

Highland Aquatic Resources Conservation and Sustainable Development

Overview Report on Livelihoods and Aquatic
Resource Use in Upland India, Vietnam and
China



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EXECUTIVE SUMMARY

INTRODUCTION

Highland Aquatic Resources Conservation and Sustainable Development is a multidisciplinary project working in five sites across upland Asia, in Vietnam, China and India. It seeks to better understand the biodiversity situation of aquatic ecosystems in upland watersheds, identify patterns of resource use and livelihood dynamics of aquatic dependent communities, and review the policies and institutions which regulate access to these resources. It is anticipated that a detailed cross-country comparison can inform policy and planning to enable the sustainable and wise-use of aquatic resources while safeguarding both biodiversity and the livelihoods of poor and food insecure communities. The five sites were selected to reflect both the diversity in patterns of aquatic resource use in different ecological, political and socio-economic circumstances, and the diversity of highland ecosystems and trajectories of change across India, Vietnam and China. In Vietnam, research was conducted in the districts of Phu Yen in the northern highlands and Da Krong in the Truong Son range of central Vietnam. In China, the focus was on Shaoguan district of Guangdong Province. In India, research was located in the Buxa hills of Jalpaiguri district, West Bengal, and the lake system of Nainital district, Uttarakhand state.

This report focuses on Work Package 4, which explores the livelihoods of highland aquatic dependent communities. In each site three separate communities were selected for in depth analysis, including a survey on resource use and livelihoods and a series of focus groups with women, men, girls and boys. The teams spent extended periods of time in the communities to build rapport with local people and gain an insight into their lives. The historical and geographical contexts of the three communities are diverse and are outlined in Section 2.

EVOLUTION OF LIVELIHOODS AND ENVIRONMENTAL CHANGE IN FIVE COMMUNITIES

Phu Yen is home predominantly to indigenous, Muong, Thai and H'mong communities. Although this was once a region of high social stratification with an agrarian based economy, it underwent significant social and ecological transformations over the last few decades with the collectivisation and then decollectivisation of agriculture, and the flooding of the valley to create the Song Da reservoir. While rice is still farmed on the valley floor when the reservoir water is low, the fields are submerged for half of the year. Aquatic resource based livelihood activities however, offered new opportunities with households diversifying into shrimp trapping in the locality of the village and fishing from larger boats in more distant parts of the reservoir. Some also carry out pond aquaculture. However, fishing is not always enough to make up for food shortfalls and households have expanded the cultivation of maize and other cash crops in upland fields to generate cash. The reduced forest cover and over-farming has worsened soil run-off, and intensifying the sedimentation of the reservoir, with consequences for biodiversity and aquatic resource based livelihoods.

Da Krong is a sparsely populated region home predominantly to the indigenous Van Kieu community, and is one of the poorest districts of Vietnam. The local population have been less integrated into historical state formations, and were less affected by colonial era social stratification

or socialist collectivisation and decollectivisation. Nevertheless, the region was badly affected during the American War, which caused extensive damage to livelihoods and biodiversity. In the post-reunification period, although there has been extensive economic development in neighbouring regions, this has had a limited impact on the population of the Da Krong valley, whose livelihoods remain based upon upland farming, livestock raising, and the harvesting of forest and river produce. There is some limited out-migration to urban regions and wage labour in the coffee plantations. Aquatic resource dependent activities play an important supplementary role in meeting food security, particularly given the restrictions on traditional patterns of shifting cultivation by government regulations. Fish, snails and crabs are collected, and normally consumed within the household providing a valuable source of protein. The biodiversity of the river system has been under some threat due to hydro-power development upstream and pollution from the well developed Khe Sanh plateau to the west.

Shaoguan is unique in the five sites in that aquatic resource based activities are the traditional livelihood strategy of the study communities population, for whom fishing is an important way of life. The fishers of the Beijiang river had under socialism fished collectively with their farming counterparts, but now fish independently. Over a decade ago fishing was reportedly quite profitable, and they reportedly were better off than their farming counterparts. Today however, hydro power development and sand mining has permanently changed the hydrology of the river, while fish stocks are falling due to pollution from industry. In the rapidly developing capitalist economy, the younger generation is moving away from fishing and seek wage labour in urban centres. As a result fishing is becoming an increasingly unstable livelihood activity which supports to older generation who still live and work in the river side villages.

Buxa is the one site which falls within a national protected area. The region has a complex history as frontier between the Indian and Bhutanese states. Forest based livelihoods such as shifting cultivation, fishing and livestock rearing dominated the pre-colonial period. However, the establishment of administrative centres, forestry, and stone processing factories under colonialism increased the population and introduced wage labour to the region. At the same time, the much of the hills and a large tract of the plains was set aside as reserved forest, impeding both forest based livelihoods and the expansion of agricultural production. Today the collection of fish, crabs and molluscs like Da Krong, play an important role in supplementing existing livelihoods based upon wage labour for the forest department and in urban centres, and marginal agriculture. There are variations between villages however, with Jayanti at the foot of the hills and Buxa in the hills, using comparatively more aquatic resources than the remote hill community of Adma, where livelihoods are more agricultural based. Other forms of aquatic resource use include the gathering of medicinal plants from river banks and drift wood from smaller channels, and stone collecting. The latter activity however, is not carried out independently but is waged work carried out for contractors from the towns.

Nainital region is unique in that lakes form the primary highland aquatic resource, and lake based livelihoods are based less on resource harvesting and are more focussed on tourism activities. The region was part of numerous kingdoms over the centuries giving rise to multiple patterns of social stratification. Today rural parts of the region are predominantly populated by agricultural Hindu castes speaking the Kumoani dialect, while the urban centres increasingly attract settlers from other

parts of India, including labourers from Nepal. The valley of Nainital lake itself was unpopulated until the colonial conquest, after which a resort was established for British officials. The other lakes, Naukuchiatal and Bhimtal were in largely agricultural regions, and tourism development only expanded significantly over the last few decades. Livelihood activities which are *directly* dependent upon aquatic resources include operating boats for tourists, and a limited amount of fishing. Most people however make use of aquatic resources *indirectly*, through for example, utilising lake water for irrigation, or working in the lakeside tourism economy by pulling rickshaws, portering loads for visitors, and labouring in the construction sector. The sale of lakeside land has also allowed some local people to accumulate some wealth, although there are risks attached to this activity. On the whole, these activities have replaced agriculture as the primary source of income.

CLASS, LABOUR THE MARKET AND LIVELIHOODS

Understanding the basis for class stratification is complicated by the very different economic, political and cultural character of each site. Nevertheless, an analysis of theory and local wealth ranking exercises provide some key characteristics. Households considered 'poor' usually include those with limited ownership of the means of production, who are dependent on others for their subsistence, usually as labourers. Such households are also likely to be more dependent upon natural resources and have a smaller productive workforce. 'Medium' households on the whole have more secure access to productive resources, which are often enough to make a household 'self sufficient' in food. They are generally not making a 'profit' however or employing workers from outside the household. When they do work outside, with the exception of the more labour based economies such as Shaoguan, such households are more likely to have access to better skilled employment than their poorer counterparts. 'Rich' households more often have secure access to the means of production which produces more than is required for family consumption, and this sometimes necessitates employing labourers from outside the household. There are generally several productive workers in the family itself, and when outside labour is performed it is usually skilled in character. A new category was created from those classified as 'rich', the 'accumulating' households. These are households actively increasing their overall wealth through their livelihood activities, investing in high value productive assets and employing outside labourers on a regular basis.

Based upon the analysis of the data it was found that there was not significant class stratification across the five communities, although there were enough variations that one could observe differences in how aquatic resources are used according to one's wealth. In Phu Yen, the 'rich' and few 'accumulating' households generally have larger rice lands and thus display greater self sufficiency in grain staples. A greater number of 'poor' and 'medium' households however, must expand cultivation of cash crops in upland fields and catch shrimp to sell, in order to buy grain. Interestingly, although poorer households are more dependent upon aquatic resource for this reason, the richer households are actually investing more in such activities. As they have grain security they can allocate excess resources to activities such as fish culture as well as larger scale fishing from boats. There is a tendency whereby younger households are often poorer as they have

less productive labour in diversify their livelihoods in both fishing and agriculture and have had less time to accumulate assets.

In Da Krong, although there were wealth differences, most households were poor with marginal livelihoods and only one could be classified as 'accumulating'. On the whole most households struggled to meet food security needs from their land, and combined agriculture with seasonal labour on the Khe Sanh plateau and other more developed regions. Fishing was particularly important to supplement livelihoods providing a source of protein, while collecting gold from the river offered households a source of cash saving that could be used at times of need. There were some differences in livelihoods however according to wealth. Richer households often had more productive labourers to engage in a greater diversity of livelihood activities, meaning that younger households are often poorer, like in Phu Yen. Some of these households owned *xe oms* or motorbike taxis offering an alternative income source. Such households were less dependent on the river. However, as in Phu Yen, poorer households have a limited investment capacity, and they sometimes have to 'rent' equipment such as nets from their richer counterparts for fishing.

Unlike the more agricultural land dependent communities studied in Vietnam, for the fishers of Shaoguan, the primary source of income was labouring, especially in the urban sector. Fishing in this context, along with some very small scale agriculture, are supplementary activities for many households. In this context, patterns of class stratification are quite different from the other HighArcs sites. There is by no means a significant class with extensive ownership of the means of production for whom fishing is itself a profitable source of accumulation. The two households classified as 'accumulating' have generated their wealth through other livelihood activities (aquaculture and livestock). On the whole however, for both richer and poorer households, fishing is still a coping strategy to make up for shortfalls from what is provided by the younger generation in factories. Unlike in Phu Yen and Da Krong, the poorest households in this context are often the older households who can not secure labouring employment with limited income from sons or daughters. The primary difference in livelihoods between wealth groups is that richer households on the whole have invested more in fishing and have a higher income, while often also having sons or daughters in better paid labouring jobs.

In Buxa, like in Da Krong, most households are poor with limited ownership of the means of production. Land can not be expanded due to Forest Department regulations, meaning that for most households labouring is a primary source of income, like in Shaoguan. However, it is primarily casual labour, unlike the regulated factory labour in China. There are no households that could be classified as 'accumulating' and there are only small differences in wealth according to how much land or livestock households operate, or the ownership of assets such as guesthouses for tourists. In this context, fishing is primarily an activity to supplement livelihood strategies, offering households an additional source of protein.

In Nainital, the strong tourism based economy has led to deeper levels of class stratification. There is a large groups of wealthy and accumulating households with extensive ownership not only of land, but of small businesses and boats for tourism use. Medium households also own boats and land, but only enough to meet their subsistence needs. Poorer households have limited ownership of land and work primarily as labourers. These patterns of stratification reflect how households use aquatic

resources – for example, rich and accumulating households often own more than one boat, renting them out to poor households who do not own a boat. Medium households own their own and operate their own boat, representing an important livelihood activity. Poor households work on their richer counterpart's boats, as well as in labouring in the tourism based lakeside economy.

In the context of variable investment capacity within the different communities, access to credit is an important issue if households are to fully benefit from aquatic resource based and other livelihood activities. While in Shaoguan, Buxa and Nainital there did not appear to be a strong culture of taking loans, many households in Phu Yen and Da Krong borrowed money as part of their livelihood strategy. This was creating a number of challenges. In Phu Yen poorer respondents complained during focus groups that loans are often not available when required, obliging them to seek the support of private money lenders, who charge high interest. Furthermore, loans are often taken for 'non-productive' purposes, putting households into cycles of indebtedness.

Regarding marketing relations, it is only in Phu Yen and Shaoguan whereby aquatic resources are sold in substantial quantities. In Phu Yen poor households who depend on shrimp sales sell to middlemen from the lowlands, inevitably reducing their bargaining power. In Shaoguan however, fishers fortunately sell direct to consumers, offering them a greater control over setting the price.

POLICIES AND INSTITUTIONS AND IMPACT ON AQUATIC RESOURCES

There are a series of rules and regulations which are in place to regulate the use of aquatic resources across the five field sites, with variable impact on local livelihoods. While some of these are based upon national or state level laws, other are adapted according to local conditions, while others exist on paper, but are not actually implemented locally. In Phu Yen and Da Krong, respondents had limited knowledge of polices to regulate the use of fishery resources, although forestry regulations were more strictly enforced. Only weak informal regulation regimes were evident. In Shaoguan on the other hand, polices to control pollution, and sand mining were in place, but implementation was weak, worsening the ecological decline of the watershed. Order to regulate fishing activity a licensing system is in place, but a number of fishers were unable to secure licences, undermining their livelihoods. In Buxa, a protected area, the most stringent environmental regulation policies were in place. Although fishing was technically prohibited, this was tolerated, while other use of forest resources was controlled, with the Forest Department even putting pressure on some local people to relocate. This has a severe impact on livelihoods, and renders much of the forest dwelling population dependent upon low wage labour to survive.

Nainital, although not in a protected area, has also had a series of stringent regulations on natural resource management. Fishing requires a licence in the case of Bhimtal and Naukichiatal and daily catch is regulated, while it is totally banned in Nainital. Boating has also been stringently regulated by the local authorities in recent years and requires a licence. This system has unfortunately created a market for licences, whereby extortionate sums must be paid to secure one when boatmen leave the profession. This prevents poorer communities participate in boating, a potentially profitable activity.

