compensation money into a new house could not decide if such a trade-off was beneficial for him in the end: "What is more important between the land and the new house? The house is very important, but I also need land to grow my food and make money" (Z-66, 9 December 2011).

While only the wealthiest villagers could consider investing in a new house before the reservoir creation, house construction came within reach for many more after they received compensation money. Yet, some underestimated the costs of building a new house and ran out of money before construction was completed. Discussing the hardship this created for him, one villager explained:

> I expected my new house to cost 80,000 RMB ($13,333), but I have already paid 110,000 RMB ($18,333) and have to invest a further 10,000 RMB ($1,667) to

[184] Renovating typically involves adding rooms or other elements from modern houses to an older building. Villagers distinguished between such renovations and the usual maintenance work that clay brick houses require yearly.

> finish construction. I do not have that money. I am very I happy that I built a new house. Friends and relatives lent me some money and all this is really heart-warming. However, I will not be able to pay construction workers to complete the house now, and I find this very difficult (Z-75, 20 February 2012).

Underlying such grievances is the conclusion from Wang et al. (2013) that in Yunnan villages, a shift from traditional to modern house building has social effects beyond solely physical changes in the villagescapes. Traditional house construction involves mutual labour exchanges between villagers, while modern house building requires hired labour. As the above villager found out, the former arrangements build on and reinforce social capital ties and shared community values, while the latter arrangements achieve none of this. Interestingly, this new outlook closely relates to the wide-ranging social changes that come along with people abandoning rice culture (see Section 6.3.2).

Apart from driving a house building/renovating frenzy, compensation and increased access to financial capital sped up purchases of consumer goods in the villages. By 2008, many villagers who did not already own certain increasingly available consumption goods, such as television sets, cellular phones, electric/gas cooking plates, and rice cookers, began to acquire them soon after receiving their payout (Table 7.2). The 2008-10 period also marks the moment when refrigerators became a common feature in Handai houses.

Table 7.2: Year of acquisition of certain consumption goods

	Before 2008		2008-2010		2010-2012		Total
	N	%	N	%	N	%	(n=106)
TV	91	86%	14	13%	1	1%	106
Cell phone	56	55%	40	39%	6	6%	102
Fridge	22	26%	49	58%	14	16%	85
Electric cooking plate	17	24%	37	52%	17	24%	71
Rice cooker	58	56%	31	30%	14	14%	103
Washing machine	4	25%	8	50%	4	25%	16
Air conditionner	1	13%	6	75%	1	13%	8
Water heater	3	18%	8	47%	6	35%	17
Toilet	9	22%	21	51%	11	27%	41
Gas-powered tricycle	7	18%	23	61%	8	21%	38
Motorcycle	3	10%	22	71%	6	19%	31
Rotovator	4	17%	14	58%	6	25%	24

(source: author's survey data)

The acquisition of these consumer items has triggered a range of sociocultural changes, with impacts that go beyond the sheer ownership of a particular commodity (see Nevins and Peluso 2008). For instance, television sets are transforming Handai culture. Television programs expose my Handai informants to Han culture and language, bringing state discourses into their homes and encouraging the villagers to increasingly adopt aspects of the 'modern' lifestyles that dominate Chinese screens. Likewise, in an area where landline telephones are rare, owning a cellular phone has a significant influence on many aspects of daily life in the villages. Peasants use their phones to discuss the prices that crops are fetching in other villages, to coordinate harvests when buyers are expected, and so on. During a funeral I attended, people even used their cellphones to inquire about the moment they were expected to pay respect to the mourning family. In this sense, their phones have metaphorically turned into firecrackers.[185] With temperatures in the high-thirties quite common in the villages, refrigerators have revolutionized the potential for conserving meat. Commenting on how his first fridge and freezer influenced both his diet and reinforced positive perceptions of traditional preservation techniques, one informant stated:

> We used to dry meat or preserve pork in fat because there are a few periods in the year when we have lots of meat to process and these methods were our only options to avoid waste. Fridges now allow us to freeze meat, and this is quite convenient. Owning a refrigerator also made us realize that we really like to eat the meat we process in traditional ways! (Z-75 brother, 16 March 2012).[186]

Finally, electric or gas cooking plates and rice cookers have become alternatives to using traditional firewood-powered ovens over which a huge wok is fixed (see Figure 7.1). Yet locals often prefer cooking with traditional methods when they prepare big meals, and argue that food cooked as such tastes better than that cooked with modern cooking plates. However, many also find that modern cooking methods are much more convenient (D-122, 28 November 2011). This is especially true in Xiaocun village where people have had to travel longer distances to fetch firewood since jatropha plantations still cover important portions of the barren lands adjacent to the village.

[185] Firecrackers are still used to call friends and distant relatives to the house of the deceased, and to keep evil spirits away. In this example, people utilized their telephone to inquire about the moment when firecrackers would be set alight.

[186] The ability to always have ice and cold water in the freezer is also something that many villagers – and the foreign research alike – appreciate.

Figure 7.1: Traditional Handai cooking method (photograph by author, 2011)

While the ownership of such consumption goods is now almost universal in my case study villages, other larger and more costly commodities have also become more frequent over the last decade, particularly during the period following the reservoir-creation announcement. These goods include washing machines, air conditioners, solar water heaters, and toilets,[187] which villagers tend to consider luxuries rather than bare necessities. This is especially true for air conditioners, the ownership of which was used as a criterion for distinguishing between "wealthy" and "average" households by the individuals who helped me design and carry out rapid rural appraisals (Section 5.2.3; D-108, M-1, 28 November 2011). Indeed, air conditioners are considered expensive to buy and utilize, yet in a setting where temperatures often reach into the mid-thirty degrees Celsius six months a year, cold air has recently became a luxury which the wealthiest villagers increasingly feel is worth the investment. Whether air conditioners will influence village life in a manner similar to what fridges did earlier remains to be seen though.

Finally, productive or physical capital commodities such as motorbikes, gas-powered tricycles, and rotovators are also increasingly frequent in the villagescape. In general, villagers perceive

[187] People have traditionally used the public toilets found within each village.

these goods as useful for optimizing their current activities and/or diversifying their income sources.[188] For instance, one informant stated: "After I received compensation money, I knew I had to invest a portion of it into goods that will provide me with an income to compensate for the loss of my land. I first hesitated between buying a motorbike or fishing gear, but I finally decided to acquire the latter because it is much cheaper" (Z-75, 23 August 2011). This echoes the conclusion of Marshcke (2012) that in a Cambodian fisherfolk community coping with resource decline, wealth is indeed an important criterion shaping what diversification strategies people privilege.

Besides the necessity to engage in income diversification strategies, increased consumerism in the villages has been partly driven by a desire to enjoy the alleged benefits of modern lifestyles. That being said, quantitative and qualitative data on the relationships between the Handai villagers and consumerism suggest that this relationship is somewhat ambiguous. For instance, when asked to rank the importance of certain social and cultural values, my survey participants ranked frugality and material possession ownership almost on par with each other (Table 7.3).

Table 7.3: Results of a value ranking survey question

	Rank				
	Against my values (-1)	Not important (0)	Not that important (1)	Very important (2)	Total
Equality		8	7	90	187
Novelty		32	13	59	131
Respecting the elderly		2	3	99	201
World peace		4	5	95	195
Curiosity	1	39	14	51	115
Frugality		16	12	76	164
Environmental conservation		2	7	95	197
Material possession ownership		11	16	78	172
Power	2	59	15	29	71

(source: author's survey data)

[188] The income diversification statement is less true for rotovators, since I only met one informant who said that she rented out the rotovator her household owned (Z-8, 9 December 2011).

Curious to know more as I saw this ambiguity surfacing, I asked one of my key informants – a Handai male in his late twenties – about what lay beneath this enigma. He explained:

> Family, friends, the house, and enjoying good food are the most important things for me. Most of the rest is not necessary, and I hope that my children will be able to draw a line between what is important and what is secondary. I think this is getting increasingly difficult for our generation because there is more money, more publicity and more things to buy. People remember that life was much more difficult as recently as 15-20 years ago. Because they remember this past hardship, they want to enjoy material goods. For instance, we seldom ate meat when I was young, and we now eat some twice a day almost every day. We do so partly to treat our parents, as their lives were really difficult. Nonetheless, for many among us, doing well without leaving the village is more important than getting very rich and buying many things (D-118, 17 March 2012).

In other words, Handai populations are currently experiencing the benefits and comfort that financial wealth can create, and they do wish to enjoy these along with relatives and friends. Yet, in a manner similar to what Carr (2013) found out, this interviewee demonstrates that financial capital does not constitute an end in itself, but rather consists in an asset that is necessary for achieving higher aims, including being able to stay in the village. This explains, for instance, the little enthusiasm my informants demonstrate towards activities that could generate income but in which they see no point, such as Dai water splashing festivals (see Section 5.6.1).

This same reason explains why many among my informants considered that buying a new house, a central aspect in their project to do "well in the village", was the only trade-off that was potentially worth losing their land. Indeed, while villagers were often ambivalent about whether they preferred keeping their land or buying a new house, they made it clear that no commodity other than a new house was potentially worth the loss of their land. For instance, when asked if they would consider selling their land to buy a vehicle,[189] no less than 94 per cent of my survey respondents answered that this option was 'impossible', most often with a big laugh. As one informant framed it: "I would be ready to rent my land, but I would sell it under no circumstances" (D-115, 17 March 2012). This aspect demonstrates that there is much more into land than a regular commodity with a market value, as Hall et al (2011), Hall (2013) and Tilt (2010) previously argued.

[189] The exact question mentioned 辆车 (*liangche*), a generic term.

Summing up, a sudden and significant increase in access to financial capital occurred in my case study villages after peasants were compensated for their flooded landholdings. Peasants adopted different strategies in their attempts to make the best of the asset trade-off that reservoir creation imposed upon them. Three types of investment strategies surfaced in my data. Namely, compensation payments correlate – or at least most often coincide – with a surge in savings, house building and renovation, and consumption good ownership. Many villagers also privilege investment projects allowing them to diversify their income sources, and accordingly compensate for potential losses in agricultural income. I now turn to how these various income diversification strategies have manifested themselves since the mid-2000s.

7.3 PRIVATE ENTERPRISE TO THE RESCUE

Land flooding has forced Red River valley peasant farmers to diversify their livelihoods, while simultaneously creating new livelihood possibilities for them, again re-affirming that exclusion is a double-edged process (Hall et al. 2011). For instance, road improvement and increasing traffic that occurred in parallel to renewable energy development have also brought new opportunities. In this section, I chronicle how some villagers have seen the potential to diversify their activities and sources of income. I also assess how various diversification strategies have paid off in comparison to remaining predominantly engaged in agriculture. Focusing on the main emerging sectors, namely trading, retail, and fishing,[190] I convey the increasing complexity and diversification of the local economy.

My focus on off-farm livelihood options does not aim to contradict the argument, recurrent throughout this thesis, that agriculture remains the first and foremost occupation in the villages. Rather, my point is to demonstrate that other occupations are increasingly important for the local economy in the Red River valley. Accordingly, as expected, an overwhelming proportion of my survey respondents cited agriculture as the main occupation their household members are

[190] When asked during the survey to list the main occupation of their household members, along with their secondary occupation (if any) and tertiary occupation (if any), my informants seldom thought about mentioning fishing. Yet, a section from my survey did concentrate on fishing, yielding data that pointed to the fact that fishing is a much more common livelihood activity than Table 7.4 suggests (see below). I made sure to confirm that fishing was the sole occupation that my informants had forgotten to list both during my survey and through participatory observation.

involved in. Of the 377 individuals able to undertake labour included in my survey,[191] agriculture is the main occupation for 88 per cent of these individuals (Table 7.4). Further, agriculture is the sole occupation for 269 people (71 per cent) That being said, some 12 per cent of my respondents consider a non-agricultural activity as their main occupation. A further 13 per cent answered that they are involved in both agriculture and another activity. Apart from agriculture and work migration – the latter activity being the focus of the next section – the next most popular activities relate to the emerging retail sector.

Table 7.4: Main occupation from my surveyed population in 2011-12

	1st occupation	2nd occupation	3rd occupation	Total (% of labour force [n=377] involved in each occupation)
Agriculture	330	25*		355 (94%)
Migrant worker	21	9		30 (8%)
Street vendor	2	14		16 (4%)
Work in a family restaurant	11	1		12 (3%)
Shop owner	2	9		11 (3%)
Fishing	4	1		5 (1%)
Forestry department	1	3	1	5 (1%)
Worker in a local factory	1	4		5 (1%)
Village politics	1	3		4 (1%)
Passenger transport (moto or bus)		2	1	3 (1%)
Trader	2			2 (1%)
Mining	1			1 (0%)
Motorcycle repair		1		1 (0%)
Teacher	1			1 (0%)
Working in a banana plantation		1		1 (0%)
Total	377	73	2	452

* this value includes 9 individuals who considered fish farming a second occupation

(source: author's survey data)

This predominance of agriculture is also clear in my datasets regarding the income structure of the households I surveyed (Figure 7.2). Income data are, however, much more diversified than those referring to occupations. For instance, some 40 per cent of surveyed households derive at

[191] This excludes individuals for whom the main occupation/status were one of the following: infant, schoolchildren, sick, or elderly.

least a quarter of their annual income from sources other than agriculture (Figure 7.3). I henceforth refer to these households as the 'less agrarian households'. Apart from farming, fishing and retail activities also provide these households with relatively significant portions of their financial earnings (Figure 7.4).

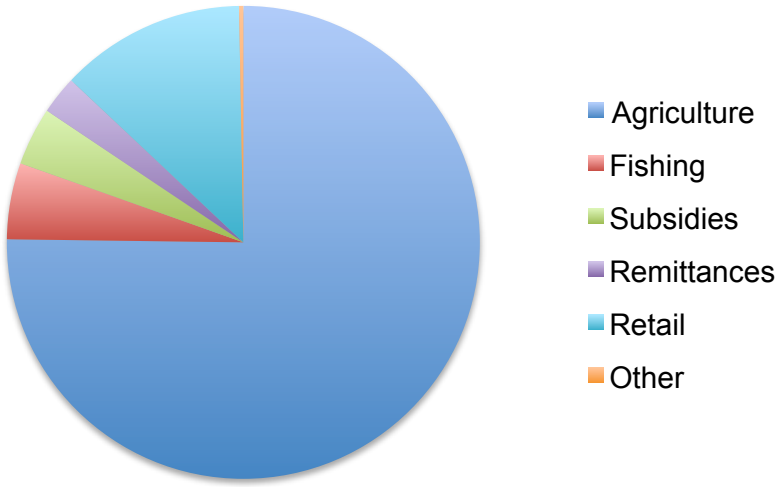

Figure 7.2: Sectorial contribution to household income (n=93)
(source: author's survey data)

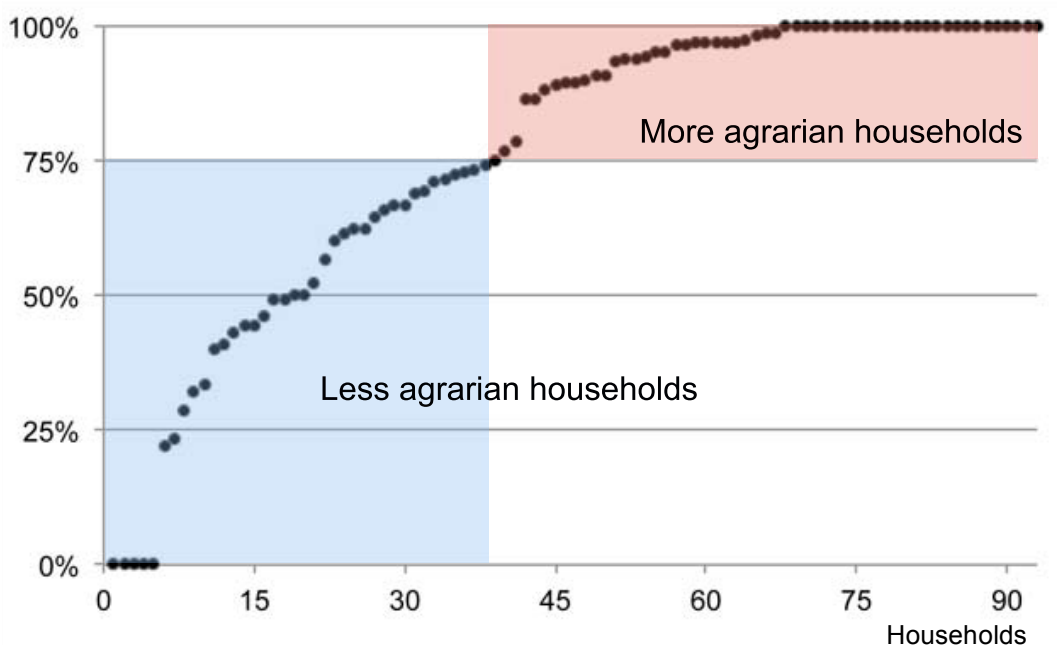

Figure 7.3: Agriculture contribution to household income, percentage (n=93)
(source: author's survey data)

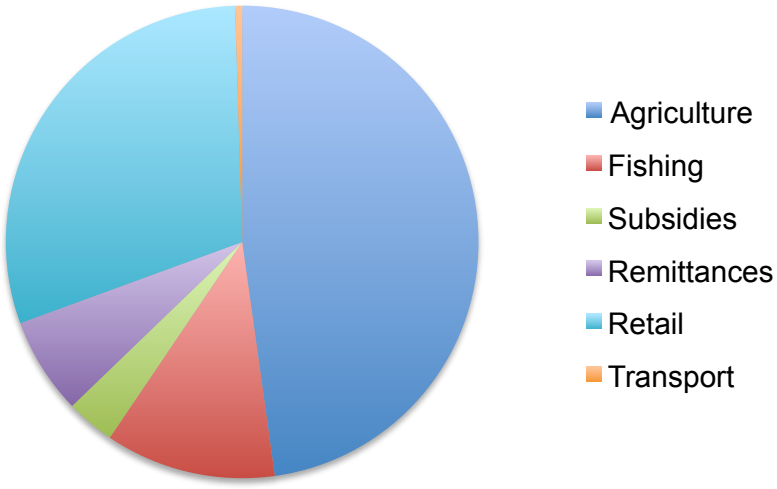

Figure 7.4: Sectorial contribution to household income, less agrarian households (N=39) (source: author's survey data)

The less agrarian households generally achieve higher financial incomes than households predominantly deriving their income from agriculture (Figure 7.5). Likewise, among the households I surveyed, most of those that achieve the highest financial income obtain at least a quarter of their total earnings from non-agrarian activities. These findings convey that income diversification is beneficial, at least from a financial standpoint. On the other hand, households that mostly rely upon agriculture have benefited from a brighter economic outlook since the mid-2000s (Table 7.5). Indeed, a much higher proportion of the predominantly agrarian households saw their cash income grow over the 2006-11 period in comparison to less agrarian households. The various agricultural expansion and intensification strategies I addressed in the previous chapter are obviously closely tied to this trend.

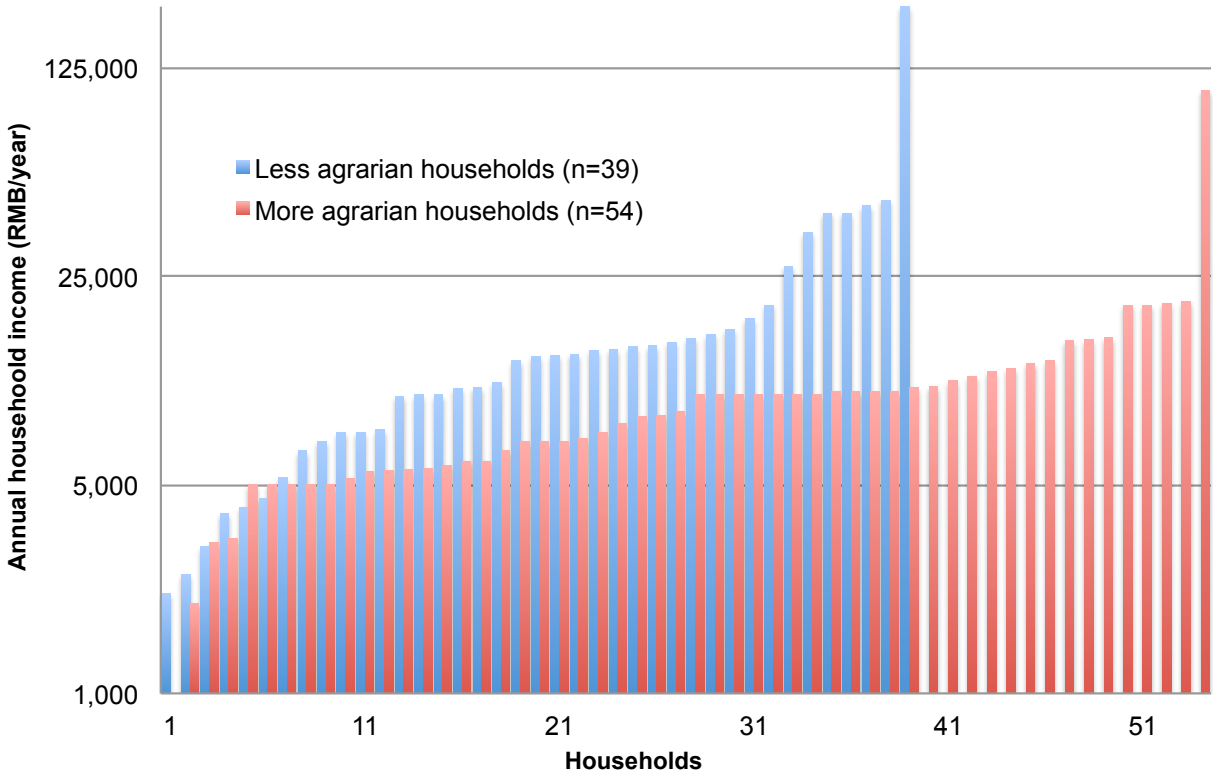

Figure 7.5: Agrarian and less agrarian household income in 2011-12 (source: author's survey data)

Table 7.5: Income trends for agrarian and less agrarian households, 2011-12

Compared to 2006…	More agrarian households (N=54)	Less agrarian households (N=39)
Total income more important	49 (90.7%)	27 (69.2%)
Total income less important	4 (7.4%)	8 (20.5%)
Total income same	1 (1.9%)	4 (10.3%)
Agricultural income more important	48 (88.9%)	23 (59%)
Agricultural income less important	4 (7.4%)	14 (35.9%)
Agricultural income same	2 (3.7%)	2 (5.1%)
Fishing income more important	2 (3.7%)	12 (30.8%)
Fishing income less important	1 (1.9%)	2 (5.1%)
Fishing income same	0	0
Retail income more important	2 (3.7%)	14 (35.9%)
Retail income less important	0	2 (5.1%)
Retail income same	0	0

(source: author's survey data)

Scrutinizing how land flooding affected both agrarian and less agrarian based households highlights that a significant proportion of the less agrarian households lost over 50 per cent of their arable land and *ziliudi* land holdings to the reservoir (Figure 7.6). Households whose income still predominantly relies upon agriculture lost, on average, smaller portions of their landholdings. This comes as no surprise, as those who lost larger portions of their land faced higher pressure to re-organize their livelihoods. Likewise, these households have potentially received higher compensation payments they could utilize to re-organize their livelihoods around non-agrarian activities. My data also confirm that diversification strategies are a function of the physical capital endowments of the locales where they occur (see Rigg 2001). For instance, less agrarian households are much more numerous in Dacun village, where a higher population, better road access, and the weekly market encourage more diversification opportunities than elsewhere (Table 7.6). Likewise, a disproportionate number of the households I surveyed in Xiaocun village rely almost exclusively upon agriculture to gain the bulk of their financial income.

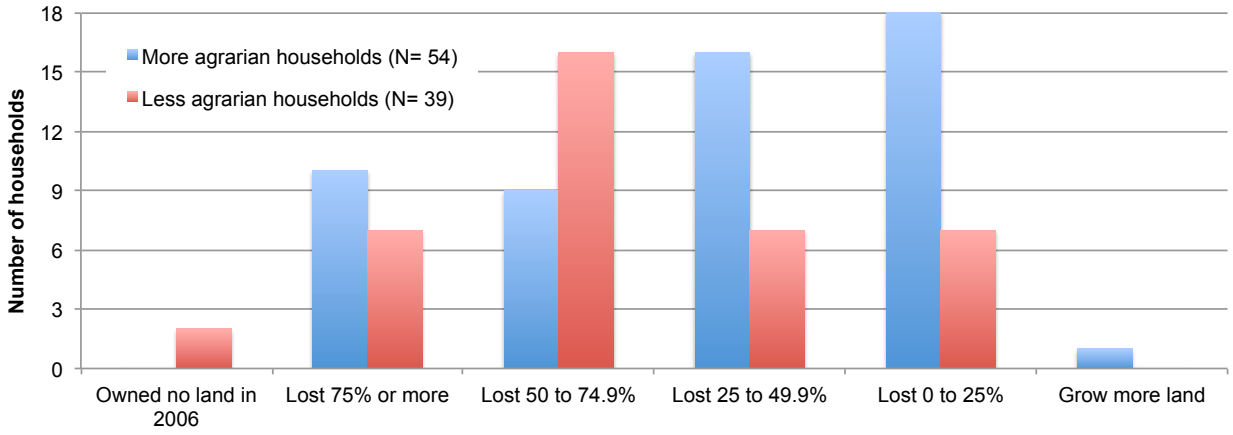

Figure 7.6: Land loss for agrarian and less agrarian households (source: author's survey data)

Table 7.6: Geographical distribution of less agrarian and more agrarian households

	Less agrarian households	More agrarian households
Xiaocun	3	16
Zhongcun	13	19
Dacun	23	19

(source: author's survey data)

The most common village-based income diversification strategy is selling fruits and vegetables along the road. Since this trading occurs mostly along the road connecting Gejiu and Honghe City, the population of Dacun is predominantly involved in this activity, with Zhongun residents to a lesser extent. In Dacun, most roadside traders wait for their customers in semi-permanent barracks wisely placed in front of the local gas station (Figure 7.7).

Figure 7.7: Fruit stalls in Dacun (photograph by author, 2012)

In Zhongcun, villagers partaking in such trading tempt passers-by by showcasing their goods in rattan baskets. Members from 33 households I surveyed were involved in this form of business in 2011-12, and 13 of them had begun selling fruit along the road within the previous five years. One trader drew a direct relationship between the increasing popularity of this activity and reservoir creation, arguing: "I began selling fruit along the road about four years ago. At that point, there were not that many traders, and I could manage to get a good spot for my stall. Now, every month they are more people selling. This is because those that lost land must sell goods to make a living" (D-124, 15 September 2011).

As the number of roadside traders grows steadily, some of the initial individuals involved have decided to abandon this activity. One trader from Dacun provided an explanation: "There are

more cars on the road than five years ago, and I spend more time in my stall today than I did then. In spite of this, I now make less money than before. There are now so many stalls, and business is not that good anymore" (D-91, 4 March 2012). Likewise, a trader from Zhongcun confided: "Business along the road is not as good as it was five years ago, and there are now more wholesale traders coming to buy our harvest in the village. This is much more convenient, and I almost never sell my fruit along the road anymore" (Z-84, 19 March 2012).

Along with this increased competition, another aspect of trading that has changed recently lies in the origins of the goods for sale. Discussing this with an informant while she was piling up bananas, papayas, pickled chilli peppers, pineapples, *yutou*, *shanyao*, mango and litchis in front of her stall, I was told: "My relatives and I began selling here in 2006. Then, we would only sell locally produced fruit. Now, the bananas are from Vietnam, the pineapple from Hekou, the *shanyao* and *yutou* from here, and so on" (D-96, 3 April 2012). Therefore, villagers are now nodes within commodity chains that transcend their valley, exposing them to external influences and modifying their relationship with the commodities they sell (see Nevins and Peluso 2008; Rigg 2001). Indeed, trading food commodities produced elsewhere participates in weakening the cultural ties that my informants traditionally have with food, in a manner similar to their adoption of agricultural practices they do not value, as demonstrated in the previous chapter.

Small shops and restaurants have also proliferated in the villages over the last few years, and again, this has occurred mainly in Dacun. In contrast to fruit stalls, opening a shop or restaurant requires higher investment. Further, an operating license and certificate of compliance with hygiene standards are sometimes necessary. One informant who had just invested 5,000 RMB ($833) in building a small cabin and furnishing it with counters and fridges with the aim of selling juices and snacks explained that he did not need any official documents to run his business:

> Formal businesses with a street sign must obtain the permits. This is not necessary for random shops like mine. Those that do get the permits only need to fill the paperwork and to pay the annual 700 RMB fee ($117), there is absolutely no other requirement to fulfill (D-118, 18 February 2012).

Opening a small shop or restaurant is indeed easy provided that small entrepreneurs can put together the money they need for their initial investment. However, a notable exception is that of

a villager from Dacun who invested most of his compensation money in 20 computers, desks, and chairs, opening an Internet café in 2011. Unfortunately, this person found out the hard way that this activity is controlled tightly in China, and he never obtained a business licence and was soon forced to close his business (D-87, 28 February 2012). His computers and furniture have since been gathering dust.

Since formal credit is difficult to obtain, those who want to open a small business typically draw on their personal savings or informal credit networks. Many villagers have invested their flood compensation money in such ventures, with the hope that they would compensate for lost agricultural income. For instance, a noodle restaurant owner from Dacun explained: "We lost all the land [10 *mu*] after the Madushan dam was completed and we could not grow food anymore. We had to open the restaurant to make a living, but times are difficult and money is scarce. We have less money today than we did when we still had land to grow" (D-65, 11 March 2011). The experience of this small restaurant owner is a typical story of relative financial hardship faced by some households less dependent on agriculture since the mid-2000s, in comparison to those deriving most of their income from farming (Table 7.5).

Like established fruit traders, entrepreneurs who have long been in the restaurant business have also experienced the drawbacks of a recent surge in competition. One restaurant owner selling expensive fish dishes explains how her business has evolved:

> We have owned this restaurant for about 10 years, and it is much less lucrative now than it was five years ago. When we opened this restaurant, no one else was selling yellow catfish dishes here.[192] There are now four restaurants offering a menu similar to ours in the village. Our income has gone down by thirty per cent in the last five years" (D-46, 3 April 2012).

The final common village-based livelihood diversification strategy is fishing in the Madushan reservoir. Fishing along the Red River is not new in the villages and many people have always casually done so, typically using improvised fishing lines. While in the villages, I heard numerous stories about when there were still yellow catfish weighing up to 50 kg in the river (D-32, 23 August 2011; X-15, 25 November 2011), and when "one was sure to catch yellow fish

[192] Named after the color of its flesh, yellow fish (全黄鱼 – *quan huangyu*) is the most expensive, and most famous fish from the Red River. Yellow fish dishes served in restaurants such as the one this informant operates typically fetch 600-700 RMB ($100-117), based on an average price of 320 RMB/kg (53$).

every time one cast a line into the river" (D-118, 5 December 2011). However, this prized fish species was already getting increasingly scarce in the late 1990s and its market value has since skyrocketed. Unfortunately, it is nowhere to be found since the Madushan dam was built, as the dam proves an insurmountable obstacle to migration route. The fate of the yellow catfish recalls that of the Mekong giant catfish in mainland Southeast Asia, where the migratory fish has become one of the key symbols epitomizing the transboundary impacts of Yunnan hydropower development (see Dudgeon 2000; Yot 2011).

Dam construction has had an unprecedented influence upon fish ecology and the disappearance of the yellow catfish is only one example among many.[193] Another impact has been a drastic increase in overall fish availability, coupled with major changes in the species most often caught close to the villages. An increase in fish population is frequent within newly created reservoirs, where flooding releases nutrients caught in the soil and triggers rapid population growth for certain species (Dorcey 1997; Scudder 2005). *Honghe Guangyuan*, the hydropower company, furthered ecological changes by introducing exogenous species in the reservoir as a measure to alleviate the impacts of Madushan dam (Z-75, 23 August 2011). Likewise, individuals involved in fish farming have also introduced new species into the reservoir (see Section 6.3.1). Given the combined influence of all these factors, some villagers have had a hard time keeping track of all the changes, including one person from Zhongcun ironically stating: "There are lots of new fish species, including quite a few we know absolutely nothing about!" (Z-70, 29 February 2012). Another informant argued just the opposite, saying: "The people who say that there are new species got it all wrong. The species are the same, but the balance between the species is different. Some have thrived in the reservoir, while others have vanished" (D-118, 2 April 2012). In any case, changes in fish ecology have driven a revolution in fishing practices, particularly their intensity.

As such, the only fisherfolk still using fishing rods in the reservoir live in nearby urban centers – mostly Honghe City and Gejiu – and come to the villages for leisure fishing. While this activity is

[193] I limit my discussion to how the local population experiences and understands the impacts of dam construction upon fish populations. Unfolding the overall dam building/aquatic life/fisheries nexus goes beyond the scope of this thesis since my focus is on the livelihoods of Handai. However, insight about this topic can be found in Dudgeon (2000), Friend et al. (2009), Ritcher et al. (2010), World Commission on Dams (2000) and Ziv et al. (2012).

quite developed in Nansha reservoir, where tourists can even rent boats, no such business has been developed on the Madushan reservoir yet. However, one resident from Zhongcun foresaw creating a boat rental company as a promising development option for the villages. This same person complained that: "Right now, the tourists only stop in Dacun to eat in the restaurants. Only a handful of people come in Zhongcun and when they do they only hang around, and then they leave. They buy nothing, and we do not benefit from their presence whatsoever" (Z-74, 16 March 2012).

In contrast, villagers fish in increasing numbers using fishing nets and usually do so for different purposes than in the past. By 2012, 36 of the households I surveyed had individuals fishing regularly in Madushan reservoir, compared to 22 households five years earlier. However, much more significant is that while a fifth of the fisherfolk active in the mid-2000s owned some fishing gear, today four out of five possess their own fishing nets (Figure 7.8).