INTRA-HOUSEHOLD DIVISION OF LABOUR

In order to promote reconciliation between conservation and sustainable livelihoods development, it is crucial to understand not only how different communities and even wealth groups within communities utilise aquatic resources, but also the divisions within the household. Acknowledging the particularities of each site, there are some recurring themes with regards to the division of labour between men and women and how they utilise aquatic resources. Regarding gender, Nainital was probably the only site where women's direct role in aquatic dependent activities was limited. In all other sites, both men and women are involved in harvesting resources from rivers, lakes and wetlands. However, a division of labour within these activities normally exists. For example different techniques are used or species are caught. Certain considerations such as timing restrict limit women's participation in some activities, such as fishing at night in the case of Da Krong, Phu Yen and Buxa. In the case of China couples fish together catching the same species, but there are set gender roles on the boat. On the whole women's workload is greatest, not only due to male out-migration which cause women to take full responsibility for some tasks, but due to their disproportionate role in household reproductive activities.

The distribution of resources within the household is somewhat unequal and decision making power by women is more limited, although this has been changing in more recent years, particularly with the out-migration of males in Vietnam and China. Furthermore, for households with limited disposable income, respondents in Phu Yen did not feel men cornering income from fishing (or other activities) for themselves were a significant problem. Women's control over income was most limited in India, particularly when much of the cash comes through the males who partake in wage labour.

Aside from gender, age is another often overlooked axes of inequality within the household. This is particularly important in aquatic resource dependent communities as across all sites children play particularly important role in fishing. This involved either helping their parents or more commonly, fishing independently. Young people, particularly girls, also play an important role in helping their parents with household reproductive activities, especially in Vietnam and India. However, as they get older there is a tendency for girl's responsibilities to parallel their mother's and boy's to parallel their father's. In Vietnam and China in particular, young people's responsibility to contribute to household livelihood activities is decreasing as parents place more emphasis on education, although this is less pronounced amongst the poorer households.

With regards to distribution of income, few children have the opportunity to retain the product of their labour for themselves. For example, fish caught are given to their parents, and they will not receive any payment for any assistance offered to parents, even when involved in income generating activities. Nevertheless, young people made contributions voluntarily out of a sense of obligation, as well as to increase the opportunities for resources in later life, while in some instances, informal resistance strategies allowed income to be cornered for personal use.

NON-USE VALUES, AQUATIC ECOSYSTEMS AND LIVELIHOODS

It is important to acknowledge that ecosystems not only offer economic security and wellbeing but have non-use values attached to them. For example, young people in all of the sites appreciated the natural beauty of the river resources in the vicinity of their communities. More significant however, is the fact that particular livelihood activities themselves contain non-use values, such as fishing which for young people allows them to combine work and play. This was observed in all sites except Nainital. In Shaoguan, some older fishers value the livelihood activity as a 'way of life' which stands in stark contrast to factory labour.

ENVIRONMENTAL KNOWLEDGE, GENDER AND AGE

The overall finding regarding environmental knowledge is that it is acquired both by being passed on from parents, or through the process of work itself. For this reason, it reflects the particular gender and age division of labour. For example, where men play a greater role in fishing as in Phu Yen they hold a greater knowledge of the reservoir resources, while women have a greater knowledge of agricultural and forest ecosystems. Ecological knowledge however, is declining with changing livelihood roles, particularly as young people place more focus on education, as is the case in China, where fishing based knowledge appears to be weaker amongst the younger generation.

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Section 4 - Highland aquatic resources and livelihoods: Buxa, West Bengal, India.

Section 5 – Highland aquatic resources conservation and sustainable development: livelihood report, Uttarakhand Site, India.

Section 1

**Report on livelihoods dependent on
highland aquatic resources in the Northern of Vietnam.**

Report on livelihoods dependent on highland aquatic resources in the Northern of Vietnam

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On behalf of RIA1 team

Nguyen Thi Dieu Phuong

#

I. INTRODUCTION

1.1 Introduction to HighARCS.

Climate change and the degradation of the environment influences the livelihoods of all people, especially poor communities who are living in mountainous areas. In this context, the livelihoods, food security and natural resource utilization patterns of poor people are of considerable interest to governments and international organizations. There has been little research on the relative importance of aquatic resources in to poor and vulnerable groups highland regions, in contrast to their lowland counterparts. In this context Highland Aquatic Resources Conservation and Sustainable Development (HighARCS) is a project which seeks to better understand the patterns of resource use and livelihoods of communities who utilise highland aquatic resources in five sites across Vietnam, China and India. The interdisciplinary approach employed by this project will enable sustainable and wise-use of aquatic resources while safeguarding ecosystem services, biodiversity and livelihoods of poor and vulnerable groups. This report seeks to analyse the livelihood patterns of communities who utilise highland aquatic resources in Son La, Northern Vietnam, in the context of environmental and economic change. This will facilitate the provision of solutions to livelihoods diversification, will enhance poor livelihoods, conservation and sustainable development.

1.2. Objectives

The overall objective of this study is to produce in detail a holistic overview of the livelihoods of households who utilise Aquatic resources in Son La in northern Vietnam, based upon a case study of Tuong Ha and Tuong Tien commune, Phu Yen district. The specific objectives of the study are:

- To identify the livelihood strategies of households dependent on highland aquatic resources derived goods and services and variation according to both the gender and age of different household members.
- To analyse the nature, productivity and resource-use in highland aquatic resources-dependent farming, fishing and gathering strategies.
- To better understand and evaluate the role of highland aquatic resources derived ecosystem services in benefiting the poor and sustaining social systems.
- To assess the effects of seasonality, trends and shocks on access to ecosystem services and evaluate the impact on producers, intermediaries, consumers and society.

II. METHODOLOGY

2.1. Study site

This research was carried out in five villages (Dần 1 village, Dần 2 village, Tâm Ốc 1 village, Tâm Ốc 2 village and Tật village), belonging to two communes, Tuong Ha and Tuong Tien in Phu Yen district, Son La province. These communes are located in the West - South of Phu Yen district and 25 km far from Phu Yen that lying along the road No 43. The study sites belong to watershed of Da river, where people are living along two sides of Tac stream that connects to Da river. These two communes occupies large water surface and local people depending on fishing activities.

Table 1. Information of selected villages of study sites

Commune	Village	Total Households living in commune (Household)	Total population (people)	Ethnic composition
Tuồng Hạ	Dần 1	49	226	Mường, Thái
	Dần 2	46	194	Mường, Thái
	Tâm Ốc 1	54	237	Mường, Thái
	Tâm Ốc 2	51	230	Mường, Thái
Tuồng Tiến	Tật	86	387	Mường, Thái, Kinh
Total		286	1274	

Research on livelihoods in study sites in the Northern of Vietnam was carried out from April, 14th 2010 to November, 23th 2010.

2.2. Data collection

The data was collected by integrated methods, including household interviews, focus groups and observations. Questionnaires were developed by Lead partners of University of Stirling, Essex University and the RIA1 team.

2.2.1. Household Interview

A list of households was collected from population record books provided by leaders of communes and head of villages. Key informants were selected from the village for well-being ranking. They were the Chairman of the Farmers Union, Vice President of the Village, Chair woman of Women's Union- who had a good understanding of the social and economic condition of all people in these villages. The key informants were asked to categorize the village households into three distinct wealth groups, namely Worse-off households, Medium households and Better-off households, then

a common criteria for each well-being group was identified. In total 92 households (27 worse-off, 32 medium, 33 better-off) were interviewed which were randomly selected from within the wealth groups in each villages (Table 2).

Table 2. Households interviewed by villages and wealth-being

Village	Worse-off	Medium	Better-off	Total
Dã 1	5	4	7	16
Dã 2	5	6	5	16
Tâm Ốc 1	5	7	4	16
Tâm Ốc 2	4	5	5	14
Tặt	8	10	12	30
Total	27	32	33	92

Household interviews included 2 parts, quantitative and qualitative.

The quantitative section of the questionnaires included the following sections:

- Interviewee details
- Household background information
- Productive activities of household
- Household expenses
- Asset ownership
- Labour relations
- Other income sources

The qualitative section fo the questionnaires included:

- Livelihood strategy
- Environmental change
- Livelihood change
- Market relations credit
- Knowledge
- Social networks, politics and non-economic structures
- Policies and institutions governing natural resource use
- Concluding questions

Questionnaires were then translated from English into Vietnamese and then piloted in Tuong Ha commune in Vietnamese language. Feedback from the pilot questionnaires was used to help revise the finalized questionnaires. The questionnaires are in Appendix 1.

2.2.2. Focus group

As well as conducting questionnaires, a total of 37 focus groups were carried out during May and October 2010 in Tuong Ha and Tuong Tien communes. The participants were chosen to be representative by age, gender and level of dependence on aquatic resources. Each focus group included 4 to 6 members. All groups (boy/girl 9-13 years old, boy/girl 14- 20 years old, better off men/women, medium men/women, poor men/women) were requested to discuss a set of relevant issues. A number of Participatory Rural Appraisal tools were used, including community mapping, timelines, seasonal calendars, activity matrix, resource mapping, problem ranking and wealth ranking. Detailed content of focus groups are presented in Appendix 2 and Appendix 3. The detail information about number focus groups in each commune are present in Table 3.

Table 3. Numbers of Focus groups carried out by gender and aged in study sites

Village	Women	Men	Children from 9-13 years old		Children from 14-19 years old		Total
			Boy groups	Girl groups	Boy groups	Girl groups	
Dãn 1	2	2	0	2	1	1	8
Dãn 2	2	2	1	1	0	2	8
Ôc1	1	1	0	2	0	2	6
ÔC 2	2	2	1	2	1	2	10
Tật	2	2	1	0	1	0	6
Total	9	9	3	7	3	7	38

2.2.3. Other data sources

Other data sources included internal documents such as annual reports supported by offices of the agriculture and rural development of Son La province, People's Committee of Phu yen district as well as Tuong Ha and Tuong Tien. Furthermore, livelihood activities were observed and recored in each study site villages during field works. In addition SOS meetings (State Of System) with different stakeholders from commune, district, provincial level was also organized in Phu Yen town for further feedback informations.

2.3. Data entry and analysis

All the qualitative information was coded according to theme, while the quantitative data was entered into SPSS 13 for analysis.

III. RESULTS AND DISCUSSION

3.1. Ethnic composition of field site

There are four ethnic groups in the research area. In Tuong Ha, a commune with 2667 people, Muong people is the majority group which and represent 53% of the population, followed by Thái people (45%), while the remainder are Kinh people (2%) (Tuong Ha People’s Committee, 2009). Tuong Tien commune has a total of 1651 people, in which Thái people represent around 63%, with the remainder including Mường people (27%), Hmông people (7%) and Kinh people (3%) (Tuong Tien People’s Committee, 2009). Ethnic groups have their own habits, customs and working strategies and currently some ethnic groups still face many challenges. For example, the life of H’mong ethnic group is particularly difficult due to their homes being located in high mountains which are very far from the commune centers and services. They often lack electricity, while the infrastructure is poor, and access to schools for children and technical knowledge is more limited.

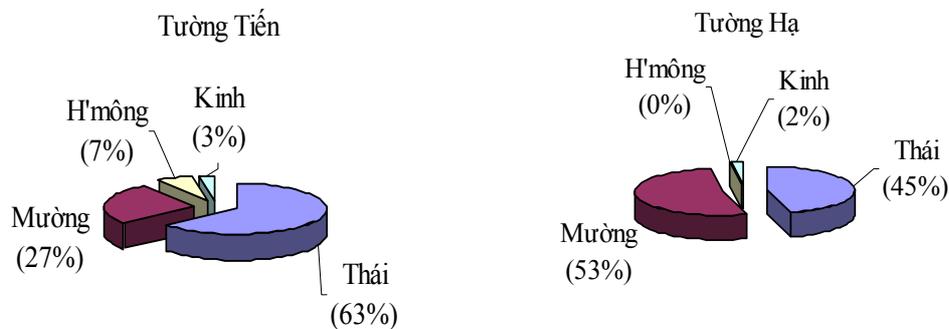


Figure 1. Ethnic composition of Tuong Tien and Tuong ha communes

3.2. Historical change in livelihoods

Son La has a complex history, with relative historical isolation from the state structures of the lowlands, while also being influenced by indigenous forms of economic and political organisation. Some insights into the past can be gained from both literature and oral histories recorded locally¹. According to a Wiegiersma’s (1982) research Land inequality was severe in Vietnam, even before the French colonization, particularly from the 1700s onwards. As in many parts of Asia, patterns of social stratification were influenced by the state and its revenue collection apparatus (Wiegiersma, 1982). State functionaries became a powerful landlord class and were granted large private

¹ Further discussion of colonial and post-colonial transition in this site is available in the HighARCS overview livelihoods report (Sugden and Punch, 2011).

holdings as payment for their administrative role (Dao, 1993). These relations were reinforced under French colonial rule, with intensified land inequality and feudal relations such as sharecropping in the countryside (Dao, 1993).

In contrast to the lowlands, the minorities of remote Son La province remained at the margins of state control for much of the pre-colonial period, and villages remained as relatively autonomous units home to rice cultivating Muong and Thai communities (Sikor, 2001). Upland fields were historically cultivated privately while wet rice land was held communally. Nevertheless, Sikor's (2004) study of Thai communities in neighbouring Yen Chau district reports that hierarchies still existed. The Thai village chiefs or *phias* had the right to collect a portion of the paddy as tax and held private plots of rice land. Under colonial rule by the French, the central state increased its influence, by demanding greater tax and corvee labour obligations, intensifying inequality between the peasantry and the minority chiefs (Sikor, 2004). Oral histories recorded locally noted how after planting their crops, local people were obliged to give a large share as tax to the village leaders. These tax collectors would retain some of the revenue generated for themselves while paying the remainder to the French, allowing them to become a powerful landlord class.

The agrarian economy changed radically following independence from the French in the 1950s, with land redistribution from large landlords to landless peasants (Kerkvliet, 2006; Sikor & Truong, 2002). This was later followed by a policy of collectivization, whereby land, labour and other resources would be shared (Sikor, 2001). In Tuong Ha and Tuong Tien, each household worked together for points according to how much labour had been performed. The points were then converted into shares of food and money. According to interviews with elders, households were still permitted to clear private upland fields by claiming forest land, although forest regulations limited the size of plots, and only small fields were allowed, primarily for cassava cultivation. During this stage people reportedly used only 5% of their land for private cultivation and they had to devote 95% of their land for co-operatives, although this model did not encourage people's participation and food productivity went down.

There were further changes in the 1980s, as economic problems facing the cooperative farms, combined with a growing influence of free market theory, led to a government policy of liberalization or Doi Moi, literally 'renovation' (Hue, 2008). In the 1980s, the politburo promulgated resolution 100/CT in April 1981. According to this resolution the farmer was contracted with the co-operative to produce number of goods on their land. The co-operative would support irrigation system, fertilizer, and soil preparation. The 100 Resolution made agriculture's productivity increase between 1981-1987. However, the resolution soon encountered problems, and it was replaced by the No 10 resolution in the middle of 1988. The 100 resolution's limits were

deleted by No 10 resolution and approved in the middle 1988. The No 10 resolution carried out through a government's circular about unregulated rice prices and inputs. Now the market was allowed to determine the price for inputs, while land tax was decreased. Farmers were now allowed to choose which kind of trees to plant and animals to breed.

Decollectivisation coincided with what is perhaps an even more significant shock to the livelihoods of Tuong Ha and Tuong Tien, the construction of the Hoa Binh dam downstream (see Table 4). Between 1986 and 1989 households were compelled to move to slightly higher ground to make way for a new reservoir which would flood the valley. A large portion of the most fertile rice land was lost under the water permanently for most residents, and seasonally for some of the residents of Tuong Ha, who could plant just one rice harvest. While aquatic resources in earlier periods were primarily valued as a source of water for irrigation and household use, and as a location of small scale fishing activities, they now played a far more significant role in people's lives as communities were compelled to adapt their livelihoods following the loss of their paddy lands.

Fishing activities in the new reservoir were increasingly promoted and supported through the government's Project 747, although this was by no means straightforward for households who were not traditionally large scale fisher people. Kinh fishers from the lowlands were the first to benefit from the new reservoir. They would migrate seasonally and set up temporary floating homes in shallow sections of the reservoir for a few months a year, and would fish with large fixed 'lift nets' and with seine nets from small boats. They continue to reside here, and over the years their fishing skills were gradually transferred to local people, whose livelihood strategies today include a diversity of aquatic and non-aquatic dependent activities.

Table 4. Timeline of villages

Year	Events
1986 – 1989	Move to higher place because of construction of Hoa Binh dam
1990 – 1991	No wet land because of high water level
1995	Project 747 supports planting forest and equipment for fishing and aquaculture
1996	Having electric system. Animal disease because of new higher living place
1997	CARE project supports construction of water tank, training technical planting trees and breeding livestock, cattle.
1999	Started constructing road No 114 (provincial road) that was finished in 2009
2002	The storm destroyed ten roofs of houses
2005	The number of lift net increase but hand net decrease
2007	Flooding caused muddy water so many fish and shrimp die. Yield decreased

2008	Successful soybean crop due to new seed and area of soybean much increase
2009	Unsuccessful corn crop due to the damage of rats

(In focus group from 14/4/2010 – 23/10/2010 in Tuong Ha and Tuong Tien commune)

3.2 Wealth ranking

The patterns of resource use today and livelihood strategies vary considerably within the study communities. In order to gauge these differences it is first necessary to identify the livelihood resources or ‘assets’ available to different groups of households. The first step in this process entailed a wealth ranking exercise (see

).

Table 5. Characteristics of household according to Well being ranking of study villages

<i>Villages</i>	<i>Worse- off households</i>	<i>Medium households</i>	<i>Better-off households</i>
<i>Dã 1</i>	<ul style="list-style-type: none"> - Low level income, -More dependent people (children ,old person), -Family members with illness - New household, - Lack of capital, -Obligated to take loan with high interest - Involment only in agriculture and fishing, 	<ul style="list-style-type: none"> -Normal income, -Some inheritance of capital from parents. -No access to bank loan -Some land 	<ul style="list-style-type: none"> Stable income -Subsidy from government (200.000 - 600.000 VND/ month, -Access to pension, -Capital investment, -Higher education for children , -Head of village or commune -Involvement in business or trading -Enough food for whole year
<i>Dã 2</i>	<ul style="list-style-type: none"> -Lack of labour, having many dependent people (childrent) -Family members with illness -Not enough food all the year. -No mortobike -Limited access to loans -Lack of land 	NO DATA	<ul style="list-style-type: none"> -Stable income, -Only two children, -Happy family, -Enough food for whole year -Motorbike -Higher education for children -Large land holdings
<i>Tâm Ốc 1</i>	<ul style="list-style-type: none"> -Income lower than 200.000 VND/month/person -Lack labour -Two small children and old person -Poor health -New divided HH from poor Households -Lack of capital, -Obligated to take loan with high interest -Little land 	<ul style="list-style-type: none"> -Income from 300.000 to 400.000/person/month No ill people -No access to bank loan - Hard working 	<ul style="list-style-type: none"> -Income more than 400.000/person/month -Inheritance of capital from parents -Stable income -Access to susidy or pension -Children studying at university - Involment in business
<i>Tâm Ốc 2</i>	<ul style="list-style-type: none"> -Many people in the family, 	<ul style="list-style-type: none"> -Works hard but lack 	<ul style="list-style-type: none"> -Access to, subsidy

	<ul style="list-style-type: none"> -New households, many small children -Lack of valuable asset, -Poor health -Limited knowledge. 	<ul style="list-style-type: none"> capital. -Good health, knowledge -Good labour management 	<ul style="list-style-type: none"> -Inheritance of capital from parents Access to household labour (4-5 main labours), - Knowledge of integrated agriculture, -Fishing with animal husbandry -More than 10 cattle -Hard working
Tūt	<ul style="list-style-type: none"> -Ineffective use of capital -Less labour and many small children -Many children and old people, -poor health, -Newly started household , -Limited knowledge. -All husband and wife have no education 	<ul style="list-style-type: none"> -Having many children at school -Main occupation is agriculture - Good agricultural productivity 	<ul style="list-style-type: none"> -High income - Inherit capital from parents - Access to pension/ allowance - Access to loan to invest in plantation forest and animal husbandry -Hard working -Few dependent people -Children have higher education and stable job -Government job

In carrying out this study, key informants were selected from the village. They included the Chairman of the Farmers Union, vice president of the village, and the chairwoman of Women's Union. These key informants were then requested to organize participants for a PCA study. Subsequently, they were asked to categorize the village households into distinct wealth groups, using their own criteria. This finally resulted in three distinct well being groups: better off, medium and worse off.

Based upon a study from Tanzania, Birch-Thomsen et al (2001) divides livelihood strategies into three types. An ‘accumulating’ strategy is pursued by households those that are actively investing their surplus to expand their asset base and increasing their wealth. A ‘peasant’ strategy is one which offers households livelihood security but yields limited surplus to sell to increase household wealth. Finally, a ‘coping strategy’, is pursued by households that struggle to meet their minimum subsistence needs and own limited assets. It includes dependence upon upon common property resources as well as labour for others. A similar framework was described in the HighARCS overview livelihood report (Sugden and Punch, 2011). These three livelihood strategies in some way correspond with the livelihoods pursued by the three wealth categories, although there is a degree of market orientation for all households whereby agricultural produce is sold either for a profit in the case of wealthier households, or to purchase grain staples in the case of poorer households.

‘Worse-off’ households are those that lack land or capital to invest and have limited education. Without adequate holdings of wet rice land, households often must cultivate cash crops such as corn and cassava on the fragile upper slopes or carry out small scale fishing to generate cash to purchase rice in the market. Even holdings of land on the upper slopes are sometimes marginal. Given the lack of opportunities to generate a surplus in this context there are fewer opportunities to diversify their livelihoods through entry into trade and other occupations. Another cause of poverty is demographic. Households classified as ‘poor’ often have a large number of dependent family members such as young children or elders, which means there is a shortage of food or income

relative to the amount of productive labour in the household. Poor health can also increase the numbers of dependent family members and can incur additional expenses. Such households usually have a small house with more limited space to live, with day to day food insecurity and no valuable assets such as motorbikes. They are often dependent upon loans from the bank or private lenders, often at high interest rates.

'Medium' wealth households have larger holdings of wet rice land and can usually meet their subsistence needs through agriculture and fishing. They also are not constrained by large numbers of dependent family members or illness. However, most households in this category lack significant savings and there is limited capital investment to expand the households asset base.

'Better-off' households have a lot of land and cattle which not only offers them year-round livelihood security, but allows them to generate a surplus product which when sold can be used to accumulate wealth. Profits are sometimes invested in more advanced agricultural inputs and machinery, or are diverted into other activities such as aquaculture. This explains the higher average investment over the last year of 3,519,000 VND on agriculture, livestock and aquaculture inputs by 'better-off' households as compared to the 2,283,000 invested by 'medium' households and 1,736,000 spent by poor households. Furthermore, the survey showed that 7 sampled 'rich' households owned high value machinery such as threshing and husking machines, while only three 'medium' and one 'poor' household had made such investments. The consumption pattern of households reflect these wealth differences. According to 'better-off' households spend considerably more on building and maintaining their homes than their medium and 'worse-off' counterparts. They also have more electrical equipment such as television, and refrigerators and spend more money on gas to cook.

Children in the 'better-off' category have a better education, family sizes are reportedly smaller, and the general health of the household is better. Although educational expenditure per person was reportedly higher for richer households larger family sizes amongst poorer households may be why average educational expenditure over the last year remains the same for all wealth categories in Figure .

Among five villages studied Figure shows that Dan 2 has the highest rate of 'better off' Households (43.14 %). This village was established long time ago, occupies a large area of land, and people have good experiences in agriculture and business. In addition, Dan 2 has many people employed in government administration such as the village/commune/district leadership. Tầm Óc 1 has the highest rate of poor Households (46.3%) due to lack of land and poor quality of soil.

Figure 2. Wealth ranking



Figure 3. Average household expenditure over last year by wealth group (VND)

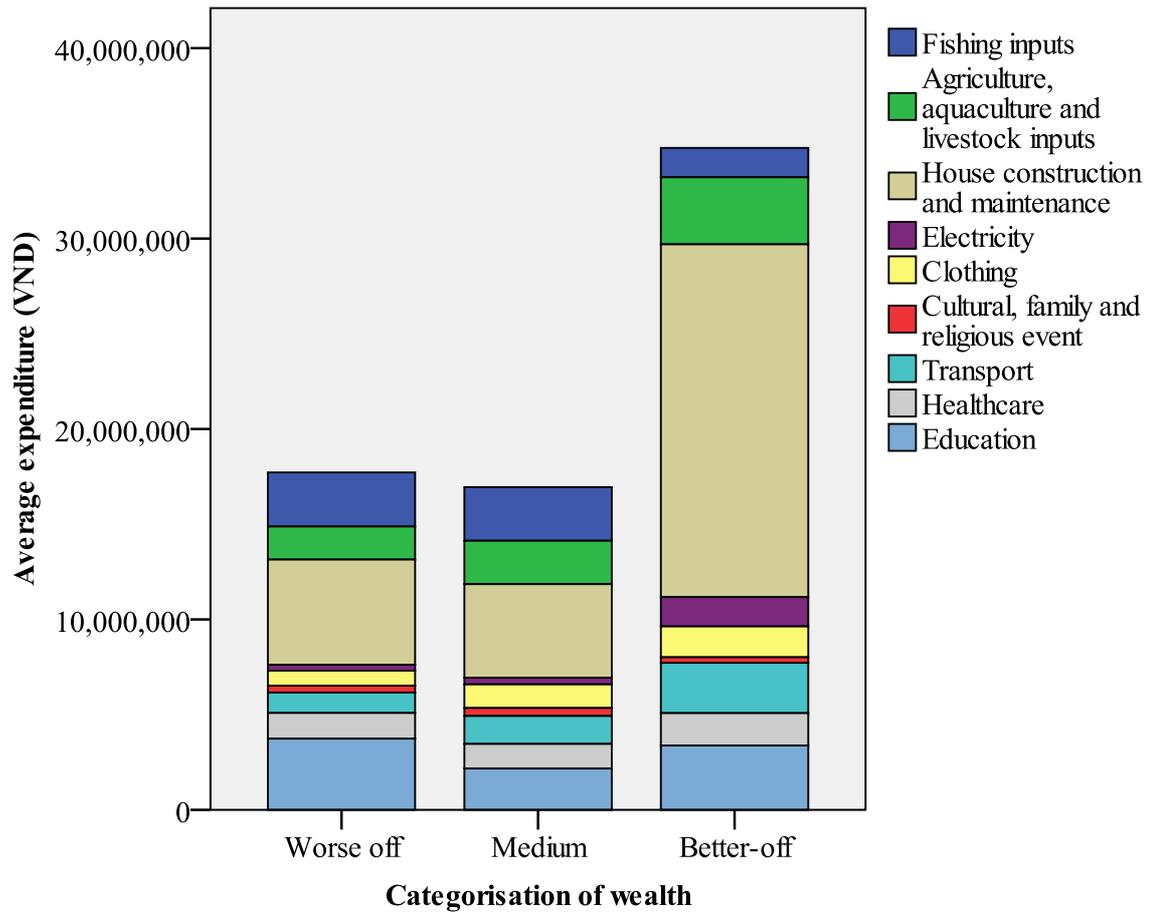
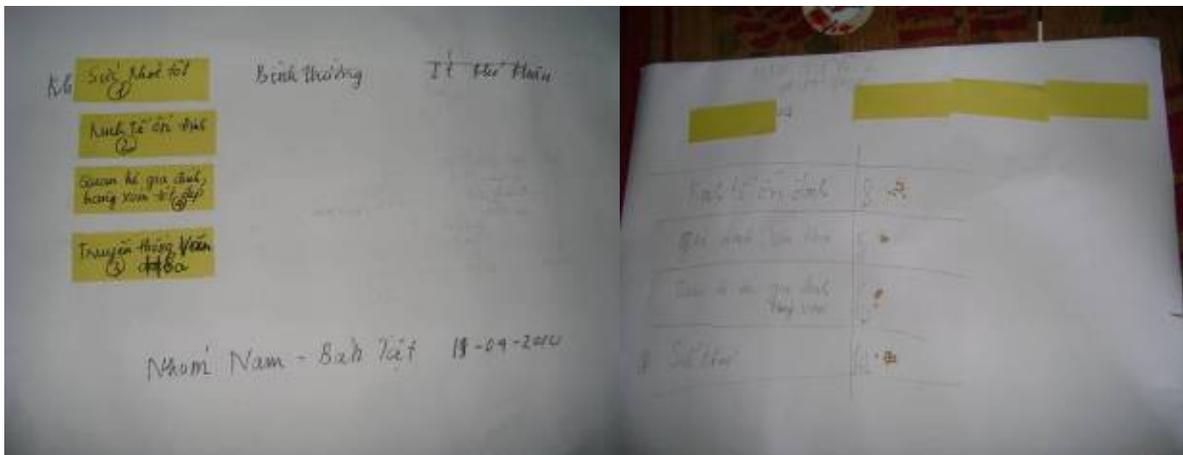