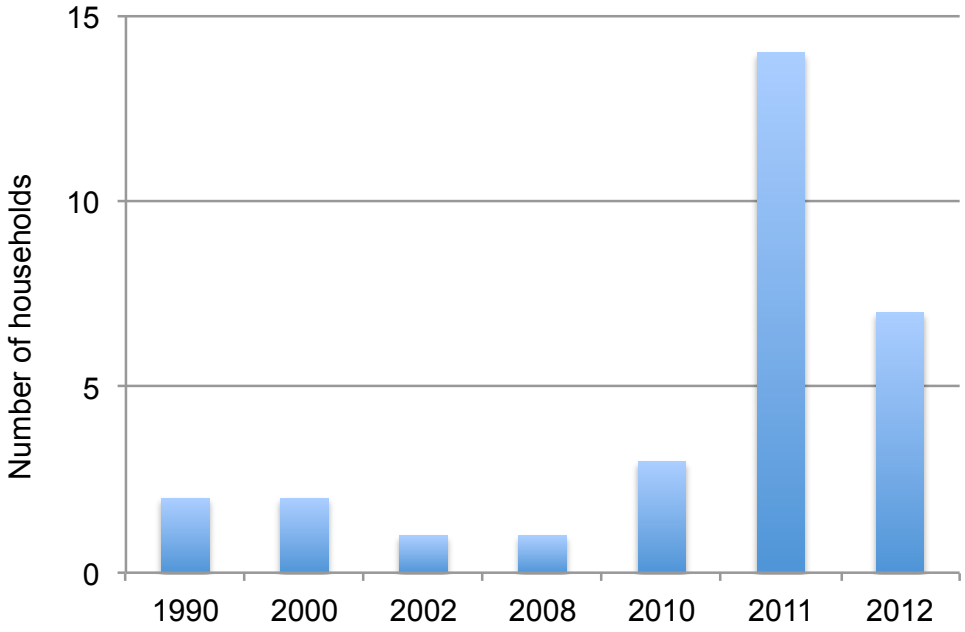

Figure 7.8: Year of fishing net acquisition (source: author's survey data)

On average, households own fishing gear worth about 1,000 RMB ($167), but this value ranges significantly from just a few RMB to 10,000 RMB ($1 to $1,667). Villagers who have committed to important fishing gear investments of course expect some return from it. Fishing is thus increasingly envisioned in the villages as an income source rather than as a way to obtain food for

the household (Table 7.7). This is especially true in Zhongcun and Dacun villages, where fish commodity chains are more developed than in Xiaocun.

Table 7.7: Reasons for fishing

	2006 (n=22)	2011-12 (n=36)
Mainly self-consumtion	12 (54.5%)	10 (27.8%)
Mainly selling	1 (4.5%)	7 (19.4%)
Self-consumption and selling	9 (40.9%)	19 (52.8%)

(source: author's survey data)

Except during winter when the weather is too cold to allow for it, fisherfolk from Zhongcun and Dacun most often go to the river early in the morning in order to collect their catches before traders drive by the villages. Five years ago, no such commodity chain existed, and one informant explained that market and transport infrastructure development allowed for this most "convenient" evolution (X-7, 19 February 2012). Most traders come from Gejiu and arrive in the villages between seven and eight o'clock. The villagers must thus be in the water around six am in order to be ready to sell their morning catch in time. At first glance, this schedule is beneficial since the sole opportunity cost from such early fishing expeditions is less sleep. This trade-off is even less for those who pool their labour and exchange morning turns, so that not everyone has to go into the water every day (Z-3, 1 April 2012). Nonetheless, this new activity adds to the already increasingly busy schedule of farmers (see Section 6.2.3). Also, fishing provides the villagers with a very unstable income, with catches in the reservoir fluctuating from one week to the next.

Apart from the normal ups and downs that all fisherfolk are aware of, villagers also argue that reservoir operation exerts an important influence on their catches. For instance, although many are new to fishing, villagers have quickly discovered that rising waters bring many more fish into their nets (Z-75, 23 August 2011). Likewise, fishing nets sometimes end up on the shore and out of the water due to random and unpredictable reservoir operation-induced water level changes. I often heard complaints about how villagers could easily avoid such upheavals if they possessed more information about reservoir operation, but typically these complaints were followed by a resigned: "nothing can be done" (没办法 – *mei banfa*; D-118, 2 April 2012).

Such impacts on fisheries are by no means specific to the Red River valley. For instance, Hirsch and Wyatt (2004) found that unpredictable changes in the Se San River's hydrology after the building of the Yali Fall dam in the Central highlands of Vietnam have had similar consequences for local fisherfolk. Likewise, they explain that reservoir creation and operation in the Se San watershed have made the river much more dangerous than in the past, documenting that unexpected water releases are allegedly responsible for 39 deaths by drowning. Fortunately, no such event has ever occurred in the villages where I undertook research. Yet the villagers indeed consider swimming in the Red River more dangerous than before the Madushan dam was built. Speaking with nostalgia about his youth, one of my informants in his twenties remembered: "In the summer, we used to swim all day long. We were in the river from 8 am to 5 pm. Nowadays, the parents do not allow children to play in the river anymore. There is now much more water, and it is too dangerous" (Z-5, 9 December 2011).

All told, the creation of the Madushan reservoir has compelled many villagers to find alternatives to agriculture and engage in new occupations and/or diversify their income sources. Reservoir creation has also allowed many villagers to easily access financial capital, often a prerequisite to engaging in new livelihood activities. The reservoir further created ecological conditions favourable to the rapid development of fisheries nearby the villages, although this activity could vanish as rapidly as it grew in the 'boom and bust' fashion typical of reservoir fisheries (Scudder 2005). Similarly, market development and increased traffic along the road passing by Zhongcun and Dacun has encouraged many to get involved in retail and trading activities. This is a risky gamble, with increasing competition making fruit stalls and restaurants less profitable than in the past. This outlook adds incentives for the population of Xiaocun, Zhongcun and Dacun villages to leave their homes and try their luck elsewhere, a strategy I explore next.

7.4. MIGRATION: DOING LIKE 150 MILLION OTHER CHINESE MIGRANT WORKERS

Many among the profoundly territorial Handai do not valorize work migration, or as one informant put it bluntly: "The Handai do not like to migrate. We rather aim to stay in the village and lead a good life" (D-12, 12 March 2012). Hence, if given a choice, most individuals would opt to stay in their villages rather than find work in distant locales. In this sense, Handai differ from many other Chinese countryside dwellers – both Han and minority nationality – who often

consider work migration either as a rite of passage to adulthood or a way out of peasantry and into a 'modern' – and urban – lifestyle (Froissard 2013; Wang et al. 2013; Ye et al. 2013). Apart from such cultural motivations, farmers from all over China decide to migrate because they believe they can achieve higher incomes working in a city than they would by staying in the countryside (ibid.). I argue here that economic factors indeed influence the decisions of those among the population of Xiaocun, Zhongcun and Dacun villages who leave their home to find work elsewhere. However, my data suggest that there is more to the decisions of migrant villagers to leave the home than a desire to maximize income. An inability to make ends meet at home stands out as a more important factor driving what is most often a necessity/distress diversification strategy than progressive/choice one (Bouahom et al. 2004; Ellis 2000a). In other words, factors 'pushing' the villagers away from the villages play a greater role than factors 'pulling' them to other locales, including wage labour opportunities and enhanced labour movement possibilities. Again, reservoir creation has acted as a catalyst in this process, or, in the words of Ellis (2000a: 56), it drove an "underlying trend that created pressures leading to livelihood diversification".

My survey replicated the findings, frequent within migration literature, that the migration patterns villagers have been involved in since the first migrants left in the early 2000s are particularly elaborate (see de Haan 1999; Froissard 2013; Rigg 2007). For instance, some villagers have partaken in circular migration over periods ranging between just a few months to many years, alternating work sojourns with stays in the village with as variable durations. Others leave home for weeks, months or years and then come back to never leave the villages again. Some leave a first time, came back with the hope that they would not leave anymore, but end up departing again for a host of reasons explored below. Finally, some left years ago and since then only came back to the villages for visits. The places where villagers have found employment are as diverse as their migration patterns and cover a surprisingly wide territory. In general, younger migrants tend to move to the city of Mengzi, which is only a few hours away by bus, while the distance migrants travel tends to increase with age (Z-27, 3 March 2012). Migrants from the villages have partaken in dozens of different activities in their new locales, spanning jobs in mining, forestry, factories, gas stations, hotels, supermarkets, and so on (Table 7.8).

Table 7.8: Migrant workers' occupations, and distance from the village

Location	Number of migrants	Occupation
1- Gejiu	9	Driver (1), Electricity grid maintenance (1), Forestry (2), Mining (1), Security guard (1), Telecom network maintenance (1), Welding (1), it depends (1)
2- Mengzi	11	Construction (1), Driver (1), Restaurant staff (3), Security guard (1), Supermarket (1), Mining (1), it depends (3),
3- Elsewhere in Honghe Prefecture	17	Army (1), Bakery (2), Construction (5), Electricity grid maintenance (1), Factory work (3), Gas station staff (1), Mining (1), Motorcycle repair (1), Restaurant staff (2)
5- Yunnan	7	Driver (1), Hostess in a KTV (1), Hotel staff (1), Restaurant staff (1), Security guard (1), it depends (2)
6- Eastern China	11	Factory work (1), Hotel staff (8), it depends (2)
7- It depends	6	Factory work (1), it depends (5)

(source: author's survey data)

My survey results document the journeys of 61 migrants who have temporarily or permanently left the villages since the early 2000s. These individuals belong to 47 households in total, representing almost half the households I surveyed. Neither the percentage of land these households lost to the reservoir nor how non-agrarian activities contribute to their household income stand out as clear drivers for migration. That being said, the annual household income from the greatest share (68 per cent) of the households where one or more member left is below the local average.[194] Also, relatively speaking, migration is a slightly less frequent livelihood strategy in Xiaocun and Dacun than in Zhongcun (Table 7.9). This is potentially due to the fact that flooded land areas were proportionally wider in Zhongcun than Xiaocun (see Section 6.2.1), while income diversification opportunities are fewer in Zhongcun than in Dacun (see Section 7.3).

[194] Household income values include remittances the migrant villagers send back home, but not the actual wage that migrants earn while away from the villages. Most often, household members who remain in the villages were not informed of this.

Table 7.9: The origins of migrant workers

	Migrants		Survey sample	
	Migrants (61)	Households (47)	Population (493)	Household (106)
Xiaocun	12 (19.7%)	10 (21.3%)	104 (21.1%)	23 (21.7%)
Zhongcun	23 (37.7%)	17 (36.2%)	165 (33.5%)	36 (34%)
Dacun	26 (42.6%)	20 (42.6%)	224 (45.4)	47 (44.3%)

(source: author's survey data)

Men make up an overwhelming proportion of the migrant workers who have left the villages, accounting for 82 per cent of all individuals who have found jobs away from home. This is apparently no exception as the three countrywide surveys carried out with Chinese migrant workers that Mallée (1995/96) reviewed pinpointed to similar gender imbalances; male migrants composing between 70 and 84 per cent of the surveyed samples. My survey data also demonstrate that most often, unmarried men – and women to a lesser extent – leave the villages before reaching their mid-twenties, while married women migrants are extremely rare. Again, a similar trend emerges from the surveys that Mallée (1995/96) analyzed. Consequently, while the pattern where 'left behind' children are taken care of by their grandparents while their migrating parents are away is frequent in many areas in the Chinese countryside (see Xiang 2007; Ye and Lu 2011; Ye et al. 2013), I seldom encountered it in my case-study villages. That being said, I did encounter a few households where 'left behind' women lived with a young child and their in-laws. For one such woman informant, this involved that she *de facto* became responsible for growing the family's crops, as I found out while carrying out my survey. Indeed, while she knew about what was currently grown on their land, her husband – who had just returned home – had little idea about the current state of his household's crops. This echoes similar findings from (de Haan 1999) and Xiang (2007) on the increased workload that women have to cope with after their husbands migrate.[195]

Only a quarter of the migrants who left the villages in their teens and twenties send remittances back home. Hence, instead of sustaining their households, these young migrants mainly leave to

[195] This example demonstrates that renewable energy development influences how household responsibilities are shared among household members, including men and women. Similar arguments could be made in regards to how the dams and jatropha plantations have impacted intra- and inter-household power relations.

deploy accumulation strategies with the aim to secure the financial assets that will allow them to afford getting married in their village. The proportion of older migrants who send remittances back home is, however, much more important (67 per cent). For these individuals, migration serves compensatory or security livelihood strategies that sudden livelihood stressors and/or an erosion of the natural resource base have made necessary (see Section 2.4.4). As one informant explained: "Most older migrants must leave because they have no other option. They would stay in the villages if they could" (Z-63, 19 March 2012).

Another significant pattern that emerges from my data on work migration is an increase in the number of people who have decided to resort to this strategy since 2008. Almost three-quarters of the migrant workers my survey documents left the Red River valley in 2008 or later. When I asked how they envisioned this trend unfolding, one third of the survey respondents stated that increasing proportions of the villagers would "definitely" be engaging in work migration in the future, while a further 40 per cent or so thought that this would "maybe" happen. More surprising is that when asked if they foresaw further increases in the number of work migrants as a positive or negative outcome, no less than 70 per cent of all respondents answered positive. Obviously, such opinions differ from my repeated claim that Handai villagers perceive work migration negatively. Qualitative interviews that focused more specifically on both perceptions allow for the reconciliation of this apparent contradiction.

As with the other off-farm income diversification strategies discussed above, villagers point out to the direct relationship between reservoir creation and increasing migration flows. For instance, standing on his family soon-to-be-flooded arable land, an informant in his late teens disenchantingly argued: "Many people will have to *dagong* [engage in work migration] next year. No one is happy with this, but *mei banfa* [there is nothing we can do]" (X-21, 17 December 2011). Yet, this new conjuncture has also contributed to reversing how some Handai weigh the cultural and financial significance of work migration. Pragmatically, one villager noted: "If migrating was a bad option, people would do something else!" (D-62, 15 March 2012). One informant further argued: "Migrant workers are now much more numerous than five years ago. Now that people have less land, migrating allows them to buy food. How could this be bad?" (D-65, 11 March 2012).

Further unpacking this uneasy relationship, another villager commented:

> Of course many villagers now argue that migration is a good option. Land is scarce because of the dam, and migration allows those who lost land to make money. It also means that there are fewer people working the land, which is also good.[196] However, the Handai do not like to migrate, and will only do so if they cannot make a living here anymore. In that sense, more migration is a bad thing. It means that life is not as easy as before in the villages. (D-115, 17 March 2012).

Similarly, another informant argued: "There is no point in leaving the village. If I could get a paid job nearby and commute home daily, I would take it and spend less time in the fields. But it is not worth to move to another place" (X-33, 22 November 2011).

The above quotes recall those from earlier informants, including one who listed a low interest towards migration among the main characteristics that differentiate the Handai from the Yi and Hani people from villages neighbouring Xiaocun, Zhongcun and Dacun (see Section 5.3.4). Likewise, another villager mentioned that the potential higher earnings he could achieve away from home, and associated enhanced access to consumption goods, were not worth leaving his family (see Section 7.2). One scholar informing my research and carrying out ethnographic research in Dai villages from Xishuangbanna reaches similar conclusions, arguing: "The Dai people I work with often find that their situation is quite good in their villages, and do not feel the need to leave their homes" (K-4, 12 April 2012). Likewise, Wang et al. (2014: 47) compare how women belonging to different minority nationalities from Yunnan perceive migration and conclude that Dai people "have stronger attachment to land and their home village and tend not to leave". Again, these authors explain that overall good farming conditions within Dai inhabited river valleys make a strong argument for Dai people to remain in their villages.

Adding to a cultural bias against migration are the grievances that some migrants have brought back to the villages when their migration came to an end. Besides the emotional hardship associated with being away from home and the village, some mentioned that their low proficiency in the Chinese language created important hurdles while they were away (X-86; X-87,

[196] I have encountered a few farmers who recently began renting land from friends and relatives who migrated to urban areas.

22 August 2011). Indeed, migrants belonging to minority nationality groups often face greater prejudice from their co-workers and employers than their Han Chinese counterparts (Lyttleton et al. 2011), making migration a less interesting option for the above informants. Moreover, some begin foreseeing the game might not be worth the gamble from a financial point of view either. As one villager who had ended his work migration sojourns earlier than he had initially planned explained: "Not only is it annoying (很麻烦 – *hen mafan*) to leave the village, but it is not worth it. I went to work in Kunming over the last few years, and while there my income barely covered my living expenses. I made more money, but also spent more, and in the end, I brought back almost nothing." (D-125, 19 June 2012). To this were added oft-heard negative comments regarding the safety conditions of some activities – most particularly mining – as well as difficulties in getting paid on a regular basis and in obtaining leave during the spring festival.

Summing up the complex perceptions that my Handai informants hold toward work migration is this quote from Alexander Day (2013: 123), who, referring to writings by Chinese academic Lu Xinyu, writes that work migration comprised "the only road open for peasants when they could not live on farming (…) Migration was not a positive sign of modernity, but a negative sign of further unequal economic conditions, a sign of the economic position that capital had over rural labor". Indeed, migration is a livelihood strategy that increasing numbers of Handai use in the three villages where I conducted research, often as a way to cope with the livelihood stressors that reservoir creation has driven. Many villagers leave their homes because they feel they have no other option for sustaining their livelihood or achieving their long-term goal of getting married and raising a family in the village. They often leave reluctantly, for a host of reasons, the first of which relates to a profound desire not to leave their family, friends, home and fields. Not all ethnic groups from the Southeast Asian Massif share such a strong desire to stay in their village, reminding us of the determinant role of culture and institutions in shaping livelihood strategies, a role that is often overlooked (de Haan 1999; Rigg 2006, 2007). Also, while my survey participants have the general impression that migration will gain in popularity as a livelihood strategy, other qualitative signals suggest the opposite. For instance, as more villagers engage in work migration, information becomes more readily available about the hard conditions those who leave the villages face in the locales where they settle. Whether these lackluster 'pull' factors will

suffice to compensate for the increasingly important 'push' factors driving migration remains to be seen.