Figure 3. Definitions of happiness ranking



It is important to note that aside from economic security, a sustainable livelihood should also encompass overall wellbeing, including the consideration of non-economic factors (Scoones, 2009). Households were asked to define happiness and to rank a number of measures of wellbeing including economic security, good health, protection of family and village customs and good relations within the community (see

). All wealth categories have the same attitudes regarding non-economic wellbeing. According to respondents happiness entails not only having enough rice to eat, but having family members who love each other and children who have a good education and career. Happiness does however also include economic measures such as having a high income and big house. Interestingly, in the ranking exercise, all respondents agreed that good health is the most important, followed by economic security, good relations with neighbours and finally, the protection of family and village customs.

3.4 Livelihood resources

3.4.1 Sustainable Livelihoods framework.

The Sustainable Livelihoods framework suggests that one's capacity to pursue different livelihood activities is dependent upon the livelihood resources one has at their disposal (Scoones, 1998, 2009). These livelihood resources or 'assets' are categorised into several types. These include: *economic capital*, such as savings; *social capital* such as networks of mutual support with friends or relatives; *human capital*, such as knowledge and education; and finally *natural capital* which includes agricultural land as well as aquatic ecosystems such as rivers and lakes. The particular combination of assets one has access to has a bearing on the livelihood strategy one will pursue (Scoones, 1998). The key livelihood resources present in Son La are discussed below.

3.4.2. Natural capital

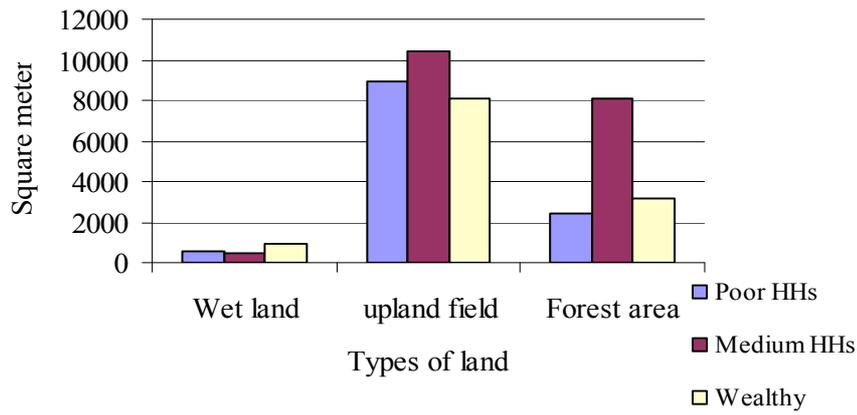
In order to understand the basis for wealth differences, a first step is to examine each livelihood resource, and examine who has access to them. Natural resources include wetlands, hills, fields, forests and water surfaces.

Water surfaces: In the research areas, there are more than 200 ha of water surface. The reservoir is by far the most important aquatic resource in the study site (see

). The watershed belonging to the Hoa Binh hydropower dam has a high potential for fishing and aquaculture (The social – economic report at Tuong Ha commune in 2009; The social – economic report at Tuong Tien commune in 2009) .The reservoir is effectively ‘common property’, in that any household with appropriate fishing equipment can utilise its resources. Aside from this, there are some small artificial ponds which are privately owned and built by households for aquaculture. There are also several smaller streams which are sources of aquatic produce such as molluscs.

Wet rice lands: Marshy wetlands were traditionally used for wet rice cultivation, although since 1994, the water level in this area has increased due to the storage of water in the Hoa Binh hydropower dams and they are underwater. Before resettlement, all the villages had a large area of wet fields but now most of it is under water, so local people are lacking wet land for rice cultivation especially in Tầm Ốc 1 and Tầm Ốc 2 village, where each household previously had 2 ha wet land area which was distributed by the village leader. However yield of agricultural products harvested in these areas depends on natural conditions and water level. The annual rice production is about 5,6 - 6,6 ton/ha (Tuong Ha people committee, 2009; Tuong Tien People committee, 2009). Furthermore, as **Error! Reference source not found.** displays, wet rice holdings are not equally distributed. Wealthy households have larger holdings of wet rice land than their poorer counterparts, explaining their stronger livelihoods. Households classified as ‘poor’ and ‘medium’ own on average 533 m² and 430 m² of wet rice land respectively, while ‘rich’ households own 904m².

Figure 5. Land ownership by wealth being households



Upland fields: Hill land and dry fields are the main lands for agriculture activities in the study site (see

). Cultivation in dry fields include dry rice (*Oryza sativa*), corn (*Ostrinia nubilalis*), cassava (*Manihot esculenta*), soybean (*Glycine max*) and dong giềng (*Canna edulis*). The techniques of cultivation are different between villages, depending on the natural conditions and habit of local people. In general, the quality of land is decreasing due to soil erosion, deforestation and unsustainable farming techniques.

Figure 4. Tending fields of corn and fishing activities in Dan 2 village



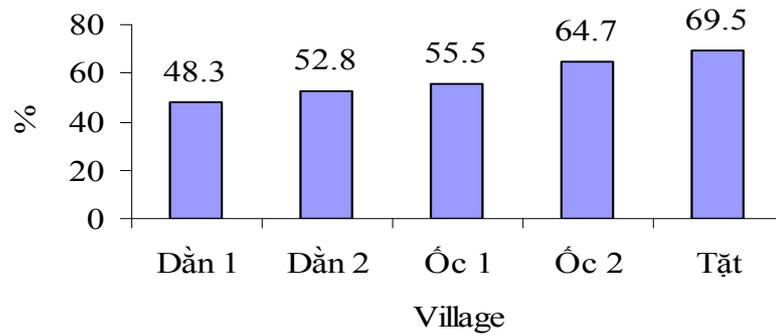
Forest: Regarding forest resources, there are two kinds: natural forest and cultivated forest. Natural forests are listed as national assets that are entrusted to local communities for protection. Beside natural forest, each household has also been given two hecta of hill land to plant and manage. On these kind of landd, local people are growing forest treed such as Keo (*Acacia mangium*), Luồng (*Dendrocalamus membranaceus munro*), Têch (*Tectona grandis*).

3.4.3. Human capital

Household members can be compared to cells of a society. The wellbeing of each household indicates the wellbeing of the commune, district, province and country. There were a total of 94 Households surveyed across 5 villages. On average, the household size ranges from 4 to 5 people (average of 4.76 person per household), this includes 2 to 3 generations (parents, children and or grand children). The population ranges from 194 to 387 people, Dan 1 has the lowest number of households (46 Households/194 people) and Tat village has highest (86 Households/387 people). The detailed data is presented in Table 1.

Labour is important for economic development, and a key form of ‘human capital’. Figure 7 shows the percentage of productive labour in research communities. The percentage of productive labour ranges from 48,35% (Dăn 1 village) to 69,5% (Tăt village). The number of dependent people is highest in Dan 1 village because this is a new village and almost all household heads are young people with many children. In the community, people who are older than working age are still contributing to agricultural and household activities. Almost all younger labourers have graduated from secondary school or high school.

Figure 5. Proportion of productive labour according to village



Education in Vietnam has been reformed and promoted and is a regular special concern at all government levels. Almost all Vietnamese learn by heart “benefit 10 years by planting tree and benefit 100 years by educating people” – the sentence draws from the reformation of education by Ho Chi Minh - leader of Vietnam. As a result, education is usually mentioned in the Annual Progress and Planning meetings at the commune, district, province, city and government levels. In terms of education, primary and secondary schools are well attended in all 5 villages . Tat village appears to have a higher educational status than the other villages with most pupils finishing high school and going out for higher studies or to get a job. Mr Thang (head of Tat village) said this is probably because households want to encourage children to get a chance to leave the village to avoid the difficult life there. There was a perception that the life of local people was becoming increasingly difficult due to lack of agricultural land and the decreasing quality of aquatic resources. The Vietnamese government has implemented a number of education supporting policies. For example, each student who registers for a college or university can borrow up to 8 million VND/year with low interest. In addition, ethnic and poor students are exempted from paying fees for their studies. Nevertheless, a large number of household members still have no education, particularly amongst the older generation in Dan 1 village.

3.4.4. Physical capital

Physical capital is the basic infrastructure required for society and its economic development. Key physical capital includes health services, schools, transportation, water supply and sanitation, energy and communications networks, and a market. There is limited public infrastructure in the research area. The two communes have a health dispensary with some nurses and a health supporting team in each village. The health care equipment and treatment capacity of the doctors is very limited.

All the communes contain a primary and secondary school. Pupils studied from grade 1 to grade 9 at the local school, while higher study pupils have to travel about 7-8 km to Gia Phu town. Tường Tiến commune has a total of 28 class rooms including 14 class rooms for grade 5-9 (secondary school), 11 class rooms for primary school and 3 class rooms for kindergarten (Tuong Tien People Committee, 2009). Tường Hạ commune has a kindergarten with 7 class rooms, a primary school with 11 class rooms and a secondary school with 8 class rooms (Tuong Ha people committee, 2009).

The level of access to drinking water is different between communities and depends upon location, topography, and ethnic customs. Drinking water is obtained from stream filled tanks (see

). Lack of clean water was a major problem in the communities and water from streams which are used for cleaning is often polluted by cattle manure. Furthermore, soil erosion causes turbidity in water and the accumulation of mud, especially in the dry season from October to March. The CARE organization and 135 programme have supported the setting up of drinking water tanks for villages. However the water storage capacity of the tanks is so low that they can not supply enough water for all the villages and the tank's life is not long because of weak management and maintainence. In Tuong Ha community, village wet lands do not have an irrigation system due to

complicated topography and depend upon rain. However in Tuong Tien community an irrigation canal system has been built to supply water for wet rice from the small stream.

Figure 8. Drinking water tank in Dan 2 and Tat village



All villages at the study site are connected to the national electricity system. Electricity supports local people, improving their knowledge and policies through access to television and radio. It also provides better study conditions for children as they can work at night, and has many advantages for living conditions. The villages are all served with a car road linking the village with neighbouring communes. The roads have been built by the government through programme 135 (Programme of social-economic development for especially difficult communes in mountain regions 2006). However, transportation systems between villages are still simple. Tat village has a market which operates every ten days to exchange products and sell belongings. In addition, local people can buy things at small shop in the village.

3.4.5. Financial capital

Financial capital is the cash or financial resources that people use to achieve their livelihood objectives. It includes savings, bank deposits, liquid assets such as livestock, regular inflows of

money. The majority of villagers have little or no cash savings as money which is earned is spent on grain staples and other basic necessities, although richer households do generate some 'profit', as discussed above. The main income source comes from aquatic dependent activities, with an average income 1.5 – 1.7 million VND/month/person in the main fishing season (from September to next April). Aside from this, cash crops from upland fields such as maize and cassava are regularly sold. A minority of households members labour outside such as in neighbouring communities, Phu Yen town (25km far from home) or Son La town (150 km far from home) with the average wage is 60.000 VND/day. Animal husbandry also constitutes an important element of household income. Cash is used for household expenses such as food, treatment of illnesses, and education fees.

Accessing credit is a way through which poorer households can invest in production systems. In recent years, access to credit was easier than before. Local people lent money through various unions (womens union, old peoples union, veteran unions) and several microfinance banks. The government supports poor households in accessing credit through programm 30a (Supporting quick poverty reduction and sustainability in 61 poor districts). The program indicates that special or poor households can borrow money with no interest at the Social and Policy bank or borrow with interest of 0.65% per month at the Agribank while the usual interest is 1.2% per month. However, there appears to be some problems in the credit market. Loans are not always available when required. Furthermore, some poor households do not know what they should use the loans for. Some loans were not used for productive purposes and others use loans for investing in animals, although they often die due to disease causing a net loss for the household (see Box 1). In such cases the bank will not allow them continue borrowing money. It is recommend that government should support and guide local people how to use capital effectively.