7.5 CHAPTER CONCLUSION

In this chapter, I have analyzed the main off-farm livelihood changes that Handai communities have undertaken since the implementation of renewable energy schemes in the Red River valley in the mid-2000s. Thus, to answer my third research question I have investigated the diversification strategies my informants tested and/or adopted in response to changes in their access to various livelihood assets. I have also unpacked how these assets made or continue to constitute core aspects of Handai livelihood complexity. As it turns out, I have barely cited jatropha plantation expansion in this chapter. The off-farm impacts and benefits of this activity have been minimal, especially when compared to those of hydropower development.

My data demonstrate that reservoir creation and the compensation payments that preceded it have driven an influx of financial capital never before experienced in Xiaocun, Zhongcun and Dacun villages. Those individuals who have received compensation payments often opted for securing this financial capital in four main investment vehicles. Namely, they either saved the money, invested in their houses, bought various consumption goods or acquired productive assets that would in turn allow them to diversify their sources of income. Many rapidly saw the latter strategy as a solution after a fraction – or all – of their landholdings were submerged in water. Simultaneously, increased traffic in both Zhongcun and Dacun has opened new opportunities for villagers to get involved in various retail activities. As a result, the importance of farming both as a livelihood activity and a source of income has declined for many households. For these households, making a living increasingly involves pluriactivity and off-farm livelihood strategies. Whenever possible, the village was the preferred site for villagers to undertake such diversification tactics, although not everyone have been able to undergo on-site diversification pathways. For some, migration, although seldom a preferred option, has ended up a pragmatic solution to cope within this post-damming conjuncture.

CHAPTER 8

CONCLUSIONS AND DISCUSSION: GREEN ENERGIES THE SOCIALIST WAY

8.1 INTRODUCTION

My thesis has examined how three small Handai communities have experienced the impacts from hydropower dam construction and operation, and jatropha plantations installed in the Red River valley. Particularly, I have investigated how households have reorganized their livelihoods to cope with the consequences from these renewable energy schemes as best they can. In this concluding chapter, I first summarize, in Section 8.2, the main features of each thesis chapter. In Section 8.3, I explain how my research fulfills my research aim, and I revisit the answers I provided to my three research questions. Finally, I explore new avenues that emanate from further interpreting my research findings, and how these avenues constitute novel scholarly contributions. Specifically, in Section 8.4, I probe further into how my findings shed new light on environmental governance processes as they unfold in Yunnan Province. In Section 8.5 I further investigate how the livelihood diversification strategies that my informants have adopted after they experienced changes in their access regimes relate to how we understand livelihood diversification, allowing us to see such diversification processes in novel ways. Finally, in Section 8.6, I reconsider the veil of secrecy characterizing how the Chinese government oversees renewable energy development.

8.2 REVISITING THE INDIVIDUAL THESIS CHAPTERS

In the introductory chapter of this thesis, I highlighted the gap between how external business and government stakeholders promote renewable energy schemes in the Red River valley and how hydropower dams and jatropha plantations impact local livelihoods. My research aim, namely *to investigate livelihood changes in Handai households in the Red River valley, Honghe Prefecture, Yunnan province, with a focus on the expansion of hydropower and energy crop schemes, ongoing since the mid-2000s,* sought to address this gap. In this introductory chapter I introduced my three research questions that drove my analysis and thesis structure. I noted that this thesis

would first investigate both the Chinese and global environmental governance regimes that allow for renewable energy schemes to become reality in a frontier setting within a remote Chinese province. I would then turn to focus on the actual implementation of the hydropower and energy crop plantations at the core of my case study. Together these two facets have helped me to answer my first research question. I then outlined how, in later chapters, I would concentrate on examining how dams and jatropha plantations have impacted Handai livelihood portfolios. With a specific focus on how Handai individuals and households have reworked both on-farm and off-farm livelihoods components to cope the best that they can, these sections have helped me answer Research Questions 2 and 3.

To help me start the analysis needed to answer these research questions and meet my aim, I developed a conceptual framework in Chapter 2 centred on three bodies of literature, beginning with political ecology. From political ecology literature I gleaned first and foremost that decisions driving environmental change and its associated impacts are outcomes of political processes involving various stakeholders with differentiated levels of power and environmental exposure (Bryant 1998; Bryant and Bailey 1997; Forsyth 2003, 2009; Robbins 2004). Being cognizant that these circumstances bring together factors and actors pertaining to various scales, I focused on how this multiscalar interplay occurs (Blaikie and Brookfield 1987; Zimmerer and Bassett 2003a). I also delved into scholarship that questions the constructed nature of the various scales that actors participating in environmental governance emphasize (Marston 2000; Rangan and Kull 2009; Willems-Braun 1997). Water resources and water management are frequent objects of inquiry for scholars who emphasize political ecology in their research (Bakker 2010; Loftus 2009; Swyngedouw 1999, 2007). In order to grasp the particular settings where water-society relations unfold, along with the embeddedness of these relations, many authors refer to the notion of the waterscape, which I also introduced and critiqued (Baviskar 2007; Budds and Hinojosa 2012; Swyngedouw 1999, 2007).

The second body of literature I emphasized in my conceptual framework looks at environmental policy-making and renewable energy development in China. This literature first allowed me to critique how renewable energy development has been/can be framed within an ecological modernization agenda, hence promoting a so-called complementarity between environmental

objectives and economic development (Mol 2000, 2006; Hajer 1995; Jänicke 2008). As a legacy of modernization theory, ecological modernization is a widespread concept within Chinese policies, including those pertaining to climate change alleviation and/or renewable energy development (CAS 2006; Mol 2006; Van Rooij 2006a). Yet policy implementation in China leads to perpetual negotiations among state actors from various government bureaus and administrative levels. Also, while the authority of these individual stakeholders is based on their rank in the state apparatus, it does not necessarily correlate with their *de facto* ability to operationalize policies. To better understand this state of affairs, Lieberthal and Oksenberg (1988) coined the notion of fragmented authoritarianism, focusing in particular on the national energy sector. Since then, their seminal study has remained a key reference for scholarship focusing on water resources governance in China (Habich 2013; Heggelund 2004; Hensegerth 2010; Magee 2006a, 2006b, 2013; Mertha 2008). Within this literature, the notion of the powershed is particularly pertinent in understanding how various actors influence and benefit from hydropower development in Yunnan (Brown et al. 2008, 2009; McDonald 2007; Magee 2006a, 2006b; Tilt 2010).

Finally, my conceptual framework stressed the important contribution of livelihood approaches to an examination of how Handai livelihoods are constructed at various points in time. One of the main tenets of livelihood approaches is that people build their livelihoods around a range of assets which is far more diversified and elaborate than the literature suggested in the 1980s and 1990s (Chambers and Conway 1991; Long 2001; Rigg 1997). The asset pentagon is one avenue proposed to grasp this elaborate reality, breaking down an individual or a household's asset portfolio into five types of capital: natural, physical, human, financial and social (Bonnin 2011; Ellis 2000a; de Haan and Zoomers 2005). Access is a determining factor in regulating if and how individuals and households can benefit from such capitals in their livelihoods and what strategies they adopt (Bebbington 1999, 2000; Ellis 2000a; Ribot and Peluso 2003). I also paid close attention the formal and informal institutions governing access regimes and the various powers of exclusion depriving people from access to resources, particularly land (Hall et al. 2011; Ribot 1998; Ribot and Peluso 2003). Changes in access regimes trigger various livelihood diversification strategies that can aim to put recently gained access options to use, or cope with the consequences of exclusion (Bouahom et al. 2004; Ellis 2000a, 2000b; Rakodi 2002; Start and

Johnson 2004). Diversification strategies unfold in various ways and underpin a wide range of livelihood objectives, although common pathways often emerge (de Haan and Zoomers 2005; Turner 2007; Zoomers 1999). In rural areas in the Global South, frequent pathways include changes in the intensity of agricultural practices, changes in the contribution of off-farm activities to rural households, and changes in migration flows (Bebbington 1999; McDowell and de Haan 1997; Rigg 2001, 2005; Scoones 1998).

As such, my conceptual framework equipped me with a range of conceptual tools to interpret my data regarding the factors that drive renewable energy development in the Red River valley, along with how local actors have been dealt with by state agencies and have responded. In parallel, my conceptual framework provided tools for assessing the specific livelihood influences that dams and jatropha plantations have brought about for my Handai informants.

Chapter 3 explained the methodology that underpins this thesis, including the methods adopted for carrying out my research in the field and for transforming the data I obtained in the Red River valley into a legible thesis. However, before approaching individual research strategies *per se*, I reflected on various aspects shaping my subjectivity during the research process (Baxter and Eyles 1997; Rose 1997). These aspects included features of my own positionality as a foreign researcher carrying out fieldwork in a developing country context (Scheyvens and Leslie 2000; Scheyvens and Nowak 2003). The friendships I developed with my informants, and even more so with my research assistant, have also influenced my inquiry (Bonnin 2013; Turner 2010, 2013). Moreover, my research addresses very sensitive topics and this, too, has had implications for how I negotiated my presence in the field (Adler and Adler 1993; Yeh 2006). In doing so, my first priorities remained to ensure that my research would not cause harm to my informants or myself, to abide by my ethical commitments and to attain my research aim. Achieving such a balance was not always a straightforward task, and when in doubt I systematically privileged the first two aspects over the latter (Salemink 2013; Svensson 2006).

As for my actual research strategies, I developed a toolkit that encompasses specific qualitative and quantitative research methods. This approach allowed me to cross-investigate certain topics and triangulate core datasets (Baxter and Eyles 1997; Cresswell and Plano Park 2008; Philip

1998). On the qualitative front, I drew on participant observation, unstructured interviews, and semi-structured interviews to grasp the diversity of individual experiences with renewable energy development in the three study villages (DeWalt and DeWalt 2002; Kitchin and Tate 2000; Valentine 2005). My main quantitative approach consisted of a wide-ranging livelihood survey, which required that I create a stratified sample through various methods associated with rapid rural appraisals (RRA) (see Chambers 1994a, 1994b; De Vaus 2002; Gustafsson and Li 2006). I also drew on secondary sources to obtain state-sponsored quantitative information, although I remained aware of the obvious caveats often associated with utilizing such information. Finally, Chapter 3 introduced the multiple data coding strategies I utilized to organize my datasets onto theoretical codes. Comparing these processed data with what is found in the literature allowed me to further interpret my results (Auerbach and Silverstein 2003; Cope 2010; Wolcott 1994).

Initiating the contextual understanding of the Red River valley, Chapter 4 delved into how renewable energy schemes have been developed in that region since the mid-2000s. However, before addressing this particular sector, I first retraced three significant central government-driven campaigns with long-lasting influences in the frontier regions where I conducted research. Unpacking such contextual elements helped me to avoid portraying the valley as a locale previously untouched by external influences. Rather, I argued that the central government has long implemented campaigns intertwining socio-political and economic objectives in frontier areas such as the Red River valley (Goodman 2003; Sturgeon 2010). The Go West Campaign is one of many such campaigns, and it links the government campaign mentality with the hydropower and energy crop schemes my case studies focus on. Indeed, Go West emphasizes renewable energy development as a priority sector for promoting environmental objectives and levelling living standards between western and eastern Chinese regions (Holbig 2004; Yao 2009).

Investigating the political processes that facilitated the implementation of renewable energy schemes in the Red River valley, I found that hydropower and energy crop plantation developers active in the Red River valley have also benefited from policy incentives besides Go West. These include measures associated with global and national climate change alleviation programs and national campaigns with a focus on energy security. Such programs include the Clean Development Mechanism, along with national objectives to encourage renewable energy to make

up greater proportions of both national energy and transport sector needs (see Gupta 2012; IOSCPRC 2008; NDRC n.d.; PRC 2010). After reviewing and critiquing these aspects, I scrutinized some of the technical, financial and organizational characteristics of the renewable energy projects in progress in the Red River valley. Hence, I documented the implementation process of renewable energy schemes within my research area. I concluded Chapter 4 by arguing that there was no possibility for the local rural population to become involved in the development of hydropower dams and jatropha plantations. Rather, my informants were left to find out in due time how dams and jatropha plantations would breed both exclusion and access opportunities for their livelihoods.

In Chapter 5, I unpacked aspects of the physical and human geographies of the Red River valley that inform why and how it is currently becoming a new frontier for renewable energy development. First, I explained the influence of the mountainous topography of Yunnan on the provincial renewable energy development capacities. Topography also comes into play when approaching the diverse ethnic minorities inhabiting Yunnan (Michaud 2006, 2010; Scott 2009). With the Red River itself an important character in my thesis, I also introduced aspects of its hydrology, and the climatic regime that influences it significantly.

I then turned my focus to the people at the core of my research. I first investigated how ethnicity issues are framed in China. I argued that Chinese ethnic classifications promote generalizations unsuited for accounting for small ethnic subgroups such as the Handai (see Gladney 1990; Harrell 2001). I also introduced other approaches to ethnicity, including the concept of ecological niche. Although it too carries caveats, this approach nonetheless equipped me with stronger conceptual foundations to address how individuals belonging to specific ethnic groups cope with changes in their access regimes. For instance, the strong attachment to the land that characterizes specific ethnic groups, such as the Handai, comes into play in how my informants perceive themselves; as belonging to a group with strong attachments to the land, the family and the home and that does not valorize migration. I also argued that the same attachment lies behind a great many of the livelihood diversification strategies my informants adopted to cope with the impacts from renewable energy development (see Michaud 2006; Wang et al. 2013). Finally, I argued in Chapter 5 that Xiaocun, Zhongcun and Dacun villages are currently undergoing rapid socio-

cultural changes that are notably manifest through the adoption of aspects of Han Chinese culture and the rapid monetization of daily life. These findings are important since they prevented me from over-emphasizing the impacts of renewable energy schemes or portraying my research area as a pristine setting unaffected by external influences – a common concern in village studies (Rigg 2006, 2007).

I scrutinized the impacts of renewable energy schemes and those from other socio-cultural changes as they manifest within local farming regimes in Chapter 6. My results highlight that renewable energy development has changed the modalities governing how most of my informants access their landholdings. The importance of these changes for the local population cannot be overstated. Reservoir creation has deprived many Handai households from significant proportions of the farmland for which they held formal contracted use rights, as well as *ziliudi* over which they held usufruct rights. Moreover, residents of Xiaocun and Zhongcun villages have also been excluded from portions of village-adjacent barren lands as a result of jatropha plantation expansion.

Reviewing how renewable energy development-driven exclusion had unfolded, I also demonstrated in Chapter 6 that some peasants had already utilized transitory strategies before portions of their arable land and *ziliudi* were flooded. For instance, some villagers altered their farm activities based on the perceived risk that their land would vanish before the next harvest. As exclusion took hold, villagers deployed a host of tactics for gaining access to other land resources in their efforts to compensate for their flooded landholdings. These strategies included renting land belonging to Yi individuals from nearby villages or attempting to open perennial crop plantations in the barren lands. However, overall land scarcity and low agricultural potential in the barren lands concurrently forced most villagers to combine these agricultural relocation strategies with agricultural intensification processes. As a result, cash crops, industrialized high-yielding seed varieties, and chemical agricultural inputs have all become much more important within local farming regimes compared to the case before renewable energy development. Such a pathway is not unique to the Red River valley (see Bonnin and Turner 2012; De Koninck and Rousseau 2012; Elson 1997; Rigg 2005), but what is interesting and unique here is being able to delve into analyzing how Handai households undergo such changes in the face of renewable

energy development-induced livelihood stress. Likewise, my findings regarding the pragmatic perceptions of Handai informants of the negative environmental and food-quality impacts of these changes yield further insights into agrarian livelihood debates. The same goes for my investigation of the cultural and socioeconomic reasons villagers have committed to specific on-farm trade-offs.

In Chapter 7, I addressed another aspect of livelihood changes in Xiaocun, Zhongcun and Dacun villages, documenting how non-farm components of local livelihoods have evolved since villagers began experiencing the impacts of renewable energy development in the mid-2000s. I found that the financial compensation that villagers have received for their flooded land has also resulted in important livelihood impacts. Indeed, though compensation payments ended up being less than national guidelines recommend and did not account for all flooded *ziliudi*, the compensation scheme still led to a dramatic increase in financial capital availability in the villages.

Studies of hydropower compensation schemes in Yunnan are scarce[197] and this thesis is potentially the first scholarly attempt at systematically understanding the overall livelihood impacts of such schemes on village communities. As I have demonstrated, the sudden rise in financial liquidity first drove changes in the villagescape, with villagers investing massive amounts of compensation money into modern houses that only the wealthiest among them could previously afford. Likewise, in the late 2000s, certain consumption goods became common while record numbers of villagers began piling up savings. Chapter 7 further made it clear that many villagers saw compensation money as a way to secure an initial investment to diversify their livelihoods locally, in order not to have to resort to work migration. Aspects of physical capital, including transport infrastructure, influenced the range of diversification options they could choose from. Notably, this explains why pluriactivity is now much more common in Dacun village than in less-accessible Xiaocun. Yet, on-site non-agricultural diversification options remain limited overall, and significantly, most of my informants engage in just a few off-farm activities. Hence, it is no surprise that competition among roadside fruit sellers and restaurant owners has risen much faster than market opportunities in these sectors. This situation is

[197] As far as I know, Sabrina Habich is the only other scholar who also investigates such issues; see Habich (2013).

convincing increasing numbers of Handai to leave their village and engage in work migration, although this option is widely perceived as contradictory to one of the very foundations of Handai identity and culture, namely a strong attachment to the land.