Private money lending also exists, taking advantage of constraints accessing credit. This often makes households victim of exploitative rates of interest. Many Households borrow money from a money lender to buy seeds. After the harvest they sell products to the middleman and then repay the money lender. The interest is generally 5-7% per month. Sometimes if they can not repay then they pay back next year for an inflated rate of interest, causing them to suffer an overall loss. There are some money lenders who borrow money from the bank and then lend it out to villagers who can not secure bank loans for higher interest, giving them a profit.

Box 1. Accessing credit

One household we met had borrowed money from the bank to invest in chickens. However, the chickens died and she could not repay the loan. For that reason the bank will not give her any more loans, so she has to borrow from the money lender. (*FG women and men 18/4*) this lender often borrow money low interest (0,65% per month) from the bank then lend poor Households with higher interest (1,0%-1,2% per month). Ater harvesting crop The poor Households had sell agricultural product (corn, cassava, soybean..) get money to repay lender. If they can not finish to pay, they will pay in next year. This condition made the poor Households was poor more and more. They have just finished to harvest crop. They lacked of food.

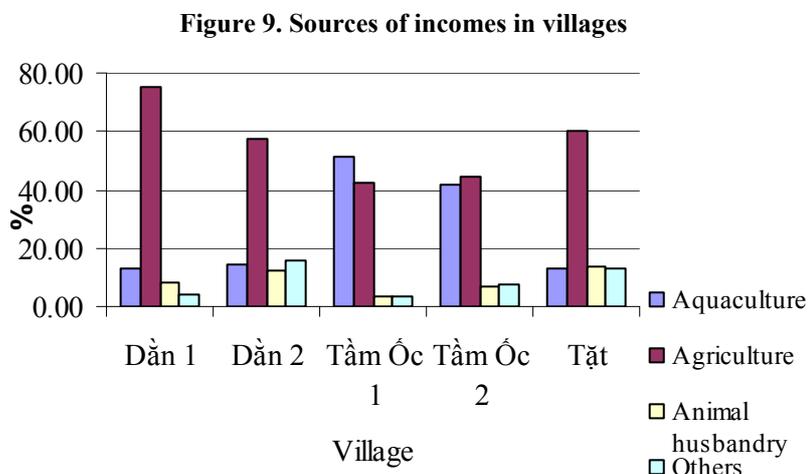
3.4.6 Social capital

Helping each other is the traditional customs of local minority people. Households sometimes exchanged their labour. For example, they may help a household one year, in the expectation that their assistance would be reciprocated at a later date. Moreover, the local people is also support each other in the important family events such as building the house, organizing wedding party. Poor households who do not have enough equipment of their may borrow the equipment of others such as buffalo for plough, although this can be exploitative if rent is paid.

3.5. Livelihoods strategies today

3.5.1 Aquatic resource use today

The livelihood activities and contributions to income of local people is shown in Figure 96. Livelihoods depend on a combination of both aquatic and non-aquatic resource based activities. Agriculture is the predominant livelihood activity in Tat, Dan 1 and Dan 2 villages, while both fishing and agriculture are the main income of Tam Oc 1 and Tam Oc 2.



Aquatic resources in the Hoa Binh reservoir today play an important role in the livelihoods of respondents in each of the three villages. A diverse range of fish are caught, as is displayed Table . Households in Tam Oc are most dependent upon aquatic resources (see **Error! Reference source not found.**) primarily because this village had lost the most wet rice lands due to the reservoir, obliging households to diversify their livelihoods.

Local people use a number of different tools for such as lift net, traps, hand nets, and cover nets. Some methods were forbidden, although the fishman still used these techniques secretly on some

occasions, such as the use of explosives or electricity. According to the survey, the total yield of fishing was 46 tons in 2009 in Tuong Ha commune and 14 tons in Tuong Tien. The fishing method includes lift nets, boat fishing, and small scale fishing (line fishing and using trap). Among 94 Households interviewed, 54 Households (57,4%) were involved in fishing, with 5 households using boats with an engine and 55 using small boats. 32 households used lift nets.

Many people use traps to catch shrimp. They go out very early in the morning (4-5am) to lay the traps, and then return in the evening to collect them. This is mostly done closer to the village. A household who used 1000 traps (cost for one trap was 2600 VND) could earn 1.5 to 1.7 million VND /fishing month/person. However the season is only about six to seven months (from late of September to the following March). Traps can also be used to catch very small fish. Often these ‘trash fish’ sell for about 8000VND per day and they can catch up to 10kg per day. Boat fishing often involves long distance travel on larger boats with motors. This is practiced mostly by Kinh fishermen, and one or two households in each village. The common species collected include shirmp, common carp, silver carp, mud carp and “trash fish”. Fishermen said that the quantities of fish are decreasing due to overfishing and soil erosion which has worsened water turbidity and accumulation of mud.

Table 6. The species of fish caught locally

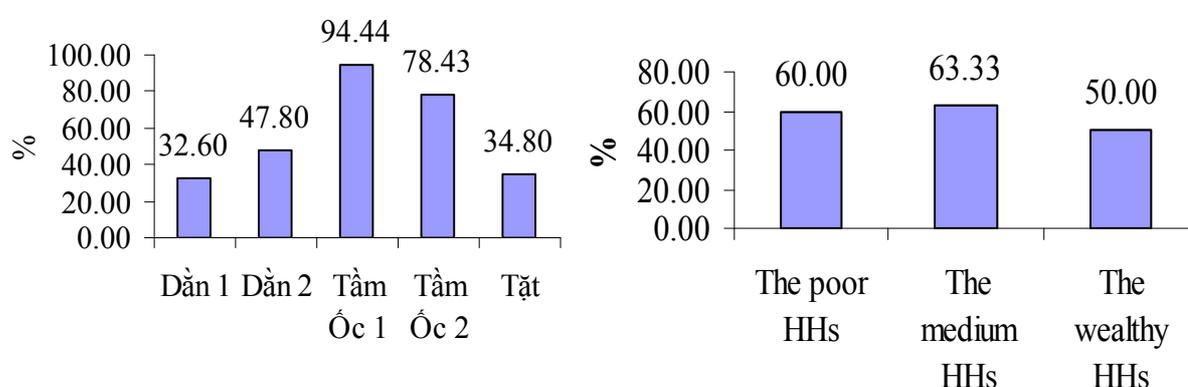
Local name	English mane	Latin name	Harvest seasonal
Cá Chép	Common carp	<i>Cyprinus caprio</i> Linnaneus, 1958	July to August nex year
Cá rô phi	Tilapia	<i>Oreochromis mossabicus</i> (peters) <i>O. niloticus</i> (Linnaeus, 1758) <i>O. aureus</i> steindachmer 1864	All the year
Tôm sông	Shrimp		September - April next year
Cá tạp	Trash fish		From January to July
Cá Mè trắng	Silver carp	<i>Hypophthalmichthys</i> Bleeker, 1860	July - August next year
Cá Trắm cỏ	Grass carp	<i>Ctenopharyngodon idellus</i> (Cuvier & Valenciennes 1844)	July - September
Cá Trôi	Mud carp	<i>Cirrhinus molitorella</i> (Cuvier & Valenciennes 1844)	July - September
Cá Ngõo		<i>Ancherythroculter daovantieni</i> Banrarescu, 1967	September - February next year
Cá Bò		<i>Pelteobagrus fulvidraco</i> (Richardson) <i>P. tonkinensis</i> Hao, 2001 <i>P. intermedius</i> (Nichols & Pope)	October - December
Cá Lăng		<i>Hemibagrus guttalis</i> (Lacepede, 1803)	October - December
Cá Măng	Milk fish	<i>Elopichthys bambusa</i> (Richardson, 1844)	All the year

In the five villges surveyed, Tầm Óc 1 and Tầm Óc 2 villages have a higher rate of households involved in fishing with the proportion of 94,44% and 78,43% respectively; followed by Dãn 2 (47,80%), Tật (34.80%) and Dãn 1 (32.6%). In Tầm Óc 1 and Tam Oc 2 village, people spent most

of the time fishing because they are lacking wet rice land, while the upland field soil quality is poor and crops are frequently damaged by rats.

Error! Reference source not found. shows that the proportion of poor and medium households involved in fishing is higher than for better-off households, suggesting that they are more dependent upon aquatic resources, perhaps due to their limited ownership of land and other productive assets. There are more than 60% of medium and poor households engaged in fishing as compared to just 50% of the wealthy households. The reason are perhaps the fact that better-off households have more land and higher income from animal husbandry than their poorer counterparts, and therefore spend more time engaged in agricultural activities.

Figure 10. Proportion of household involve in fishing categories by villages and wealth group



Within the household, men participated in fishing more than women, The men usually go out to fish in the afternoon and return in the morning the next day. In some households the husband goes fishing for a few months and their wives stay at home to take care of the children and work in the field.

Box 2. Aquatic resources

According to Mr Can Ngoc An a fishmen in Tat village, ten years ago there were a lot and big fish in the Da river. Each time he went fishing he could catch from 5 to 10 kg of fish. However at the moment the number of fish has decreased very much and he no longer catches big fish. If he wants to caught big fish he has to go to a distant commune, Van Yen, due to over fishing from lift nets. Sometimes when he has free time he goes fishing but each time he catches only 1 – 2 kg small fish

3.5.2 Culture aquaculture

Another livelihood activity which depends upon aquatic resources is fish culture. The large surface area of the reservoir and the availability of bamboo to make cages suggest there is a good potential for cage culture development. From 1990 to 1991, the government supported a policy on cage culture development in Hoa Binh reservoir but it was not successful because of fish disease and water fluctuation. At the same time, the complicated topography of the mountains limited the potential for pond culture. Each village has 3 or 4 ponds with an area of 70 to 100 m². Pond culture is normally carried out by some wealthier households who can afford the investment, although productivity is generally low. For example, one ‘better-off’ household was raising Tilapia in a pond. Some was sold and the rest was kept for the family. The common culture species include tilapia, common carp, grass carp, mud carp, catfish and silver carp which are a highly adaptable species that can survive off available food waste such as leaf of cassava, leaf of banana, and grass. All the households wish to participate in cage culture because despite its limitations, it is one way to supplement their income in the context of soil erosion and climate change.

3.5.3. Agricultural and livestock activities today

Despite this, agriculture remains the predominant livelihood activity, engaging 83% of sampled respondents, whereby households cultivate rice on the remaining paddy lands, and corn and cassava on the steep hillsides. Most land is dry fields, while there is some wet land. Tường Hạ commune has a total of 56 ha wet land and 871 ha of dry fields (Tuong Ha People Committee, 2009), Tường Tiến commune has a total of 28 ha wet rice and 828 ha dry fields (Tuong Tien People Committee, 2009). Wealthier households have more wet land than others, while poor and medium households often depend more on upland rice fields. **Error! Reference source not found.** earlier showed that the ‘medium’ households have the largest holdings of upland fields and forest. Livestock raising, such as buffalo and chickens are also important income sources. Rice is generally produced for consumption while corn and cassava production is more market oriented. Corn cultivation has taken off in recent years, and the produce is sold to middlemen who take it down to the lowlands. However, corn is also used for feeding domestic livestock.

After the water level in the Hoa Binh reservoir increased to its highest level in 1991, local people had to move their houses to the fields and mountains. In this context the proportion of wet rice land for cultivation per person decreased and the methods of cultivation changed from two crops per year to one crop per year. Following this, the extensive cultivation of the high slopes of cassava and corn made the quality of soil deteriorate. This has been further worsened by lack of experience in cultivating slope soil for displaced farmers, lack of irrigation systems, high annual rainfall, and climate change. With the expansion of upland fields, forest cover also decreased significantly,

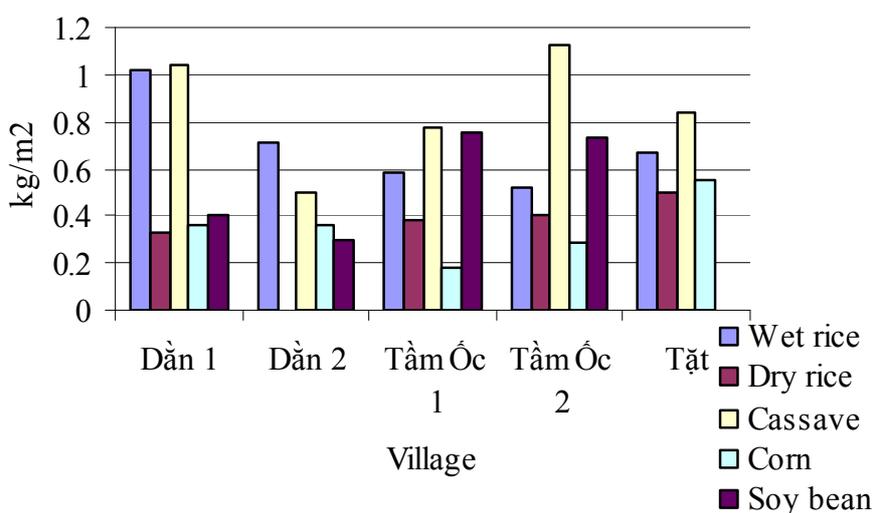
increasing soil run-off. According to respondents in interviews, this has in turn negatively affected the water quality and fish stocks, highlighting the interdependency of ecosystems and livelihoods.