8.3 REVISITING MY RESEARCH AIM AND RESEARCH QUESTIONS

As noted above, the aim of my thesis has been *to investigate livelihood changes in Handai households in the Red River valley, Honghe Prefecture, Yunnan province, with a focus on the expansion of hydropower and energy crop schemes, ongoing since the mid-2000s*. Since the impacts that hydropower and jatropha plantation development have driven upon local livelihoods cannot be isolated, my research also accounts for a range of socio-economic factors that impact how people make a living in my three study sites of Xiaocun, Zhongcun and Dacun villages. Nonetheless, the qualitative and quantitative data I gathered in these villages have made it clear that since the mid-2000s the dams and plantations have resulted in far more important impacts on how my informants make a living than any other feature.

Deriving from my research aim are the imperatives to investigate: 1- the factors that drive renewable energy development in the Red River valley; 2- the actual 'green energy' schemes implemented in that same area; 3- the local livelihood consequences these schemes provoke and; 4- what the local populations make of these consequences. I have framed my three research questions so as to meet these imperatives.

8.3.1: Research Question 1

My first research question asked: "*How are renewable energy projects being physically and politically designed and implemented in the Red River valley? What are the roles of different non-local stakeholders towards these schemes, given China's approach to environmental governance within a neoliberal authoritarian regime*?" This question was the focus of Chapter 4, where I demonstrated that Chinese frontier regions have long been subjected to the overarching influence of stakeholders external to the Red River valley responsible for drafting policies in faraway Beijing and/or for implementing such policies in this setting. This governance regime has resulted in an incapacity to account for local geographical and social characteristics, and,

therefore, repeated – and systematically ignored – policy failure, and even more frequent failures to enhance local livelihoods.

Chinese policies promoting renewable energy expansion in the Red River valley are numerous, including the Go West Campaign, along with various national climate change alleviation programs. This has resulted in a hybrid structure for the energy sector in China. Indeed, although this industry is mostly privatized now, the state maintains a tight grip over energy capacity development and does not encourage, nor tolerate, public debate about this matter. At another scale, renewable energy is now promoted and subsidized by global climate change alleviation initiatives, including the Clean Development Mechanism (CDM). Taken together, these aspects have allowed the state and other non-local stakeholders to overcome the "limit of diminish returns" (Lattimore 1940: 243) inherent to the frontier, facilitating the development of hydropower dams and jatropha plantations in the Red River valley. Correspondingly, these same projects have been framed in specific ways. For instance, their alleged capacity to generate fewer greenhouse gas emissions than hypothetical 'business as usual' scenarios has been emphasized far more than any actual on-site impact.

The methods I utilized to answer my first research question focused on the analysis and interpretation of secondary sources, including documents I acquired in the field – such as government publications – as well as policy documents available online (both from the Chinese state and UN-based organizations), and academic literature. I also gathered insight on these topics in the course of semi-structured interviews I carried out with China-based academics and NGO workers familiar with environmental governance and renewable energy development in Yunnan.

8.3.2: Research Question 2

My second research question asked: "*How is the implementation of renewable energy projects affecting and shaping on-farm components of Handai household livelihoods, especially access to land; and how do Handai smallholder agriculturalists perceive these changes?*" This was the focus of Chapter 6, although Chapter 5 helped set the scene by scrutinizing assets that are key to Handai livelihoods in my research area.

I found that the most dramatic impacts from the dams and jatropha plantations have been their role in excluding Handai farmers from portions of their landholdings. People have lost access to one or many of the following land categories, namely: contracted riverside landholding, riverside land over which they owned usufruct right, barren land areas that they cultivated, or barren land areas they utilized for other achieving other means. While exclusion has affected each of my survey participants to a different extent, common pathways have emerged in regards to how people have coped. Strategies I documented include: adopting less intensive farming system in soon-to-be-flooded areas; expanding agrarian activities over new territories such as the reservoir and the barren lands; renting land; intensifying agricultural practices over areas still accessible; relocating activities previously carried out in the barren lands adjacent to the villages further afield; selling livestock and so on.

In regards to how my informants have perceived such changes, they unanimously expressed harsh sentiments about losing the land that is so central to their culture and livelihoods. Likewise, the ways in which the authorities have understood land resources – whether they be along the Red River or in the barren lands – contradict how Handai farmers perceive these same landholdings. Yet, perceptions towards the various strategies that people have utilized to cope with exclusion and their outcomes are more tempered. For instance, many informants consider that further intensifying their agricultural practices is a good opportunity to increase their financial income while remaining in the villages. Nonetheless, they also refer to the crops they grow with modern agricultural techniques in quite pejorative terms.

Both quantitative and qualitative fieldwork methods helped me to answer my second research question. I obtained most of the quantitative data through a RRA and surveys I conducted in Xiaocun, Zhongcun and Dacun villages. Specifically, my livelihood and jatropha surveys provided me with insights into the ways in which my informants perceive changes in the on-farm components of their livelihoods. These results were complemented by unstructured interviews, and participant observation as I worked in the fields or during never-ending meals. These qualitative approaches allowed my findings to achieve much more nuance than the data I gathered through my surveys.

8.3.3: Research Question 3

My third research question asked: "*How have Handai households engaged with and forged off-farm livelihood strategies in response to changes in access to land, other assets and state financial compensation?*" This was the focus of Chapter 7, although again, Chapter 5 indirectly helped me to answer this question too, as it documented assets that are key to Handai livelihoods.

In focusing on this question I found that the financial compensation that smallholders received for their lost riverside landholdings has driven significant changes in the extent to which my informants can access financial capital. Although the compensation process has been fraught with corruption, it has nonetheless provided many with substantial financial resources. In most cases, villagers have first and foremost invested this money in new and modern houses, and major changes in the villagescapes have followed.

However, many among my research participants also foresaw their compensation money as an asset they could utilize to engage in livelihood diversification strategies, so as to compensate for the income and food they previously gained from their now flooded landholdings. Many have opted to become further involved in non-agrarian activities, partly because land has become so scarce in the villages. Eager to benefit from an expanding retail market, some have opened small fruit stalls, restaurant or little *xiaomaibu* (小卖部) shops where they sell cigarettes, cold drinks and frozen treats to the passer-by. Others have decided instead to invest in fishing gear to take advantage of the booming fish populations that characterize new reservoir ecology. Finally, some have felt that they had no choice but to leave their village and engage in work migration.

As stated many times in this thesis, losing land has been a traumatic event for many Handai informants who allocate exceptional importance to this asset. However, the trade-off between loosing land and gaining a modern house has often been considered a somewhat reasonable one. Indeed, while many have remained lukewarm about an expanding consumerist culture, the house upholds significant value for Handai villagers. Likewise, engaging in off-farm activities has often been perceived as a vehicle towards achieving the overarching goal that many interviewees share of staying in the villages and raising a family *in situ*. Yet, at the same time, rising pluriactivity tends to increase workloads, and the rest periods characterizing the traditional agrarian calendar

are now becoming luxuries that more and more people cannot afford. Likewise, since villagers have tended to privilege just a few off-farm activities, competition is rising fast in these sectors. As a corollary, roadside trading and the restaurant business have become less lucrative than in the past. This is something that villagers often deplore, especially those who had already privileged such diversification strategies before the Madushan reservoir was created. Finally, work migration has generally remained a last resort solution that people would prefer avoid.

The methods I relied on to answer Research Question 3 were similar to those for Research Question 2. My livelihood survey allowed me to identify and analyze the main investment pathways that people who had received financial compensation privileged, as well as the main trends characterizing how the off-farm economy had evolved in the villages since the late 2000s. Conducting participant observation in fruit stalls, restaurants and small shops allowed me to grasp the day-to-day rhythm of such outlets. Likewise, there was no better place to experience the ups and downs of reservoir fisheries than in the muddy waters of the Madushan reservoir. Finally, the unstructured interviews I conducted while partaking in these activities or during the various social encounters I participated in, allowed me to further my understandings of how these livelihood diversification strategies have unfolded and grasp what they mean for the people.

8.3.4 Research aim and questions revisited

It is my contention that the answers I have provided to my research questions shed new light on the environmental governance processes that facilitate the implementation of renewable energy schemes in Chinese frontier settings such as the Red River valley. My thesis has likewise demonstrated how the implementation of the dams and jatropha plantations in this area unfolded, a matter undocumented before I undertook this research. Moreover, my investigations of the complex on-farm and off-farm diversification strategies Handai individuals have adopted to cope with renewable energy development-induced livelihood impacts have contributed important insights into livelihood diversification strategies and the factors that influence them. As such, I argue that the answers I provide to my research questions have allowed me to achieve my research aim, namely *to investigate livelihood changes in Handai households in the Red River valley, Honghe Prefecture, Yunnan province, with a focus on the expansion of hydropower and energy crop schemes, ongoing since the mid-2000s.*

Reflecting more on the answers to my three research questions allows me to further interpret my findings and analyze the contributions my interpretations make to the conceptual fields of political ecology, environmental policy-making and renewable energy development in China, and livelihood studies. I synthetize these interpretations and conceptual contributions in three discussion points, and I conclude my thesis by expanding upon these. I first establish how the implementation of renewable energy schemes in the Red River valley is an outcome of national and global policies that fail to account for the local consequences of the development projects they facilitate. Secondly, I demonstrate the moderated perceptions of my Handai informants towards the wide-ranging livelihood changes that they consider, undertake, and cope with either as direct or indirect results of renewable energy development. Finally, I revisit the challenges associated with researching renewable energy schemes in Yunnan, particularly hydropower development.

8.4 RENEWABLE ENERGY DEVELOPMENT AS ONE COMPONENT OF A MODERNIZATION PROJECT

The extensive livelihood consequences that hydropower dams and jatropha plantations have driven for the populations of Xiaocun, Zhongcun and Dacun villages, and the little support offered to cope, tell a lot about the state projects behind these schemes and consequentially reflect renewable energy development and environmental policy-making priorities in China as a whole. In Section 8.4.1, I probe how Chinese policies that facilitate the enterprise of turning the Red River valley into a new frontier for renewable energies fail to account for, and alleviate, the local impacts that such a project drives. In Section 8.4.2 I move my focus to a wider scale and scrutinize how the political ecology of global climate change alleviation has facilitated a particular form of renewable energy development in the Red River valley.

8.4.1 Modernization with Chinese characteristics

A billboard I first saw in the Red River valley in a Handai village near Nansha in 2010 heralded the virtues of the latest political slogan of 'scientific development' (科学发展 – *kexue fazhan*), with images portraying local Handai women as the beneficiaries of development schemes

including high-yielding fruit trees, a riverside gravel mine, a wood mill, a brick factory, a fish farm, and Nansha hydropower station (Figure 8.1). This particular slogan, a legacy of the mandate from former CPC Secretary Hu Jintao (2002-12), has been no more important to the villagers than the 'Three represents' （三个代表 – *sange daibiao*)[198] dear to his predecessor Jiang Zemin, which one can still randomly see painted in fading red characters on some buildings in Nansha. Though I left the field before the slogans of the Xi Jinping leadership appeared on walls and public billboards, my informants are likely no less lukewarm about these. Yet, while Chinese leaders and their slogans come and go every 10 years, the modernization projects they promote in the Red River valley remain a frontier formation endeavour that unfolds over a longer term.

Figure 8.1: Billboard promoting *Kexue fazhan* (photograph by author, 2010)

Since the mid-2000s, the consequences of renewable energy development have convinced many in Xiaocun, Zhongcun and Dacun villages to become further involved in cash cropping, develop plantations in the barren lands, and invest in fish farms. In this sense, while renewable energy schemes made a core element of the frontier development programme the above billboard emphasizes, the dams and jatropha plantations also participated in promoting other aspects of this same state modernization project. In other words, the implementation of renewable energy schemes drove changes in local access regimes that convinced riparian populations to

[198] The main slogan associated with the Jiang leadership aimed at reforming the Communist Party, which traditionally emphasized the working classes. The slogan held that the CPC should equally represent "advanced productive forces, China's advanced culture and the fundamental interests of the largest majority of the Chinese people" (Lewis and Xue 2003: 935). However, it is mostly remembered for opening the doors of the Party to Chinese capitalists labeled as 'advanced productive forces'.

purposefully and actively engage with other aspects of this same frontier endeavour, most often so that they could keep making a living in their villages.

That being said, the ways that local Handai populations have negotiated the impacts of such development are much more complex than Figure 8.1 suggests. A good example is that, whenever possible, farmers have continued to allocate portions of their reduced landholdings to traditional crop varieties they cherish, replicating a pattern that Bonnin and Turner (2012) witnessed in Vietnam. Yet the modernization project promoted in the Red River valley cannot accommodate such a strategy. This testifies to how governmental and private actors promoting modernization in the Red River valley have not accounted whatsoever for what local communities think of state-supported technologies, nor for how villagers should negotiate resulting impacts. One of the most evocative quotes I gathered about this was a comment from one informant who argued that I knew much more about him and his fellow co-villagers than any stakeholder involved in the renewable energy development schemes (see Section 3.3.3). Local authorities and private actors never conducted any form of social inquiry in the villages prior to undertaking projects that have brought about significant consequences for the local waterscape. This, I argue, says a lot about renewable energy development and environmental policy-making in Yunnan, and China in general.

Indeed, it demonstrates that the ways local populations utilize and value various attributes of the waterscape are routinely ignored. For instance, stakeholders involved in hydropower development precisely determined how reservoir creation would influence the Red River's hydrology, along with the extent of the area that would be flooded as a consequence. They then allocated a precise financial value to some of these areas, based on national guidelines they followed more or less strictly. In contrast, my livelihood analysis-based approach demonstrates that locals can only laugh at the notion of assigning a value to their land and voluntarily trading it for money. To them, their land is much more than solely a commodity (see Tilt 2010; Wang et al. 2014). Likewise, uncultivated riverside areas were by no means 'valueless' for the local people, as they notably made very convenient grazing grounds for livestock.

The same applies to the barren lands where jatropha plantation expansion was encouraged based on the assumption that these areas could not sustain intensive agrarian activities. Overnight, agricultural intensification became officially more important than the livelihood functions the barren lands had fulfilled for as long as the elderly could remember, including serving as burial areas, sites for collecting various non-timber forest products, and grazing grounds. What is more, those excluded from portions of the barren lands where they used to carry out such activities were not compensated in any way. This in turn demonstrates that state authorities have categorized various livelihood activities and concluded that only riverside farming is worth compensation. Obviously, those who were excluded from portions of the barren lands see things differently.

What this illustrates is that state and business actors have promoted a vision of nature where ecology and society are disembedded, and as such, my thesis makes an important contribution to political ecology literature. More precisely, I establish that while reshuffling the local waterscape, these stakeholders emphasized aspects and usages that suited their modernization project (Castree 2001; Bakker 2010; Loftus 2009; Swyndgedouw 1999). This approach aimed at legitimizing state-supported endeavours such as dams and jatropha plantations. Yet these projects have also been driving a precise form of exclusion, deemed 'green grabbing' by Fairhead et al. (2012) (See Section 2.4.3). Indeed, by overlooking how various types of landholdings allowed local populations to fulfil important livelihood functions, these projects were essentially land grabs by external stakeholders (see Borras et al. 2011; Fairhead et al. 2012; White et al. 2012). As a response, some villagers protested in the prefectural capital against the criteria overseeing the compensation payments they were offered. Since these critiques pinpointed the application of national guidelines rather than the guidelines or cadres themselves, they coalesce with what O'Brien and Li (2006) have deemed 'rightful resistance' (see also O'Brien 1996; 2013).

Digging further into the circumstances that have tolerated and/or facilitate such a separation of how nature and society are considered, I argue that this partitioned vision is enshrined in other practices characterizing renewable energy development and environmental policy-making in China. For instance, Chinese environmental impact assessment (EIA) law states that such assessments must account for the voices of local populations affected by development schemes (Wang et al. 2003). Yet none of the local views I uncovered in my research are found in the

publicly available sections of the EIAs drafted for Nansha and Madushan dams. For instance, the EIAs do not bother mentioning farmland flooding, although the people informing this research consider this to be by far the greatest consequence of hydropower development. Hence, the Nansha and Madushan dam cases demonstrate that the implementation gap characterizing environmental policy-making in China remains (see Economy 2004; McDonald 2007; Magee 2013). Indeed, the campaigns opposing the Salween dam cascade and the Three Gorges dam likewise resorted to various strategies, including rightful resistance, in seeking the thorough application of Chinese law. One would think that the exposure that these campaigns gained on the Chinese and international scales might have convinced state and business stakeholders to modify their practices. My scrutiny of the Nansha and Madushan hydropower dam projects reveals that such has not been the case so far, highlighting the ongoing authoritarian nature of renewable energy development and environmental policy-making in China.

The same is true for the jatropha plantations, as it seems that no formal EIA was ever conducted before the plantations were given the green light. That being said, the UK-based company involved in jatropha development in the Red River valley hired a foreign consultant to review the plantation projects in 2009. The consultant drafted a report, which I managed to get my hands on. The consultant argued that his assessment was rapidly shelved given its highly critical comments, which noted the deficient agrarian technologies utilized in the plantation sites and concluded that the project offered no commercial potential whatsoever. This example informs how ecological modernization is understood in China as more authoritarian and less open to critique and compromise than its western equivalent (Mol 2006; 2009; Mol et al. 2006; see also Section 2.3.1).