Yields of crops are low. According to the survey, the average productivity of corn is 3,47 ton/ha, cassava is 8,56 ton/ha, wet rice is 7,03 ton/ha, dry rice is 3,22 ton/ha, and soybean is 4,37 ton/ha. In the five studied villages, Dan 1 village has the highest wet rice productivity (10,24 ton/ha) due to good soil quality and larger agriculture land area when compared to other villages. But Tầm Ốc 2 village has highest cassava productivity with 11,28 ton /ha. The average of agriculture annual income is 3.927.000 VNĐ/year/person, higher than vietnamese standard for ‘poor’ households² (The social – economic report at Tuong Ha commune in 2009, The social – economic report at Tuong Tien People commune in 2009).

Box 3. Agricultural cultivation

Ha Van Huu’s Household in Tam oc 2. village has 3 members with 1000 m² field to planted corn, soybean and cassava and 300 m² area for plant wet rice and dry rice. Annual his family harvested about 300 kg cassava 170 kg soybean 120 kg rice and 400 kg corn . However last year all the area of soybean is destroy by rat and did not harvested. Agricultural cultivation is not enough food for his family all the year so after finished field work he go fishing on Da river to caught fish to earn money and buy rice for his family.

Figure 71: Productivity of agricultural land between villages



² (According to decision No 170/2005/QĐ-TTg signed on 08th July, 2005 about defining poor standardd applied for period 2006 – 2010, in the countryside. It states that households are defined as poor people if they have an annual income lower than 2.400.000VNĐ/year/person)

Data on agricultural income may be misleading given that sale of agricultural produce is not a sign of wealth accumulation. In all the villages at the study site, the annual rice yield was not enough to meet family needs. Households usually have to sell other agricultural products (corn, soybean, cassava) to get money to buy rice. The exception is many of the ‘better-off’ households who are yielding a surplus. In this context, any agricultural product which is sold generates a profit.

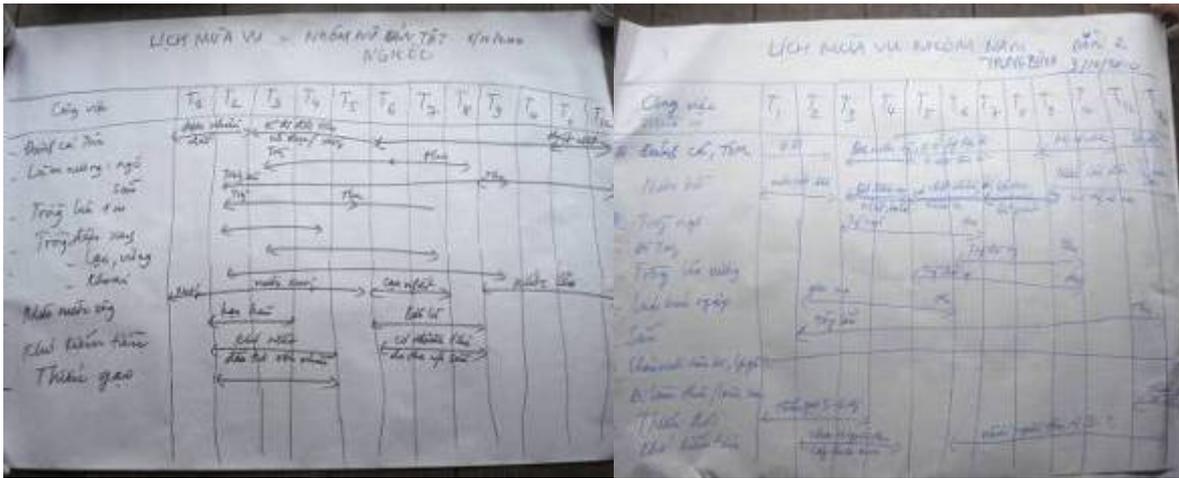
Agricultural production is seasonal (see Table), leading to temporary food shortages for some of the poorer households. The hunger period is normally from three to four months (from March to May). In that period, the poor Households often mix rice with corn or cassava for food. There are differences between medium and poor.

Livestock raising, such as buffalo and chickens are also an important livelihood activities of households. Buffaloes provide a productive force for agriculture and are an important saving asset. The government has a policy that offers credit for households to buy buffaloes, cows and pigs. Many households culture chickens and pigs for home consumption. According to the annual report of Tuong Ha people committee, in 2009, Tuong Ha commune has 405 buffaloes, 903 cows, 1954 pigs, 68 goats, 32 horse and 14280 poultry. Tường Tiến commune has high sloping in topography that is sustainable for goats raising; in 2009, Tuong Tien has 219 goats, 297 buffaloes, 643 cows, 650 pigs and 9000 heads of poultry (Tuong Tien People Committee, 2009).

Table 7. Agriculture seasonal calendar at Tầm Ôc 1 village

Activities	Jan	Feb	Mar	Apr	Mar	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prepare land	■											
Plant com and cassava				■								
Take care com and cassava						■						
Harvest com								■				
Harvest cassava												■
Prepare land for soybean			■									
Plant soybean					■							
Harvest soybean									■			
Prepare soil to plant sesame			■									
Harvest seasame					■							
Prepare soil to plant dry rice					■							
Take care dry rice							■					
Harvest dry rice											■	
Prepare soil to plant wet rice			■									
Take care wet rice				■								
Harvest wet rice						■						

Figure 12. The seasonal calendar drawn by respondents during focus groups



3.5.4 Forest plant and management

Planting and managing forest in the uplands is also an important livelihood activity. There are some programmes that supporting plant and capital for forest management such as COS (Consolidating and enhancing ability of community and organizations) and FARM (seeks to develop natural resources and community in Phu Yen). Each household has been allocated 2 ha of forest to plant and manage. This is normally on land not suitable for agriculture and is separate from natural forest land. The kind of trees which were planted include keo (*Acacia mangium*), luồng (*Dendrocalamus membranaceus Munro*), tẻch (*Tectona grandis*). The forest plays an important role in preventing soil erosion while also offering a source of additional income to households. Some wealthier households would sell wood such as that of the ‘stick tree’, others would use their forestry plots for family use. Natural forest is considered as an important community resources. The entire area of natural forest is managed by the community through the commune people’s committee and the forestry management office. Each household is allowed to cut enough wood to make a house. Local people are permitted to collect other products from the forest whenever it does not damage the forest. In addition, the forest supplies wood, bamboo shoots and vegetables for local people. In the hunger period, people go to the forest to collect young bamboo and sell it with the price of 5000 – 8000 VND per kg. However the management of forest is still limited, and the area of forest in the communes was very small.

3.5.5 Other livelihood activities

Most of the poor people in the community go outside to find jobs in their free time and in the hunger period (from March to June). There are many kinds of jobs where work can be found including ploughing the fields, cutting trees, removing weeds, and building houses. In the households with many labours, some of them go to other provinces such as Ha Noi, Bac Ninh and Hai Duong to work for long periods. There is a little overseas migration (Malaysia, Taiwan, Japan), although a few households have members living in other parts of Viet Nam such as Ho Chi Minh City or Binh Duong in the south of Viet Nam. It is also common for households to have younger members who work in other communes. Some even have land elsewhere, and send contributions to their parents.

Many of the 'better off' households who have capital and business experience, open small shops or services such as the buying and selling of pork and bike repairing. There are also sources of social support such as allowances from the war veterans union, which give monthly payments and compensation to those suffering health problems due to the American war. Other interesting income sources include work for the village administration. This seems to be quite a big employer in the study communities.

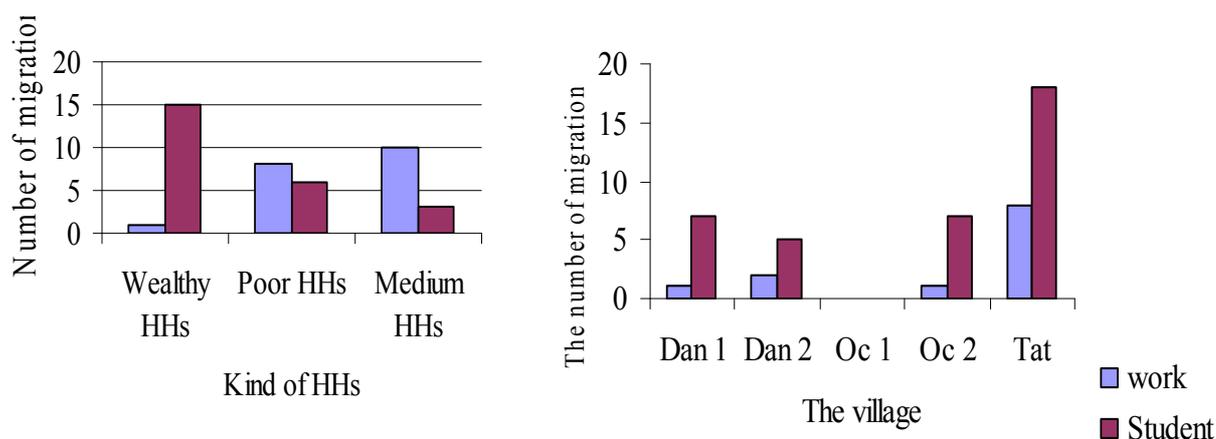
3.5.6 Migration

Migration was primarily linked to education for the wealthier households, as

suggests, and a total of 16 people had migrated at the time of the survey. For the medium and poor households however, migration is primarily to a find job. Within the wealthy households 15 members had gone outside to study, while for medium households there were 3 members and for poor households there were 6 members Tat village contains the highest number of work migrants (8 people), followed by by Dan 2 (2 people) and Dan 1 and Oc 2 (1 people). The village leader of

Tat village, Mr Thang, noted how households prioritise migrate outside to work as they feel there is no potential for livelihoods in the village due to declining aquatic resources and falling soil quality.

Figure 8. Migration by well being Households and by villages



3.6. Policies and projects at study site

The government and many international and national agencies have carried out some programmes and projects which are aimed at helping local people improve their livelihoods, guarantee food security and reduce the negative impact on biodiversity and sustainable development. Project include:

Programme 135 for Socio-Economic Development in Communes Facing Extreme Hardship in Ethnic Minority and Mountainous Areas (2006-2010): This is known more familiarly in Vietnam as Program 135, Phase 2 (P135-2). The programme supports policy and institutional actions with particular reference to: (i) improved poverty targeting of program resource allocation; (ii) deepening and scaling-up of community-driven approaches to planning, managing, operating and maintaining basic rural infrastructure; (iii) enhanced fiduciary transparency and accountability in program implementation through wider use of social audit approaches; and (iv) process monitoring and impact evaluation. The programme supported 150 million VND to improve the road in Tuong Tien commune. In addition, it also supported 30 million VND to help farmers buy

tractors, thresher machines and husker machines, provide seeds, equipment and training to increase the income of households to 3.5 million VND/person/year (The social – economic report at Tuong Tien commune in People Committee, 2009).

The program 30a: According to decision number 30a/2008/NQ-CP on December 27th, 2008 of Viet Nam government, this programme sought to reduce poverty and enhance sustainable development for Phu Yen district from 2009 to 2020. In this programme, each household was given 7 million VND and they could borrow 8 million VND to build new houses.

The program 925: Supports communes by providing materials to build school and culture house.

The program 747 (1382): Support for people with a fixed residence in Hoa Binh reservoir stage 2001 – 2005. The programme supports planting trees and 50% discount on tools to exploit aquaculture.

Aside from specific programmes, the government also has policies to offer annual support to local people such as: Supporting trees, animal husbandry and fertilizer. On the other hand, poor households can secure loans with low interest (from 0% to 0,5% per month) from Agriculture and Rural Development Bank and Bank for Social Policies. On 6th May 2010 the prime minister promulgated decision number 579/QĐ-TTg, according to which the government will support interests of all poor households when they try to secure a loan at Bank for Social Policies if the interest is lower 4% per year. Furthermore, students can borrow 8 million VND per year for their studies at an interest rate of 0.5%/month³. Students who come from mountainous areas are excused from the school fees, and receive support to find a job at their area of residence after graduation. The government supports land and housing for bachelor and masters level students who are willing to work in mountainous areas. Women's unions and farmer's unions are also involved in activities such as helping with community development through sharing experiences in animal husbandry, agriculture, and taking care of children. They have formed credit groups that help their members develop economically.

The community leadership is also involved in promoting policies and regulations through village's meeting and activities, such as the law of family and marriage, laws on prevention of domestic violence and family planning, and laws relating to gender equality. The above programmes and projects contribute to helping local people reduce risk and poverty, diversify their livelihood and achieve food security. Social policies which seek to support the poor still face a number of

³ Support financial for student in term of 2008 – 2009, <http://vayvondihoc.moet.gov.vn/?page=6.3&view=58> update 11st September 2008

challenges. Some households in Phu Yen reported problems accessing loans, as was discussed above. Loans were not always available when required, for example to buy fertilizer or shrimp traps, and if a loan is not repaid on time, an individual may be prevented from taking future loans.

This has led to a profusion of private money lenders who take advantage of these constraints accessing institutional credit. Poorer women in Tuong Ha in particular, would borrow money from private lenders to buy seeds for corn. After the harvest they sell the corn to the middleman and then repay the money lender. Interest is 5-7% per month, although this rate can increase if the loan is not repaid within a year, causing the borrower to suffer an overall loss. Interestingly, the money lenders themselves often borrow money from the bank and then lend it out at higher interest to villagers who for various reasons can not secure a loan themselves (see Box 1).

Access to institutional credit itself can be problematic, as many households fall heavily into debt. There seem to be a number of primary reasons. Firstly, there is a tendency for households to take loans for non-productive purposes. Spending on family and community events are a considerable burden for households. One man we met who was involved in the village leadership active felt obliged to attend many weddings in the village, and spent up to 6 million VND per year on gifts. Furthermore, in an expanding market economy, there was desire to invest in luxury consumer goods such as expensive mobile phones, televisions, and even refrigerators, which are often beyond their usual purchasing power. These were often bought as much for the social status they offer rather than their direct utility to the household, and loans were often used for this purpose.

3.7. Policies and practices for the management of natural resources

3.7.1. Management of forest resources and environment.

Biodiversity has been integrated to a certain degree in programs, strategies and plans for socio-economic development at the national level such as Agenda 21 of Vietnam. Efforts have been made to implement various international commitments on biodiversity, such as Conservation of Biodiversity, Ramsar, CITES and the Cartagena Protocol on Biosafety.

The 327 Programme. This refers to the national forestry programme established in accordance with Decision. No. 327/CT of the Chairman of the Council of Ministers on use of open land, bare hills, forest, coastal alluviums and water bodies. In 1993 the Government of Vietnam launched this programme for the re-greening of uplands. As part of this program forest land was leased for 50

years or given under management contracts, as discussed above. Much of this land was planted with trees or left free from human agricultural activities to regenerate naturally. The program offers 100.000 VND/ha/year to households who manage and protect plots of forest in protected areas. In the initial period that people were not allowed to collect products from the forest at all, while the government would support households with 10 kg of rice per person per month (Le, 2007).

The 661 Programme: This refers to the national forestry programme established in accordance with Decision. No. 661/TTg of the Prime Minister, dated 29 July 1998 on objectives, tasks, policies and organisation for the establishment of 5 million hectares of new forest. The 661 Programme is commonly known as the 5 Million Hectare Reforestation Programme (5MHRP). The 5MHRP aims to establish 5 million ha of forest between 1998 and 2010 to restore the forest cover of the country back to 43%, the same percentage that was under forest in 1943. The stated objectives of this effort is to reverse environmental degradation. At the same time the project intends to boost the productivity of the national forestry sector. 2 M ha of “degraded” lands are to be converted to industrial wood plantations, 1 M ha to cash crops, and 2 M ha to conservation forest. 1 M ha is to be grown through natural regeneration (CIFOR, 2010).

Project 747: As discussed above, this program supports socio-economic development for the Da River area in the period of 2001-2005, through offering support in agriculture, forestry, and construction of infrastructure. Through this programme the area of forest increased significantly and local people’s livelihoods improved. Furthermore, the project developed natural resources and the community in Phu Yen district (FARM) to decrease retrograde of environment through activities as improving the capacity of communities to conserve natural resources, support household methods in cultivating on slope soil to ensure food security. The forest protection and environment laws were promulgated widely through local management regimes. The commune’s police and forest officers and forbade people from breaking these regulations. The villages were also given also some regulations to decrease the incidence of burning forest land. These laws and programmes have had some success at limiting flooding and soil erosion and improving local people’s livelihoods. In this context the forest cover has increased.

3.7.2. Management of aquatic resources

The Law of Fisheries (2003) indicates regulations on the protection and development of aquatic resources and the Ministry of Agriculture and Rural Development is the state management agency

in this field. There are some documents related to aquatic conservation such as Decree No. 27/2005/ND-CP that offers guidance on how to implement of the fisheries laws. The decree contains 17 articles related to the exploitation and use of water resources for production, aquaculture and marine culture. Decree 128/2005/ND-CP dated 11/10/2005 issued regulations on penalties for administrative violations in fisheries. Money must be paid as fines for those acts affecting the aquatic habitat such as discharging wastewater and oil, demolition or construction of floating or underground structures which change habitats of aquatic species discharge of waste, washing water, or infected species in natural waters or aquaculture waters. There are some regulations about protecting and preserving aquatic resources were issued also at the province level, however they are not clear or effective. Local people and fisherman still have limited knowledge about aquatic conservation laws and regulations.

3.8 Gender and age

It was felt in the study communities that the position of women in society had been improving. Nowadays, women are involved in more social activities; they can for example become the chairwomen or head of village, head of commune. However, with regards to the division of labour, women are more likely to be involved in certain activities, while men are more likely to be involved in others. On the whole, women play a much greater role in household reproductive tasks such as washing clothes and dishes, cleaning the house, and cooking. Both men and women are involved in agricultural activities, but women work longer hours, and bear responsibility for labour intensive tasks such as transplanting rice (see Table 8). However, during their grandparents' time it was reportedly much more unequal.

In terms of aquatic resource dependent activities, both women and men are involved in fishing near the village, using shrimp traps, lift nets and small boats. It is primarily women who are involved in fishing from smaller streams near to the villages, which is compatible with their work responsibilities in the home and existing gender ideologies. It is however, considered dangerous for women to travel out onto the distant shores on the larger boats. Occasionally they do participate, but only with their husbands, and this is normally due to labour shortages. When husbands go fishing it is normally overnight and they return in the early morning. This allows them to travel quite far, often as far as Moc Chau, the next district, where the fish stocks are more plentiful. By staying the night the nets can be left out, and it saves them the fuel which would be used if they had to return to the village and then come back to collect the nets in the morning. The tendency for men to migrate to other provinces both on a temporary and permanent basis has increased women's role in many aquatic dependent activities. We heard of some women who had

been learning fishing and shrimp catching techniques from their husbands who were now migrating outside.

Table 8. Household activities ranking by women group in Tầm Ốc 1 village

Activities	Men	Women	Boy	Girl
Fishing	++++	++	+	+
Sowing crop and planting	+++	+++	+	+
Transplanting rice	0	++++	0	+
Ploughing fields	++++	0	0	0
Gardening	++	++	+	+
Going to market to buy product	++	++++	+	+
Selling product	+++	+++	0	0
Tidy up house	++	+++	++	++
Repairing house	+++	+	0	0
Cleaning the house	+	++	++	++
Collecting wood	+	+++	++	++

Level: +++ : Most involution
 ++ : More involution
 + : Least involution
 0 : Not involve

In general, there is not a clear cut line distinguishing between different wealth groups in the intra household division of labour. In the ‘worse off’ households, men participate in helping women more than in the ‘medium’ and ‘better-off’ households. However, both men and women in poor

households were less active during the focus groups which perhaps reflect their more marginal position in the society as a whole. They have a more limited knowledge of policies and they found it difficult to identify solutions to key problems which could improve their life. It was also found that women from poorer households were less knowledgeable than men with regards to technical information policies as well as socio-economic policies. Such women experienced identified difficulties in mapping and giving solutions to their problems.

Aside from gender divisions, there are significant differences in labour responsibility according to age. Boys usually play a more important role in fishing activities. Young boys who do line fishing are developing fishing knowledge from their fathers and elder siblings (see Table). They also enjoy watching older men fishing. Boys usually go to the reservoir to catch fish by boat, hand net, or trap. Girls fishing activities are normally restricted to selling snails or small fish near the river's edge. Any money which is earned by boys or girls through fishing is normally given to their parents to buy rice and cover family expenses. Some children wish to keep a little money for themselves such as to buy new clothes, notebooks, or shoes. Girls aspired to buy clothes, shoes and books while boys wanted to buy bicycles, mobile phones and balls to play. However, sources of personal income are generally low and children generally felt a responsibility to give all their catch to their parents.

While girls play a limited role in fishing, they play a more important role in agricultural activities, and the maps they produced for the focus groups showed much more detail for the different agricultural environments when compared to those produced by boys. Girls also make a significant contribution to household reproductive activities such as washing clothes, cooking, washing bowls, collecting wood or working in the garden. Boys however, play a more marginal role in these activities.

There were power relations evident between siblings with regards to labour contribution. For example, children have a tendency to ask their younger brother or sister to do jobs for them as they get older. In focus group in Tam Oc 1 village on October 4th 2010 a young boy informed the research team that his brother usually asks him to help with tasks such as cooking rice and washing clothes. If he does not work he claimed his brother 'hits him'. Another boy said he has a young brother and he often asks his young brother to work.

Table 9. Some interesting outputs from focus group of children's activities

Activities	Boy (9- 13) years old	Girl (9- 13) years old	Boy (14- 20) years old	Girl (14- 20) years
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				old
Most important	Go to school, work in the field, collect soybean take care cows and buffalo, (Dan 2 village 15/5/2010) Go to school, collect soybean, collect cassava, cooking (ages 9-13 Dan 1 village 16/4/2010)	Homework, cooking, working in the field, washing clothes, prepare food for pig. (dan 2 village , 12/4/2010) Homework, arranging house, working in the field, harvesting cassava and corn, take care of buffalo, wash bowl, take young sister or brother go to school	Learn lessons for school, go fishing, catch shrimp, work in the field, take care buffalo (ages 13-16 Tam oc 2, village 18/4/2010) Go to school, work in the field, harvest soybean. (ages 13-16 Dan 2, village 15/4/2010)	Work in the field, clean the house, cooking, Boil water and wash bowls (Tam oc 2, village 18/4/2010)
Least important	Collect snail, wash bowl, catch snake (Boy group Dan 2 village 15/4/2010) Wash clothes, carry food for dog and cat, prepare vegetable for meal, harvest rice (focus group, ages 9-13 dan 1 village, 16/4/2010)	Collect grass for buffalo prepare food for chicken and pig.	Wash clothes, play football, Clean house (boy 13-16 Tam oc 2 village 18/2010) Catch snail, wash bowl, catch snake (focus group Dan 2, 13-16, 15/4/2010)	Plant vegetables, Tam oc 2, village 18/4/2010)
Most enjoy	Go to school, play football, swimming, fishing, collect snail and shrimp catching snake (Dan 2 village 15/4/2010). Swimming in river , carry food for chicken and pig, take care of buffalo, plant corn, cassava and soy bean, (Dan 1 village, ages 9-13, 16/4/2010)	Collecting snail, have bath on the river (Dan 2, village 12/4/2010)	Learn lessons for school, play football, collect shrimp, catch fish (focus group in Tam oc 2 village, 18/4/2010) Go to school, catch shrimp, fish, and snails, swimming in river, play football, catch snake (Dan 2, village 13-16, 15/4/2010)	Take care buffalo or cow, wash clothes, plant vegetables, clean house, wash bowl (Tam oc 2, village, 18/4/2010)
Last enjoy	Tidy up house, washing bowl, preparing food for duck and chicken, working on the field, collect wood (Dan 2 village 15/4/2010) Harvest rice, wash bowls, (Dan 1 village, ages 9-13, 16/4/2010)	Prepare food pig, working on the field, collecting wood, take care buffalo and cow. (Dan 2, village 12/4/2010) Take care of buffalo, collect water, work in the field, collect wood, collect grass for buffalo.	Take care of buffalo, prepare food for pig, collecting wood, work in the field, clean the house, wash bowls (Ages 13-16, Tam oc 2, village 18/4/2010) Tidy house, wash bowls, prepare food for chicken and dog, work in the field, collect wood (ages 13-16, Dan 2, village 15/4/2010)	Work in the field, collect wood, prepare food for pig, catch snail (Tam oc 2, village 18/4/2010)
Knowledge of fish's name		Knowledge from books and from parents: Common carp, catfish, milk fish, major carp, trap fish, (dan 2. village 12/4/2010 Common carp, white carp, snail, shrimp, crab sometime frog (Tat village 20/4/2010)	All the members in group participated fishing during free time. They know many kinds of fish name; they usually catch fish in early morning with their fathers.	Shrimp, common carp, grass carp, trap fish, Ngao fish, (Tam oc 2, village 18/4/2010).

Use of aquatic resources	The young children sometimes go to catch fish with their father or brother	There are not member participate in catch fish they only collecting snail near side of the stream dan 2village, 12/4/2010) Children often go to collect snails in the afternoon after returning from school. The snails they collect are sold get money (Tat village 20/3/2010)	The place where stream connects to Da river children catch a lot of fish.	When children all usually go fishing but they do less when they gt older because they busy to study and shame (Tam oc 2,village 18/4/2010)
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Education is really valued by both boys and girls, and they feel that their parents allow them to focus on this when they get older and work less. When they were younger they were expected to contribute significantly to household labour, but when they are in high school, they are allowed to focus on their studies during free time. Girls for example, noted how when they were younger (up to age 12) they used to go out to collect snails from the smaller streams with their friends. However, now they no longer have time.



Figure 9. Activities ranking by children groups

IV. CONCLUSION AND RECOMMENDATION LIVELIHOOD ACTION PLAN

4.1. Conclusion

It has been demonstrated that natural resources at the study site are being increasingly depleted. Unsustainable cultivation causes quick soil erosion while overfishing and use of destructive methods leads to decreasing aquatic biodiversity. Agriculture, fishing and forestry nevertheless, remain as the most important livelihood activities of local people, especially for the poor and medium households. Tam Oc 1 village and Tam Oc 2 are the two villages where people are most dependent upon fishing.

In each of the villages, agricultural activities are carried out using traditional methods that are dependent upon weather, and combined with declining soil quality; this has resulted in low productivity. At the same time, fish stocks have declined due to the combination of soil run-off and over-fishing. Most people do not have enough food to eat, often culminating in a 'hungry period' which normally lasts for three to four months per year. Projects and policies of the government and different organizations in the commune have played an important role in increasing people's income and diversifying livelihoods. However, there were still some limitations in management and maintaining the output of projects when finished.

One positive change recalled by respondents was improved empowerment of women, whereby more women have been encouraged to participate in public work and in the establishment of unions whereby women are group leaders and participate in making plans. Nevertheless, an unequal distribution of resources and labour still exists. While the increased emphasis on education for young people rather than labour is a positive development in the context of a declining natural resource base, the degree to which school or college leavers can acquire skilled employment outside the agricultural and fishing sector remains uncertain. It is clear that a number of challenges still have to be overcome to reconcile sustainability with economic development in the uplands of Son La. Villages, commune, district as well as the local populations who use and manage natural and their component resources all have a key role to play in the process of conservation for sustainable development.