In addition to the weak application of China's EIA law, other political factors explain why renewable energy projects have unfolded in such a manner (ibid.; see also Hennig et al. 2013; Mertha 2008). These also relate to the nature of renewable energy development and environmental policy-making in China, where actors from the energy sector hold significant political influence, and where renewable energy projects have a direct impact upon the career advancement paths and personal wealth of local cadres (see Heggelund 2004; Lieberthal and Oksenberg 1999; Lampton 1992). Likewise, access to information remains strictly controlled, as

is the participation of grassroots actors in public affairs. Some have argued that grassroots participation has evolved as of the late 2000s (Mol 2009; Mertha 2008; Wu and Chan 2012) but if this was ever the case, my research demonstrates that authoritarianism has swung back since. Indeed, public participation was neither encouraged nor tolerated during the planning stages of the projects I focus on. Likewise, when overt resistance sprung up after the Madushan reservoir was created, authorities did present the villagers with a compromise, but did not give the villagers any more room for discussing and negotiating.

The dams and jatropha projects established in the Red River valley were implemented in a unique setting, and it is important to highlight two approaches that grasp this context particularly well. Donaldson (2011) delved into Yunnan economic policy, documenting how provincial leaders have promoted an outward-oriented development strategy that has first and foremost targeted economic growth over other policy objectives. Consequently, in his words (ibid.: 158): "They [Yunnan officials] also structured the developed industries in ways that made participation by poor people difficult".[199] While this holds for Yunnan's economy in general, the notion of the powershed (Magee 2006a; 2006b) enables the unpacking of how this state of affairs applies to the hydroelectricity sector. For this particular activity, provincial outward-oriented policies combine with an overt will from public and private actors from eastern provinces to exploit Yunnan's hydropower potential so as to fulfill their own objectives regarding energy and the environment (ibid.).[200] In this grand scheme of things, local farmers from the Red River valley and/or their priorities and perceptions obviously have not counted much.

8.4.2 Global priorities before local livelihoods

Turning my focus to the global scale, I argue that global climate change alleviation policies and schemes, including the Clean Development Mechanism (CDM), do nothing to ensure that the development projects they promote avoid negative livelihood consequences. As explained earlier, the Nansha and Madushan dams are listed on the CDM, while Sunshine Technology also had ambitions to adhere to the scheme before its jatropha plantations went bankrupt in the early

[199] Donaldson (2011) compares Yunnan and Guizhou provinces and finds that Guizhou places much more emphasis on rural livelihoods.
[200] See also Oakes (2004) for a discussion on the influence of stakeholders from Eastern areas upon hydropower development in Guizhou Province.

2010s. While the Mechanism presents itself as a vehicle for achieving 'sustainable development', it lacks institutional capacity to ensure that this objective also takes into account the local populations affected by development schemes enshrined in the CDM (see World Bank 2010).

Guidelines for joining the Mechanism require extensive calculations and demonstrations that potential projects are financially unsound without CDM revenues and that they will have positive impacts upon global carbon balances (Section 4.3.1; see also Bumpus and Cole 2010). Indeed, digging into the extensive CDM project design documents (PDD) pertaining to any CDM project, one finds that no effort is spared to continually record the amount of carbon credits that dams, biofuel plantations, industrial by-product retreatment plants and other 'clean development' schemes might produce. However, the Mechanism does not require that project developers hire accredited consultancy firms to perpetually monitor how CDM projects affect local communities. In regards to the Nansha and Madushan dams, the truncated EIAs the National Development and Reform Commission submitted to the CDM sufficed for the projects to meet the Mechanism's requirements. I argue that scrutinizing what CDM projects entail at multiple scales can overcome such a caveat.

Further, my thesis has made it clear that the agenda of the Clean Development Mechanism overlaps with that of the proponents of ecological modernization in promoting the diffusion of environmental technologies and 'best practices' as solutions to development-induced environmental crises (Hajer 1995; Foster 2012). I have shown that the imperative to curtail climate change drives very specific environmental discourses that turn a blind eye to the wider development processes propelling what is nowadays considered a most pressing environmental crisis. This contrasts with an earlier, and much more ambitious, ecological modernization vision that aimed to institutionalize environmental concerns as one core component of the capitalist system (Buttel 2000; Mol 2000). Yet just as this idealist vision has failed to materialize, so too has the prospect that the CDM might help reverse the ever more rapid rise of greenhouse gas emissions.

The continuing growth of GHG emissions fuels critical scholarship arguing that ecological modernization and the vehicles promoting it, including the CDM, only serve an emerging global

neoliberal environmental governance agenda. This neoliberal governance centers on new state-market-civil society arrangements serving commodity creation and exchange, of which the CDM is a prime example (Bachram 2004; Heynen et al. 2011; Peet and Watts 2011). Heynen et al. (2011: 10) further assert that when such arrangements are "combined with a stress on individual rights and freedoms, especially private property rights, there is a necessary re-working of the way human society and non-human systems and beings relate". My strategy to document how this stress manifests in the Red River valley has centred on assessing the ultimate and proximate causes driving changes in access regimes in the Red River valley and how they relate to the livelihood consequences I observed. By approaching access from such a multiscalar angle, my research bridges the gap between how political ecologists and livelihood scholars have often previously understood this notion. Likewise, I portray local livelihoods as permeable to both local and global processes, overcoming the idea that livelihood approaches fail to account for circumstances that pertain to meso- and macro-scales.

8.4.3 The powershed and global agendas meeting up in the frontier

As explained in Section 2.3.3, when Darrin Magee coined the notion of the powershed (Magee 2006a, 2006b), carbon finance had not yet attained the importance it had a few years later when the Nansha and Madushan dam schemes joined the CDM. The same holds true for scholarship on fragmented authoritarianism as Lieberthal and Oksenberg first discussed in 1998, or a '2.0' version more open to NGO participation that Mertha (2008; 2009) defined a decade later. Yet as hundreds of Yunnan-based hydropower dam schemes now participate in the CDM, I argue that my findings allow for an expanded study of the fragmented authoritarianism and powershed frameworks. Indeed, while previous scholarship considered energy capacity development in China as a strictly Chinese affair, my research grasps the influence of this new *global* actor over a highly strategic Chinese industry.

I have established that the CDM now influences how project developers active in Yunnan – predominantly based on the eastern seaboard – carry out hydropower development and have documented how this influence manifests itself. For instance, participating in the CDM requires that various actors (the NDRC, the provincial government, the hydropower company, environmental consultants, and the CER buyer nation) comply with the guidelines and project

development document (PDD) requirements of the Mechanism. The consortium responsible for building and operating the Nansha and Madushan dams, *Honghe Guangyuan*, therefore had to publicly disclose more information about these projects than what is required for non-CDM dams. Likewise, systematic evaluations of the greenhouse gas emissions that the dams have theoretically alleviated were conducted. Such aspects were by no means standard practice in the hydropower sector in China, but, as I have demonstrated, they have become so now that the CDM is an integral part of the powershed.

Interestingly, the fact that Madushan and Nansha dams participate in the CDM did not offer any new opportunity for Chinese NGOs to influence these hydropower projects in Yunnan. Likewise, guidelines from the Mechanism did not require that *Honghe Guangyuan* commit to any further impact alleviation measures than what Chinese policies require. Also, no institution in the CDM is responsible for ensuring that companies abide by the above guidelines, and/or that the authorities do not embezzle impact alleviation funds.

Seen from this new angle, the CDM becomes a powerful frontier formation mechanism for overcoming one of the fundamental characteristics of the frontier, namely that it reworks what Lattimore (1940: 243; see also Hall 2013) defined as the "limits for diminishing returns". In other words, carrying out development and/or modernization projects in the frontier comes with an added cost, and the CDM addresses this in two typical manners (see Section 4.1). First, as I just described, the Mechanism tolerates externalities from the development projects it facilitates being passed on to local populations. Second, the CDM provides direct subsidies to frontier formation endeavours on the grounds that they contribute to a global priority, namely alleviating anthropogenic greenhouse gas emissions. My thesis has unpacked this perfect complementarity between the CDM and regional development programmes such as the Go West Campaign, along with other Chinese policies and regulations promoting environmental modernization and energy security objectives. This demonstration contributes to the political ecology literature, as it frames the environment as the locus for multiscalar political processes that combine to strengthen precise environmental discourses to the benefit of some actors, at the expense of others.

Relating the failure of the jatropha plantations to the incapacity of Sunshine Technology to join the CDM early enough would most likely be an opportunistic argument; there are many other reasons the project went bankrupt, including poor oil price forecasting and the failure of the Chinese subsidy regime to ensure – or even encourage – long-term project sustainability (see Section 4.4.2). Nonetheless, the fact that both private and governmental actors involved in jatropha development desired that the jatropha schemes be listed on the CDM supports the argument that the Mechanism facilitates frontier formation endeavours.

8.5 RENEWABLE ENERGY SCHEMES DRIVING SIGNIFICANT LIVELIHOOD DIVERSIFICATION

Dam building significantly impacts river hydrology (McCully 1996; Ritcher et al. 2010). Moreover, since water fulfills intricate social functions within any given waterscape, dam-induced hydrological changes trigger important livelihood changes for riparian communities (Bakker 2010; Béthemont 2002; Yot 2011). By investigating how three riverside Handai communities have experienced the impacts of the construction of hydropower dams, my thesis documents the intricate relationships between the natural and social components of a waterscape. In parallel, I have also documented how two of these three communities concurrently dealt with the development of jatropha plantations on portions of the barren lands adjacent to their villages. For some, jatropha expansion triggered exclusion processes that proceeded to drive further livelihood diversification strategies, including reducing large livestock herds and relocating plantations previously established in the barren lands where jatropha expansion occurred (see Sections 6.3.1 and 6.4).

I further scrutinize the overarching influence that renewable energy schemes have had upon local access regimes and upon the significance that my Handai informants allocate to some of their livelihood assets in Section 8.5.1. Then, I investigate the elaborate perceptions the villagers hold towards the livelihood changes they have undergone since the mid-2000s. I further probe how these perceptions have positioned the villagers towards development schemes such as the dams and plantations. Section 8.5.3 revisits the livelihood diversification strategies I introduced in my results chapters so as to highlight how my case studies add to previous literature on the complex tactics that people emphasize under changing access regimes. Finally, Section 8.5.4 reconsiders

the notion of progressive diversification, proposing that not only can such a tactic lead to 'progress', but it can also testify to the 'progression' of many individual diversification strategies. Again, these aspects allow me to make contributions to the literature examining the encounters between rural livelihoods and development and modernization projects, which most notably emanates from livelihood approaches and political ecology.

8.5.1 What changed, what did not, and why

In my earlier discussion about the frontier, I quoted Owen Lattimore (1940) explaining that while frontier formation drives extensive sociocultural changes in the societies experiencing it, such changes do not erase all aspects that characterized these societies before frontier encounters. Among the important changes that renewable energy schemes drove in the case study villages is a reversal in the meaning of modern house ownership, previously the privilege of a small few and now a widespread feature of local villagescapes thanks to financial compensation for flooded lands. The Madushan reservoir is responsible for this change, and the same reservoir makes going fishing much more lucrative than before. Fish are now far more abundant in the nets of fisherfolk and in the aquaculture pools that have appeared in the villagescape since the early 2010s. Yet the observed fish species are different than in the past and catches have become are highly variable. Likewise, while waterside landholdings were previously considered the most desirable land, they are now associated with land scarcity. Barren lands too are also gradually being reframed as areas tolerating intensive agriculture, where acquiring usufruct right might be worth the effort, yet both grazing grounds and large livestock are increasingly rare.

While the above changes can be directly and unmistakably traced back to the implementation of dams and jatropha plantations in the Red River valley, these same schemes have also contributed to significant changes in local cultural perceptions. For instance, in Section 6.3.3, I quoted one of my informants saying: "Income is now more important than soil fertility" (X-14, 8 December 2014). This exemplifies the powerful influence of frontier formation endeavours upon Handai populations. Soil fertility is a core pillar of Handai culture, farming systems and livelihoods. Soil fertility determines why land and the home are so important for my informants. Indeed, wet rice farming and the Red River hydrology traditionally allowed for these individuals to undergo sedentary farming regimes, which itself drove Handai societies to have a stronger attachment to

land in comparison to other swiddener societies inhabiting the neighbouring midlands and highlands.

Interestingly, this new emphasis on money over land fertility within local asset portfolios has not impacted the importance that Handai households allocate to land *per se*. Even though land is increasingly deprived of one of its core characteristics – yearly, naturally rejuvenated fertility – and it is much less available than before, it does remain as central to local livelihoods as it ever was. In other words, land has changed, it has been both modernized and enclosed, but its role in shaping the place my Handai informants consider their 'old home' (老家 - *laojia*) has remained fixed.

This persistence contradicts a body of scholarship arguing that as rural societies in the Global South in general, and Southeast Asia and Africa in particular, increasingly rely upon pluriactivity and off-farm activities, the importance of land decreases within rural livelihood portfolios (see Bryceson 1996; Elson 1997; Hall 2004; Rigg 2001, 2005, 2006). It has been argued that this outlook has convinced some smallholders to purposefully trade their land, as they would do with any other commodity (Li 2002). This is an option my informants would always consider with a big laugh; there is absolutely no way that it could ever make sense for them.

The importance that land upholds for rural societies in the Global South is currently being reassessed within political ecology scholarship, which theorizes increasingly complex processes, such as biofuel development, colluding to deprive these societies from their landholdings (Ariza-Montobbio et al. 2010a, 2010b; Borras et al. 2010, 2011; Hall et al. 2011). Hall et al. (2011: 188) has contributed significantly to this scholarship, grasping the profound and enduring livelihood importance of land to many rural Southeast Asian societies:

> [D]espite the challenges, all over Southeast Asia people struggle for land and hold on to it as long as they can. Often, they put their lives at risk. They do so because, even in a context where livelihood strategies are diverse, they are very much better off with access to land than they are without. Land remains a critical livelihood resource. Land as territory, a village, a place to call home, turns out to be equally important.

My livelihood framework-inspired approach to access and the results I have derived from it contribute to these debates. Indeed, I have documented how Handai people's attachment to their

land shapes how they cope with exclusion, and how this exclusion is an outcome of the implementation of renewable energy schemes that other actors at various scales promote and benefit from. As stated above, biofuel expansion has long been recognized as a driver of such exclusion processes. Yet scholarship on exclusion has so far paid much less attention to how hydropower development deprives people of their access to land. My research addresses this shortcoming.

Further, I have emphasized the role that ethnicity plays in determining why my Handai informants persistently cling to their land and frame their livelihood diversification strategies accordingly. In this sense, my research contributes to addressing the challenge Forsyth and Michaud (2011: 9) have identified:

> we contend that neglecting ethnicity and its local cultural determinants will ensure the long-term failure of effective good governance and development programs. Many contemporary approaches to livelihood and development, we contend, do not pay sufficient attention to this challenge.

This critique highlighting the limits of livelihood approaches recalls other caveats raised in the literature reviewed in my conceptual framework, including arguments pertaining to the challenges of utilizing template frameworks for assessing realities as elaborate and complex as livelihoods (see Section 2.4.2). Yet livelihood literature also introduces solutions to this, among these the proposition by Bebbington (1999) that livelihoods be simultaneously understood as how people make a living *and* how they understand their livelihood (see Section 2.4.2). According to Bebbington, a close scrutiny of the formal and informal institutions shaping access regimes helps us to grasp both sides of the livelihood coin.

Addressing these conceptual challenges, I have systematically emphasized how cultural characteristics come into play in shaping the livelihood diversification strategies my Handai informants have chosen after experiencing changes in their access regimes. Most notably, the farmers have first and foremost privileged maintaining and/or extending their access to any land resources available, undergoing on-site livelihood diversification strategies, and consuming specific local crops. By scrutinizing how and why this particular pattern borrows aspects from the modernization project promoted in the Red River valley while simultaneously refusing others, I make a further contribution to livelihood approaches.

8.5.2 Handai farmers in a box or thinking outside the box?

The implementation of renewable energy schemes in Honghe Prefecture has both triggered elaborate sociocultural changes and reasserted sociocultural elements that predated the dams and jatropha plantations, such as the importance people allocate to their land, to staying in the village and to traditional food systems. I now elaborate on the complex perceptions that my Handai informants expressed towards the numerous changes that renewable energy schemes have driven in their livelihoods. In doing so, I demonstrate that my Handai informants have a strong capacity to pragmatically weigh the pros and cons of their new livelihood trajectories.

First, individuals from Xiaocun, Zhongcun and Dacun villages still resent some of the changes that the implementation of renewable energy schemes has driven in their livelihoods. In most cases, their most bitter feelings relate to land flooding and how the authorities handled land compensation processes. Some overtly resisted what they felt were inappropriate compensation standards, taking their case to the prefectural seat Mengzi. Likewise, many still complain about the systemic corruption of the authorities involved in compensation processes and the hardships of making a living with reduced landholdings. These findings echo other scholarship centered on rural resistance, in which local actors are more or less in constant opposition to state projects and authorities (Adasthe 1981; Bryant and Bailey 1997; O'Brien and Li 2006; Scott 1985, 1986, 1990; Forsyth 2009). In a similar manner, this aspect of my research also reiterates the conclusions from Yot (2011) on the multifaceted hardships that a Chinese dam-building program created for riparian communities in the Lancang-Mekong watershed.

Yet such a clear-cut position does not reflect how my Handai research participants view other livelihood changes driven by renewable energy development. The modern houses that many Handai villagers invested in with their financial compensation are a prime example of this. As with land, the Handai have traditionally allocated very high importance to their houses, which serve numerous critical social functions. Likewise, reservoir creation has allowed villagers to partake in new livelihood activities, including fishing and aquaculture. Many of my informants welcome these new opportunities, and to some extent this positions them as pro-development actors, like the pro-dam Lepcha communities McDuie-Ra (2011) studies in Indian Sikkim.

However, portraying my Handai informants as solely pro-dam or anti-dam actors would again fail to account for a third category of perceptions many among them hold towards other aspects of the livelihood changes they have undergone since the mid-2000s. Indeed, although they do not totally endorse a great many of the livelihood changes that renewable energy development has brought about in the Red River valley, villagers often seem willing to accept such trade-offs and commit to associated diversification strategies. However, they have only done so as long as they can envision this contributing to the long-term goal of raising a family in the village. The description of exclusion as a 'double-edged' process (Hall et al. 2011) is a good starting point for capturing this complex state of affairs. However, the pragmatic perceptions of my informants call for a framework that tolerates even more nuances and shades of grey.

For instance, land pressure creates an important incentive for my informants to intensify their farming practices. As a result, the villagers increasingly grow food they do not enjoy through agricultural practices known for their negative impacts upon land capacity, food taste and health. Yet this has not involved that they do not self-consume food produced through such intensive methods. My informants opt for eating food grown through traditional farming practices whenever possible. Yet when such products are not available, they do not hesitate consuming food grown more intensively, even though they enjoy it less. Concurrently, they engage in elaborate discussions on differences in the taste, appearance and properties of both types of food.

Likewise, for many, pluriactivity has correlated with the gradual abandonment of the traditional agricultural calendar, in which work-intensive periods were interspersed with periods when people could take time off and rest. Nowadays, people increasingly make use of these low-work intensity periods to engage in further agrarian and/or non-agrarian activities. Again, many Handai individuals hold ambivalent opinions towards such changes. On the one hand, they positively assess that such trade-offs are not in vain and that they yield returns, with their financial income rising steadily. On the other hand, people argue that they are more tired than in the past, and they sometime feel nostalgia towards certain agrarian traditions vanishing, including the huge gatherings that rice harvest periods used to lead to twice a year.

The same goes for work migration. According to my informants, leaving the village is an option that conflicts with one of the very foundations of Handai culture; the importance of staying in the village. My informants deem that this decision has long distinguished Handai populations from other ethnic groups, including Yi and Hani people from neighbouring midlands and highland villages. Yet as increasing numbers of villagers engage in work migration, more and more people foresee leaving the village as a solution for coping with the new post-dam and jatropha plantation outlook in Xiaocun, Zhongcun and Dacun villages.

Hence, my informants have expressed some very clear positions on both the positive and negative consequences that the implementation of renewable energy schemes have either driven or influenced in their livelihoods. Yet, in parallel, their evaluation also leads to much more elaborate conclusions. Pragmatic is, I argue, the word that best grasps this state-of-affairs, negating any stipulation that the villagers resist or accept change unilaterally.

8.5.3 Access, exclusion, and livelihood diversification unveiled

The complex perceptions I summarize above have arisen as livelihood diversification strategies become increasingly elaborate in the Red River valley. Many of these strategies recall pathways documented in earlier livelihood literature. Yet by scrutinizing how the asset base of my Handai informants has influenced the strategies adopted in reorganizing their livelihoods after access to various livelihood capitals was modified as a result from underdocumented renewable energy scheme, I push this scholarship further. Digging into this question, I both investigate the evolution of my informants' abilities to benefit from various livelihood assets and probe the multiscalar factors shaping access regimes in my research villages.

Households becoming involved in aquaculture or reservoir fisheries did so in order to benefit from the new access opportunities brought about by the reservoir hydrology. Such pathways exemplify progressive diversification strategies as defined by Bouahom et al. (2004) and Ellis (2000b). In contrast, peasants who abandoned agriculture altogether after all their land had been flooded were forced to undergo distress diversification patterns that would allow them to secure new income sources they direly needed. Diversification strategies that resulted from land flooding can also count as compensatory strategies people underwent to cope with new livelihood

stressors and/or security strategies promoted to compensate for reduced access to natural capital (de Haan and Zoomers 2005; Zoomers 1999). The notion of selective diversification coined by Turner (2007) also applies to villagers collecting fruit crops and edible non-timber forest products if they feel like it, have time for it, and/or feel the price is worth the bother.

Diversification gets more elaborate when livelihood changes emphasize various and potentially ambivalent objectives. For instance, some villagers have engaged in new off-farm activities such as fruit trading or opening a restaurant in the hopes of benefiting from growing retail markets (progressive diversification). Other villagers have first and foremost engaged in retail activities because they foresee this diversification strategy allowing them to cope with being excluded from portions of their landholdings (distress/security/compensatory diversification). Migration, too, is emphasized as a multi-dimensional strategy. Indeed, migration is a livelihood diversification and wealth accumulation strategy young villagers deploy to obtain an initial asset base, including wedding money. For older migrants, a move for work typically consists of a compensatory/security strategy allowing them to send remittance money to their family. Similar compensatory/security motives have justified small-scale mango plantation development in the barren lands. Yet, for some villagers, such plantations also exemplified audacious consolidation strategies, as their labour and financial investments in this difficult setting would take a minimum of three or four years to yield results, if ever. Likewise, the investment required for opening such plantations was compensated for by usufruct access right to barren lands (*ziliushan*) areas. While these areas overall remain poorly valued nowadays, this might turn out a very clever gamble if access regimes to landholdings are modified further in the future.

The factors that have influenced diversification strategies in Xiaocun, Zhongcun and Dacun villages are as elaborate as the objectives that the villagers have aimed to fulfill through such tactics. Ethnicity and cultural characteristics are central elements shaping my informants' decisions in regard to which diversification strategies to privilege. Scholarship on the diverse ethnic groups inhabiting the Southeast Asian Massif points to water resources and geographical characteristics specific to river valley settings as important cultural markers for lowland ethnic groups such as the Handai (Berlie 1988; Michaud 2006; Wang et al. 2013). Yet research on how such populations experience the impacts of hydropower development in Yunnan remains in its

infancy. This literature indeed lacks significant discussion on how ethnicity comes into play in shaping how riparian communities experience and adapt to the impacts of river damming. My research addresses this gap for Handai populations, but carrying out similar work in other Handai settlements and with other ethnic groups and subgroups is necessary given the rapid pace of hydropower development in Yunnan. Likewise, the scholarship regarding how different ethnic groups approach migration remains limited, although some recent contributions have begun to unpack this issue (see Wang et al. 2013, 2014; Ye et al. 2013).

Another aspect that has stood out from my results relates to the intricate relationships between many of the livelihood assets my informants have been able to access and their livelihood diversification strategies. For instance, access to financial capital exerts an important influence upon the potential livelihood trajectories a household can choose from (see Marschke 2012). My earlier quote about an informant hesitating between buying a motorbike and fishing gear is a strong reminder of this link. Social capital also comes into play, as it also shapes the capacity of the villagers to secure the initial funds they need for engaging in new livelihood activities. Indeed, when in need of credit, many villagers resort to trust-based informal credit schemes. Due to a land regime that does not allow them to sell or trade their contracted landholdings, most villagers do not possess collateral assets to secure bank loans, and formal credit networks remain inaccessible to many. Villagers have therefore developed informal credit institutions as a solution to cope with such a vacuum, offering them more flexible loan arrangements than what banks could offer.

Nonetheless, my thesis demonstrates that villagers have frequently expressed grievances regarding a generalized lack of institutional support. The state presence in Xiaocun, Zhongcun, and Dacun villages is particularly low, fuelling oft-cited sentiments that authorities and cadres privilege their own personal wealth over the wellbeing of village communities. This state vacuum has forced villagers wishing or compelled to diversify their livelihoods to rely upon aspects of their social and human capitals. Adding to the above informal credit schemes, information exchanges on how chemical input adoption experiments unfold also exemplify the influence of social and human capital within livelihood diversification patterns (see also Brookfield 2001; Yot 2011).

Last but not least, physical capital also comes into play in forging diversification strategies. Notably, enhanced access to markets and transport infrastructure has driven more profitable off-farm livelihood opportunities in Zhongcun and Dacun villages than in smaller and more isolated Xiaocun (see Rigg 2001). Villagers in Xiaocun are well aware of this burden and have placed high hopes on the potential economic boost that their small community might get after the completion of a road pavement project in progress when I left the area (see Section 5.6.2). That being said, market development, too, is double-edged, as it has bred increasing competition between villagers. For activities that rely upon increasing car traffic, overall market growth is most likely assured for some time still. Yet when rising competition occurs in sectors such as reservoir fisheries or fish farming, risks of further encroaching on the natural resource base mount.

8.5.4 Expanding the notion of progressive diversification

A novel dimension of progressive livelihood diversification that has emerged from my result chapters demonstrates how diversification strategies arise in a step-by-step, gradual manner. Before I further unpack this contribution, it is important to recall that the impacts of reservoir creation and jatropha development likewise have gradually manifested over a number of years and that villagers have not experienced them abruptly – unlike, for instance, communities coping with natural catastrophes. Therefore, as they face gradual changes in their access regime, villagers have adopted strategies that allow them to actively make the best and/or benefit from shifting conditions.

Maybe the most evocative example of this progressive step-by-step diversification process is how some villagers adapted their farming regimes between when they first learned about upcoming land flooding – in 2008 – and the actual two-year long creation of the Madushan reservoir that began in 2010. Faced with insecurity, some of my informants decided that they would gradually invest fewer resources into their riverside land plots. However, most of them did not altogether abandon the lands to which they still had access as soon as water began rising: they felt that the prospect of one more harvest, though perhaps a smaller one, was worth risking the loss of their

work and farm inputs in soon-to-be flooded areas. A strategically weighted decision process was in play.

A look at how various livelihood pathways have unfolded also highlights similar gradual livelihood decisions. For instance, agrarian households have not converted their fields to cash crops altogether overnight; rather, they began by ceasing to grow maize, and then grew less rice and/or grew it only once a year rather than twice; this gradually made way for cash crops, which also expanded in different waves. The same can be said regarding how has pluriactivity unfolded in Xiaocun, Zhongcun, and Dacun villages. My data demonstrate that most villagers first committed to on-farm diversification strategies and mainly deployed off-farm diversification tactics later. Likewise, off-farm but nearby activities such as opening a fruit stall or a small restaurant became frequent several years before increasing numbers of villagers began considering work migration, pointing out again to how socio-cultural factors result in certain livelihood opportunities being played out before others.

As I have repeatedly stated, there can be no doubt that dam and jatropha plantation schemes have directly driven a great many of these shifting livelihood trajectories and changes. Yet it is impossible to isolate the influences of renewable energy schemes from those pertaining to other factors that also drive livelihood changes in the Red River valley. Xiaocun, Zhongcun, and Dacun villages are relatively easy to access, being located along a flat (although narrow) river valley where road transport is much more convenient than in the adjacent highlands. This partly explains why Handai communities have a long history of cultural exchange with Han Chinese. Livelihood changes have been driven and moulded by factors like political campaigns from the central government, road development, increased access to television and cellular phones, and increasing traffic passing through the villages. My Handai informants do not perceive the influences of these factors as fatal, nor do they refuse and/or resist change altogether.

As such, the implementation of hydropower dams and jatropha plantation schemes in the Red River valley has brought many of my Handai informants to revisit how they relate to certain livelihood assets. The elaborated perceptions that such repositioning triggered among the populations of Xiaocun, Zhongcun and Dacun villages has placed my informants along a

continuum that typical categorizations such as 'pro-development' or 'anti-dam' fail to grasp. The relationships between the diversification strategies my informants emphasize and the various assets they build their livelihoods around are similarly elaborate and notably suggest a new perspective on progressive diversification, a key concept within livelihood literature. Indeed, the tactics that my informants have adopted demonstrate that progressive diversification can also grasp livelihood diversification pathways as a progression of many individual strategies.

8.6 Final notes: Who really wins?

In this thesis I have emphasized the sensitive nature of hydropower issues in China, and how this sensitivity, along with an associated information blackout from official and governmental levels, affected my endeavours in the field. Yet the constraints I faced pale in comparison to how the populations of Xiaocun, Zhongcun and Dacun villages have experienced the impacts of these same restrictive information diffusion policies. As I have demonstrated, if local people had had precise information on the expected progression of land flooding before Madushan reservoir was created, many would have most likely further adapted and optimized their agricultural practices to the rhythm of the rising waters, hence achieving higher agricultural yields at absolutely no cost to the dam developers. Likewise, accessing information about reservoir operations would immediately make reservoir fisheries more efficient, and could potentially allow villagers to partake in further livelihood activities – such as reservoir gardening during low water periods.[201]

On a broader scale, refusal by the PRC to share hydrological information – or at least complete, relevant datasets – with countries sharing the great Asian rivers 'draining southward' (Brookfield 1998) also appears to risk backfiring. For instance, in mainland Southeast Asia any sudden and/or unusual change in the Mekong River's hydrology makes Chinese dams and a notorious Chinese lack of collaboration on international river governance easy targets for international critiques (see Fuller 2011; Hirsch 2011). Yet emerging scientific evidence tends to suggest that the influence of

[201] In the Lancang-Mekong watershed, hydropower development has often been portrayed as a threat to riverside gardening, an important livelihood activity there (see Shoemaker et al. 2001; Yot 2011). Nonetheless, during my fieldwork I observed that vast tracks of unused agrarian lands remained out of the water during periods potentially long enough to allow for the cultivation of greens with a short growth cycle. Villagers I questioned about this agreed that it could potentially work, but argued that the risks of a reservoir operation-driven crop failure were too high for this option to be viable, reminding me that "nobody can know where the water level will be tomorrow" (X-15, 23 February 2012).

the Lancang River dam cascade upon downstream hydrological changes is most likely less than the impacts of other factors, including changes in precipitation regimes (see Lu et al. in press). Ironically, this evidence predominantly builds from datasets obtained outside of China.

The available evidence suggests that the information blackout does not serve the economic actors involved in the hydropower sector, either. Documenting his experience as a consultant for Nam Theun 2 dam in Laos, Jan Ovesen (2009: 277) argued,

> nowadays most hydropower companies […] realize that an attempted insistence on secrecy is not only futile; it is not even in their own (neoliberal) interest. Thus, for the Nam Theun 2 hydropower project in Laos, which is currently under construction and which involves resettlement of a number of villages, the planning involves continual public consultations where information is shared, opposition may be vented and discussed, and suggestions or wishes may be expressed.

There are obviously areas of common interest among many actors involved in the governance of the Madushan reservoir, including sound management of the social impacts of hydropower development, reservoir water quality, and riverbank erosion control. In regards to the jatropha plantations, similar potential synergies existed, but as one academic informant pointed out: "The subsidy regimes are such that it made no difference to the local population whether the plantations made a profit or not" (K-6, 2 September 2011). Again, project developers and the authorities simply did not take into account that there is more to the Red River valley than potential sites for producing renewable energy. Likewise, better collaboration between the authorities and affected farmers before reservoir creation might have convinced villagers not to protest the criteria local authorities unilaterally declared when time came to set financial compensation distribution.

As I argued earlier in this thesis, political ecology and livelihood approaches have emerged as alternatives to earlier conceptual approaches that failed to include local socio-environmental circumstances in the development equation. The dam and plantation schemes I have documented in this thesis forced the Handai people of Xiaocun, Zhongcun, and Dacun villages to reorganize their livelihoods significantly. This contrasts with the few compromises and/or alleviation measures that governmental authorities and private actors committed to. This will come as no surprise for some, as the development schemes I focus on unfold in a frontier region within an

authoritarian country, and their promoters hold significantly greater amounts of power within Chinese politics than the local Handai population.

Yet authority in China is a fragmented thing, and these Handai populations know it. The story of a 1,000 year-old mango tree awkwardly standing in the middle of the main road traversing Dacun demonstrates this convincingly. When I asked about the history behind this curious tree, an elder explained:

> When they first paved the road during the [early 1980s] *gaike kaifang* reforms they wanted to chop down the tree. But this tree is sacred to us, and there is no way the villagers would have let the construction workers touch it. The compromise we found is that the road circles the tree (D-32, 23 August 2011).

Thirty years later, the tree still stands, and has become a 'must photograph' sight for tourists passing through the village. Like the resistance authorities met when they attempted to enforce land-compensation standards that would have only accounted for the crops grown on the land at one precise moment in time, this story highlights how Handai villagers have set clear limits to their involvement in the Chinese state's vision of development.

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APPENDIX 1: LIST OF INTERVIEWS

Xiaocun

Interviewees S-1 to S-35 were farmers (male and female) from Xiaocun village.

Zhongcun

Interviewees A-1 to A-87 were farmers (male and female) from Zhongcun village.

Dacun

Interviewees L-1 to L-124 were farmers (male and female) from Dacun village.

Mengzi

M-1: Mengzi Professor
M-2: Mengzi Professor
M-3: Mengzi Professor

Kunming

K1: Kunming NGO worker
K2: Kunming Professor
K3: Beijing Professor
K4: Kunming Professor
K5: Kunming NGO worker
K6: Kunming Professor

Nansha

N-1: Fish farm owner

Biecun

B-1: Restaurant owner

APPENDIX 2: LIVELIHOOD SURVEY QUESTIONNAIRE

Survey number: **House number:** **Informant:**
Village: Date:

Section 1: Household information

1.1. Who is the household head of this household:
1.2. How many people belong to this household?

	Surname	Sex	Age	Relation to the household head	Highest level of education completed	Main occupation	Secondary occupation	Tertiary occupation
1.2.1.								
1.2.2.								
1.2.3.								
1.2.4.								
1.2.5.								
1.2.6.								
1.2.7.								