4.2 Recommendation Livelihood action plan

Based upon this analysis, the next stage of HighArcs involves the formulation of Action Plans. The difficulties and solutions are discussed during focus groups and informant interview with the leaders of villages, communes and districts and are summarised in table 9 below and can be used as a starting point for the development of long term action proposals.

The findings of the current study offers some insights into interventions to address the problems of local people, in particular the degradation of aquatic resources and unsustainable techniques in agriculture and animal husbandry. The study has also demonstrated the critical importance of aquatic resources in livelihoods and economic terms and the threats to the reservoir ecosystem. It has raised a convincing argument for implementation of fisheries regulations, and awareness raising about these laws. It has also pointed to a need for more training in new livelihood opportunities such as cage and pond culture of high value species and sustainable fishing techniques. The ongoing local-level planning process which will form the next stage of highARCS

will also offer a key opportunity to operationalise current national policies of decentralized, participatory environmental management, to protect forest and prevent soil erosion.

Table 10. Problems and solution

Problems	Solutions
Lack of water for drinking and domestic use	Increasing level of forest covering that keep ground water so people could make well to collect water for domestic use. In addition, building and maintaining water tank to store rain water in rainy season.
Degradation of soil and soil erosion	Planting the suitable plants in high slope that prevents erosion and increase benefit. Setting steps field, planting soybean and increasing the level of forest covering.
Damage crop by rats	Commune and schools is encouraging people to trap and catching rats Each household should have at least one cat.
Lack of technique in planting and animal husbandry	Communes organize annual training courses on planting, animal husbandry and aquaculture to improve knowledge for local people. Establishing groups in sharing experience of breed and plant in village.
Lack of capital	Government support and making good condition for loan with low interest
Degradation of aquatic resources	Improving people's knowledge about sustainable fishing. Strictly forbidden in using destructive fishing methods such as bomb, poisonous, explosive and electric equipments. Fishing households should join into a group or fishing union and making fishing regulation. All villagers need to understand and make agreement on it regulation as village's regulation. Need the good cooperation between communes, villages leader and police and army in carrying out the village's regular
Animal diseases	The agricultural staffs in commune combine with village organizing annual training course and injecting vaccine for cattle and livestock to prevent disease
No addition occupation	Find and establishing the suitable addition occupation such as make broom, handicraft ...in order to increase household's income

(In focus group from 14/4/2010 – 23/10/2010 in Tuong Ha and Tuong Tien commune)

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APPENDIX 1

HighArcs Household Interview

Statistical data

Introduction to be given by interviewer

The purpose of this survey is to collect information on how people use aquatic resources, so the findings can be used to better inform policy makers of the importance of aquatic resources in highland areas, how they may be protected, and how income generating activities can be strengthened.

2 Interviewee details

Name of respondent _____ Date _____

Gender of respondent (tick): F _____ M _____ Ethnicity of household _____

Village _____

Interviewer _____

Household code _____

3 Household head details

Name of household head	
What is the age of the household head?	
Contact information (Tel/add)	
What is the gender of household head?	M _____ F _____

Wealth category (please select) Poor [] Medium [] Large []

Details of house: [to be filled in by interviewer].

What are the <i>wall</i> construction materials? (please tick)	Wooden	Brick	Concrete	Earth	Thatch	Other
What are the <i>roofing</i> construction materials? (please tick)	Wooden	Tile	Metal	Thatch	Leaf	Other
How many floors? (please tick)	1 floor		2 floor		3 floor	
What is electricity supply? (please tick)	Mains electric supply		Solar cell		Diesel generator	
Other comments (e.g. material goods)						

3) Household background information

3.2) Tell me who is living in the home right now?

What are the names of the household members?	What is their relation with the hh head?	What is their gender?	What is their age?	Up until what level have they studied?				What is their main occupation?
				Primary	Secondary	High school	University	
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								

3.3) When did you build this house? _____

3.4 Was household head born in community? _____

3.4) I will quickly ask about your households' main income source over the last year?

What are your three main income sources? (please tick)	Approximately what percentage of your income comes from each source
Fishing	
Fish raising	
Agriculture	
Labouring	
Migrant remittances	
Other	

4) Productive activities of household

4.1) Do you fish? (If no, go to question 4.3)

How long do you spend fishing each day?

What time do you go fishing?_____

4.3) Are there any other products you collect from the lake/river/wetland? (If no, go to question 4.4)

What has been collected?	What was the total quantity collected over the last week? (kg)	How much did you use in the household over the last week? (kg)	Over the last week, how much of each product have you sold (kg)	What was the price for each product you sold? (thousand VND per kg)

4.4) Do you culture fish? (If no, go to question 4.6)

Which fish have you raised over the last one year from now?	Which system did you use to raise each species of fish? (please tick)			
	Cage	Pen	Pond	Other

4.5) I would like to ask you about your recent fish raising activities

The last time you released fish, what were the quantities of each species?	Over the last <u>week</u> , what quantity of raised fish have been consumed?	Over the last <u>week</u> , what quantity of raised fish have been sold?	What was the price for each species you sold over the last week?

4.6) I would now like to ask some questions about your agricultural production.

What crops have you planted in the last year from now?	What was the area cultivated? (sao/ha/m ²)	What was the yield for each harvest?		Over the last <u>year</u> , how much of each crop did you sell? (kg)	Average price per kg	Over the last <u>week</u> , how much of each crop have you sold? (kg)
		Harvest 1 (kg)	Harvest 2 (kg)			
Wet rice						
Dry rice						

Cassava						
Maize						
Sweet potato						
Vegetables						
Soya bean						
Aquatic plants (e.g. morning glory)						
Sesame						
Forestry						
Other						

4.7) I will now ask some questions about the livestock you own

Which animals / birds do you own?	How many do you own?	How many have you sold over the last <u>month</u> ?		How many have you bought over the last <u>month</u> ?		How many have you used for home consumption over the last month?
		Qty.	Price	Qty.	Price	
Chicken						
Duck						
Pig						
Cattle						
Buffalo						
Goat						
Other						

4.8) Does anyone in your household operate a non-farm or fish related business? (If no go to question 4.9)

What is the business?	Approximately how much do you earn in a typical week?	Approximately how many months a year does this business operate?

4.9) I would like to ask you about your water use. For each of the following purposes, what is the water source?

Purpose	Water source				
	Tap or well in household	Tap or well in village	River or stream	Canal	Lake
Drinking					
Washing clothes					
Bathing					
Irrigation of rice fields					
Irrigation of upland fields					
Irrigation of kitchen gardens					
Other					

5) Household expenses

5.1) I would now like to ask you about the inputs used and expenses over the last year from now for fishing, agriculture and livestock?

Activity	For each activity, how much of each input have you used over the last year from now?		Typically how much would you pay for these inputs? (thousand VND)
	Input (e.g. fertiliser, fuel etc)	Amount used (individual or kg)	
Fishing			

Fish raising			
Agriculture / Livestock			
Other aquatic resource dependent activity			

5.6) Approximate non-food household expenses over last year from now

Expense	Amount (thousand VND)	Who bears expense		
		Men	Women	Both
House maintenance				
Electricity				
Fuel for cooking				
Fuel for motorbike				
Education				

Clothes				
Health/medical				
Transport				
Cultural/religious				
Family events (e.g. wedding)				
Gifts				
Other				

6) Asset ownership

6.1) Now lets talk about the land only your household owns or rents (not community land).

How much land do you operate and what type of land is it?	How much is both <u>owned and cultivated</u> by the household (appropriate local	How much is owned by household but is <u>rented to others</u>			How much is <u>owned by others but rented by household</u>		
		Amount	Payment	Who is rented to?	Amount	Payment	Who is rented from?
Irrigated							
Rain-fed							
Uncultivated forest/scrub							
Fish pond							
Land for house							

6.2) Now lets move on to other economic resources you own

Which of the following items do you own?		What is both <u>owned and used</u> by the household (state quantity)	What is owned by household and <u>rented to others</u> ?		What is <u>owned by others</u> but is rented by the household?	
			Quantity	What is the rental payment?	Amount	What is the rental payment?
Fishing / Fish raising apparatus	Boat (state size)					
	Boat motor					
	Fish nets					
	Shrimp nets					
	Fish cages					
	Fish hooks					
	Other					
Agricultural assets	Irrigation pump					
	Tractor					
	Thresher					
	Husker					
	Other					

6.3) I would like to ask you about property which has been bought and sold?

Asset	Which of these forms of property have been bought?		When were they bought?	Who was the buyer	Which of these forms of property have been sold?		When were they sold?	Who was the seller?
	In the last 1 year	In the last 10 years			In the last 1 year	In the last 10 years		
Land								
Agricultural machinery								
Boat (state size)								
Boat motor								
Other assets								

6.4) Lets talk briefly about other goods you own

Which of these goods do you own?	How many?	How many years have you owned these goods?
TV set		
Fridge		
Motorbike		
Bike		
Other		

7) Labour relations

7.1) Did anyone in your household work *for other households or businesses* during last week, if no go to 7.2.

Tell us about the labour your family members have done for others?

What kind of work did your family members do?		How many days in the last month has each family member worked on these tasks? What was the wage (or was it unpaid), and approximately how many months a year do they work?					
		1 (state name)	2 (state name)	3 (state name)	4 (state name)	5 (state name)	6 (state name)
Work on other household's <i>boat</i>	No of days in last wk.						
	Wage paid						
	No of months per year						
Work for other households in <i>fish raising</i>	No of days in last wk.						
	Wage paid						
	No of months per year						
Work on other household's <i>farm</i>	No of days in last wk.						
	Wage paid						
	No of months per year						
Work on <i>construction / road maintenance</i>	No of days in last wk.						
	Wage paid						
	No of months per year						

Work in <i>factories</i>	No of days in last wk.						
	Wage paid						
	No of months per year						
Other work	No of days in last wk.						
	Wage paid						
	No of months per year						

7.2) Did you employ labour last week: If no, go to *question 8*.

Production system	How many workers from outside household were employed over the last week?		How many days did they work over the last week?		What is the daily wage for paid workers? (thousand VND/day)
	Paid	Unpaid (as exchange)	Paid	Unpaid (as exchange)	
Fishing					
Fish raising					
Livestock					
Agriculture/ Aquatic plants					
Other					

8) Other income sources

8.1) What other sources of income does your household you have?

Income source	Approximate income in last year from now
Subsidies	
Remittances from non-resident family member who has migrated	
Pension	
Other	

8.4) Are there any family members who are away at the moment?

Name any family members who are living away from the village right now?	Where do they live?	Why did they move away?	How long have they been away?	How many times did they visit in last year and how long for?		When they return, do they bring any goods back apart from money?	How much money have they given the family in the last year?
				No of visits	Length of stay		

Qualitative section

NOTE: It is essential to complete the entire quantitative section of the form for the 30 households in each community. The qualitative section is however, more flexible. While we would endeavor to cover all sections and questions, respondent fatigue or time constraints may mean this is not possible. Some issues are also covered in the focus groups, so if one is short of time or the rapport with a particular respondent is weak, the interviewee can focus on a particular section of the form. The section of focus can be chosen according to: (i) the relevance to the household being interviewed, e.g. it will not be important to speak about agriculture to a household that engages primarily in fishing; (ii) The level of data already collected on a particular topic e.g. if there is little data on certain issues from the interviews and focus groups already completed in a given community, one may choose to focus on related questions for the household interview.

1) Livelihood strategy

- 1.1) What would you lose if the lake / river was no longer present?
- 1.2) How have your income generating and food producing activities changed over the past 10 years?
- 1.3) Do you feel your family was poorer or wealthier during your grandfather/grandmother's time.

2) Environmental change

- 2.1) Think about the river/lake 10 years ago and beyond. How has it changed today?
- 2.2) Think back 10 years ago and beyond, are there *more* or *less* fish than are present today?
...What types of fish have *declined* in numbers in the last 10 years?
...What do you think are the causes of the decline?
...How have you adjusted your livelihood practice to cope with the decline in fish catch and fish types?
...What types of fish have *increased* in numbers in the last 10 years?
... what do you think are the causes of this increase?
- 2.4) Think about fishing today. Are there any areas of the river/lake you do not fish?
- 2.5) Are there any times of year you do not fish?
- 2.6) How do the fish populations change over the seasons, in terms of species, quantity and size?
- 2.7) Do you know why they change?

3) Class relations and livelihood change

- 3.1) Over the past 10 years and beyond, have you invested in more fishing /fish raising equipment and boats than was previously owned?

... If not, what constrains you from investing?

Have the fishing gears you use changed? If so, how have they changed and why?

3.2) What do you think needs to change for you to increase your catch and achieve a better income from fishing or fish raising?

3.3) Is fishing or fish raising viewed as a good way to increase one's wealth? [*or other aquatic resource dependent activity*]

... Would you like your children to be fishers or fish raisers? Why?

3.4) Are there any income generating activities you would like to engage in but are unable to? What are the constraints?

3.5) Have you increased agricultural production in the last 10 years?

... If not, what do you think needs to change for you to increase production for the market and achieve a better income from agriculture? What prevents you from increasing production?

3.6) How easy is it to increase your ownership of land?

4) *Market relations, credit and class*

4.1) How do you decide which species to sell and which not to sell?

4.2) Do you ever sell fish to traders or middlemen? (If no, go to question 4.4)

...When selling fish to traders and middlemen, how do you decide which particular trader to sell to?

...If the price is poor, can you easily move to sell to a different trader?

...How many traders do you normally sell to?

...Do you have a strong relationship with one particular trader (for example, one who gives you a particularly good price)?

4.3) Are you satisfied with the price you receive for your fish? If not, what prevents you from achieving a more favorable