1.3. Total household financial income (RMB) for the last 12 months:
Main income sources:
1.3.1. Agriculture
1.3.2. Fishing
1.3.3. Aquaculture
1.3.4. Transport
1.3.5. Retail activities
1.3.6. Government subsidies
1.3.7. Remittances from migrant workers
1.3.8. Other

1.4. Compared to 5 years ago, is your income from these different sources higher, lower, or similar?
1.4.1. Agriculture
1.4.2. Fishing
1.4.3. Aquaculture
1.4.4. Transport
1.4.5. Retail activities
1.4.6. Government subsidies
1.4.7. Remittances from migrant workers
1.4.8. Other

1.5. If you would receive an aditionnal 500 yuan of income, what would you use this money for?

1.6. Have you borrowed any good or money from friends or financial institutions during the last 12 months

	Location of the lender	Type of good borrowed	If money, how much?	What have used the borrowed good for	Loan duration	If money, do you need to pay interest?	If money, what is the interest rate?
1.6.1. Bank							
coop.							
1.6.3. Friend							
define							

1.7. Have you lent any good or money from friends or financial institutions during the last 12 months?

	Location of the borrower	Type of good lent	If money, how much?	What did the borrower used the lent good for?	Loan duration	if money, interest or not?	Interest rate?
1.7.1. Friend							
define							

1.8. Do you have savings in the bank?
if yes 1.8.1. Since when?
1.8.2. What do you intend to use this money for?

1.9. What minority nationality are you from? 1.9.1. Ethnic subgroup?

1.10. Were you born in this village?
if no 1.10.1 When did you settle here?
1.10.2. Where are you from?
1.10.3. Why did you move?

1.11. Do you have friends or relatives in the following places?

	Xiaocun	Zhongcun	Dacun	Gejiu	Nansha	Manhao	Honghe City	Other / define
1.11.1. Relatives								
1.11.2. Friends								

1.12. When was this house built?

1.12.1. Have you undertaken renovations since?

if yes When ? 1.13.3. Who did the renovations?

1.13. Do you or a member of your household owns the following goods?

	Yes/No	Since when?	How many?	Do you use it every day?	Income? (monthly average)	Average expenses?
1.13.1. Fridge						
1.13.2. Electric plat for cooking						
1.13.3. Rice cooker						
1.13.4. Electric fan						
1.13.5. Tv						
1.13.6. DVD						
1.13.7. Speakers						
1.13.8. Washing machine						
1.13.9. Cell phone						
1.13.10. Heater						
1.13.11. Air conditioned						
1.13.12. Water heather						
1.13.13 Toilet						
1.13.14. Bicycle						
1.13.15. Tricycle (no motor)						
1.13.16. Motorised elect. tricycle						
1.13.17. Motorised gas tricycle						
1.13.18. Motorcycle						
1.13.19. Minivan						
1.13.20. Car						
1.13.21. Rotovator						
1.13.22. Diesel generator						
1.13.23. Irrigation hoses						

1.14. Energy use

Source	Monthly expense	Usage	Current price / unit price
1.14.1. Wood			
1.14.2 Coal			
1.14.3. Diesel			
1.14.4. Gasoline			
1.14.5. Electricity			
1.14.6. LPG			
1.14.7. Other			

Section 2: Migration

2.1. Are there people from your household that went working to other areas during the last 12 months?

	Household member?	Where ?	Departure date?	Return date?	Reason for returning?	If not returned, is returned date known?	Occupation?
2.1.1.							
2.1.2.							
2.1.3.							
2.1.4.							
2.1.5.							
2.1.6.							

2.1. Follow……	Did that person work outside on the village before?	If yes, at what frequence?	Monthly income?	Remittances?	Other contribution to the household?
2.1.7.					
2.1.8.					
2.1.9.					
2.1.10.					
2.1.11.					
2.1.12.					

2.2. Compared to five years ago, would you say that in this village

2.2.1. More people work in other areas Y - N

2.2.2. Migrant workers work in farther areas Y - N
2.2.3. Migrant workers leave for longer periods of time Y - N

Section 3: Agriculture

3.1. How much land does your household owns today?

3.1.1. Of which?

	Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland
Mu					

3.2. How much land does your household own five years ago?

	Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland
Mu					

3.3. What crops have you grown this year?

Crop	Area	Harvest (Kg)	Percentage sold	Income	Natural or mechanical irrigation?
3.3.1.					
3.3.2.					
3.3.3.					
3.3.4.					
3.3.5.					
3.3.6.					
3.3.7.					
3.3.8.					

3.3.9. Chemical fertilisers usage 2011 (kg):
3.3.10. Pesticides 2011 (bottles):

3.4. Compared to five years ago, are these values (those from 2011) higher, lower or equal?

Crop	Area	Harvest (Kg)	Income
3.4.1.			
3.4.2.			
3.4.3.			
3.4.4.			
3.4.5.			
3.4.6.			
3.4.7.			
3.4.8.			

3.4.9 .Did you use less, as much or more chemical fertilisers this year than five years ago?
3.4.10. Did you use less, as much or more pesticides this year than five years ago?

3.5. What is the main criterion guiding your decision to grow these crops?

	suggestion from the local government or companies	Cultural significance	seed and fertiliser prices	Market prices	tolerance to the geographic/ weather condition	Other
3.6.1.						
3.6.2.						
3.6.3.						
3.6.4.						
3.6.5.						
3.6.6.						
3.6.7.						
3.6.8.						
3.6.9.						
3.6.10.						
…						

3.7. In general, do you consider that your land is:

a) sufficiently irrigated year-round
b) Sufficiently irrigated during most of the year
c) Sufficiently irrigated half of the year
d) Insufficiently irrigated during most of the year
e) Insufficiently irrigated year-round
f) I own no land

3.8. Compared to five years ago, do you consider that water is :

a) more abundant b) less abundant c) Same

3.9. Have you rented land from other people during the last five years?

if yes

3.9.1. Duration
3.9.2. From whom?
3.9.3. Area
3.9.4. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.9.5. Price per mu
3.9.6. Crop
3.9.7. Main reason

a) supplementary income
b) your land is too small
c) you have available time
d) the renter is a friend you want to help
e) other

3.10. Have you rented land to other people during the last five years?

if yes

3.01.1. Duration
3.10.2. From whom
3.10.3. Area
3.10.4. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.10.5. Price per mu
3.10.6. Crop
3.10.7. Main reason

a) Supplementary income
b) your work too much and have no time to work on this land
c) you do not live in the village
d) you prefer to do other work
e) other

3.11. Have you brought land during the last five s

If yes:

3.11.1. When?
3.11.2. From whom?
3.11.3. Area
3.11.4. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.11.5. Price per mu
3.11.6. What use / crop?

3.12. Have you sold land during the last five years ?

if yes

3.12.1. When?
3.12.2. Who bought it?
3.12.3. Area
3.12.4. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.12.5. Price per mu
3.12.6. What use / crop?

3.13. How many animals do your household members own in total, who (sex/age) is mainly responsible for taking care of these and are these animals for self-consumption or selling?

	How many	Responsible person	Feeded or grazed	Do you sell these?	How many sold in 2011?	When sold?	Price per head?
3.13.1. Buffalo							
3.13.2. Cattle							
3.13.3. Black pigs							

3.13.4. White pigs							
3.13.5. Chickens							
3.13.6. Ducks							
3.13.7. Goose							
3.13.8. Lamb							
3.13.9. Horse							
3.13.10. Other							

3.14. How many animals did you have five years ago?

		Number
3.14.1. Buffalo		
3.14.2. Cattle		
3.14.3. Black pigs		
3.14.4. White pigs		
3.14.5. Chickens		
3.14.6. Ducks		
3.14.7. Goose		
3.14.8. Lamb		
3.14.9. Horse		
3.14.10. Other		

3.15. Do you currently grow jatropha on your land?

if yes 3.15.2. Area

3.15.3. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.15.4. When did you start growing it?

3.15.5. Why did you started growing jatropha?

3.15.6. What was this land used for before growing jatropha?

3.16. Have you grown jatropha on your land during the last 5 years

if yes 3.16.1. Area

3.16.2. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.16.3. Time period ?

3.16.4. Why?

3.16.5. What was this land used for before growing jatropha?

3.17. Did you or a member of your household work for a jatropha plantation in the past five years (2006-2011):

if yes 3.17.1. Duration

3.17.2. Salary

3.17.3. Land type

Arable land	Private plot on a collective farm	Economic forest	Ecological forest	Marginal / Grassland

3.17.4. What was this land used for before growing jatropha?

Section 4: Fishing

4.1. Do you or a member of your household fish?

if yes

4.1.1. How many times a week?

4.1.2. At daytime or nightime?

4.1.3. Fishing gear

a) fishing rod only
b) fishing nets only
c) fishing rods and nets

4.1.4. How much are your fishing gears worth?

4.1.5. When did you buy your fishing gears?

4.1.6. You mainly use your catches for

a) self-consumption
b) selling to the market
c) self-consumption and selling to the market

4.1.7. if selling Average weekly income for fishing?

4.2. Did you or a member of your household fish five years ago?

if yes

4.2.1. More or less often than in 2011?
4.2.2. Did you mainly use your catches for

a) self-consumption
b) selling to the market
c) self-consumption and selling to the market

if selling
4.2.3. If selling, was the income greater, lower or equal to that you get today?

4.3. Compared to five years ago, would you say that in the Red River (you can choose more than one answer):

a) big fish are more numerous
b) small fish are more numerous
c) small and big fish are more numerous
d) big fish are scarcer
e) small fish are scarcer
f) big fish and small fish are scarcer
g) same

4.4. Compared to five years ago, would you say that Red River fish species are:

a) more numerous b) less numerous c) same

4.5.What fish species are the most important for you to fish?
4.5.1. Why

4.6. What fish species do you fish the most:

Section 5: Market activities

5. Did you or a member of your household sell good along the road during the last 12 months?
if yes

Good	Origin (self-produced or traded)	Average monthly income	Main buyers: end consumer or trader?	How many days per month do you usually allocate to this trade?	Number of hours per day
5.1.1.					
5.1.2.					
5.1.3.					
5.1.4.					
5.1.5.					
5.1.6.					
5.1.7.					

5.2. Did you or a member of your household sell good along the road five years ago?
if yes
5.2.1. Traded goods: same or different?
5.2.2. If different, do you remember what you were selling then?
5.2.3. Did your household members allocate more or less time to this trading 5 years ago then they do today?
5.2.4. Do you think that this trade is more important for your household today than it was 5 years ago?

5.3. Did you or a member for your household carry goods to another city in order to sell these there during the last 12 months?

Good	Where?	Origin (self-produced or traded)	Average monthly income	Main buyers: end consumer or trader?	Main buyers origin: local people or outsiders?	How many days per month do you usually allocate to this trade?
5.3.1.						
5.3.2.						
5.3.3.						
5.3.4.						
5.3.5.						
5.3.6.						
5.3.7.						

5.4. Did you or a member for your household carry goods to another city in order to sell these there five years ago?
5.4.1. Traded goods: same or different?
5.4.2. If different, do you remember what you were selling then?
5.4.3. Did your household members allocate more or less time to this trading 5 years ago then they do today?
5.4.4. Do you think that this trade is more important for your household today than it was 5 years ago?

5.5. Did you or a member of your household attend the Friday market at Dacun during the last ten months
5.5.1. How many times per month?

Buying			Selling		
Commodity	In general, do you know the persons that you buy from?	why buying in the Friday market?	Commodity	In general, do you know the persons that buy from you?	why sell at the market rather than at Nansha or Gejiu?
5.5.2.			5.6.2.		
5.5.3.			5.6.3.		
5.5.4.			5.6.4.		
5.5.5.			5.6.5.		
5.5.6.			5.6.6.		
5.5.7.			5.6.7.		

5.7. Where do you buy most of your food?
a) in the village b) in another village c) in Nansha
d) in Gejiu e) it depends f) Other
5.8. Where do you buy most of your clothing?
a) in the village b) in another village c) in Nansha
d) in Gejiu e) it depends f) Other

5.9. Where do you buy most of your fertilisers and pesticides?
a) in the village b) in another village c) in Nansha
d) in Gejiu e) it depends f) Other

Section 6: Values

6.1. What is the most important thing in your life and for your household?
6.2. Rank these four things in order of importance?

A1 household relation	A2 household security	A3 Health	A4 Education
B1 Air quality	B2 Water quality	B3 Soil quality	B4 Food availability
C1 fishing	C2 Raising animal	C3 hunting	C4 Agriculture
D1 Work	D2 house	D3 communicatoin	D4 Markets

6.3 Indicate how important the following elements are for you.

	values	Not important	important	Very important
a) Equality / Equal opportunities	-1	0	1	2
b) Varied life / novelty	-1	0	1	2
c) Respecting the elderly	-1	0	1	2
d) World peace	-1	0	1	2
e) Curiosity	-1	0	1	2
f) Self-discipline, frugality	-1	0	1	2
g) Environmental protection	-1	0	1	2
h) Material possession / wealth	-1	0	1	2
i) Power / influence / authority	-1	0	1	2

Section 7: Change

Change, its likeliness and perceived impacts	Will not happen	Might happen	Will happen		Positive change	Negative change
1) increased climate change (rain, flood, temperature, …)						
2) Increased precipitation						
3) Water scarcity						
4) Enhanced irrigation						
5) Declining soil fertility						
6) More migrant workers will leave the village						
7) More immigrants will come to the village						
8) Fields are converted into real estated						
9) You will sell your land to buy vehicules						
10) You will rent your land to a large company						
11) Modern machinery will replace buffalo						
12) Farming profits will increase						
13) You will keep on growing rice						
14) You will keep on growing cash crops						

15) Water pollution will become increasingly severe						
16) Drinking water resources will be increasingly disputed						
17) Tourists will be increasingly numerous						

APPENDIX 3: JATROPHA CENSUS QUESTIONNAIRE

1- How would you describe the land cover in the barren lands before jatropha development:

a) Mainly bare soil
b) Bare soil with sparse bushes.
c) Mainly bushes
d) Bushes with sparse trees
e) Forest
f) Other, describe:

2- Was land cover in the jatropha plantation area different than in the other surrounding barren lands?

a) Yes
b) No

If yes: how different?

3- In the jatropha plantation area, do you believe that environmental conditions are similar, better or worst today than before jatropha plantation development?

a) Same
b) Better
c) Worst
Why?

4- Do you think that the jatropha plantations have had an influence on land erosion?

a) Yes
b) No

if yes:

- Increased or decreased erosion?
- Does that influence you in a positive or a negative manner?
- Why?

5- Do you think that jatropha plantation development has had an impact on wildlife in the village?

a) Less wildlife
b) More wildlife
c) No impact
Is this change:
1) Positive
2) Negative
3) I do not know
a. Why?

6- Do you think that jatropha plantation development has had an influence on vegetation diversity in the village?

a) Reduced number of plant species
b) Increased number of other plant species
c) 没影响 No impact
Is this change:
1) Positive
2) Negative
3) I do not know
a. Why?

7-Do you think that the jatropha plantations have had an influence on water availability in the village or in your field?

a) Yes b) No
If yes: increased or decreased water availability?
If yes: do you consider this positive of negative?
1) Positive 2) Negative
3) I do not know
a. Why?

8- Did you grow crops/vegetables in the areas now covered with jatropha plantations?

a) Yes b) No
If yes:
- What crop?
-Do you still grow that crop in other areas of the barren lands?
-If yes: is this new location as advantageous in terms of yield / walking distance / water availability?

9- Did you graze cattle in the areas now covered with jatropha plantations?
a) Yes b) No
If yes:
-Do you still own cattle?
-What was the impact of the jatropha plantations on fodder availability?
a) No impact b) More fodder
c) Less fodder
a- If less fodder, how do you cope with this situation?
b. Do you see this as an amelioration in you life, or as an additional burden?

10- Did you collect firewood in the area now covered with jatropha plantations?

a) Yes b) No
If yes:
- Do you still collect firewood?
- How did the plantations influence firewood availability?
a) No impact b) More firewood available
c) Less firewood available
a. If less fire wood, how do you cope with this situation?
b. Do you see this as an amelioration in you life, or as an additional burden?

11- Did you collect "yecai" in the area now covered with jatropha plantations?

a) Yes b) No
If yes:
- Do you still collect yecai?
- How did the plantations influenced yecai availability?
a) No impact b) More "yecai" available
c) Less "yecai" available
a. If less fire "yecai" available, how do you cope with this situation?
b. Do you see this as an amelioration in you life, or as an additional burden?

12- What is the main ownership of land for Jatropha plantation in your village?

a) State-owned b) Communal ownership
c) Privately-owned

13- Did you own land in the area where the jatropha plantations were developed?
a) Yes b) No
If yes:
- What type of land (Arable land / Private plot on a collective farm / Economic forest)?
- Land area in mu?
- Have you been compensated for the loss of your land?

If yes：
- How much money did you receive?
- Are you satisfied with the compensation?

14- Did you ever work in the jatropha plantations?
a) Yes b) No
If yes:
- From what year to what year?
- At what frequency (days / month – days / year).
- Daily income?
- Approximately what portion of your household's income comes from the revenues you get from working in jatropha plantations?

15- Do you think that jatropha plantation will have financial impacts for you in the future?

a) Yes, I will earn money because of the plantations
b) Yes, I will earn less money because of the plantations
c) No impact
Why?

16- Jatropha plantations were developed in areas where there are graveyards. What do you think about this?
a) I do not care b) I think it is good
c) I think it is bad
Why?

17- How do you envisage the future of the jatropha plantations?
a） I do not know
b）The plantations will be further developed and exploited
c）There will be no further plantation exploitation and development
If c： Why?
1) Not enough water 2) Not enough land
3)No one wants to buy the seeds 4) Other, detail: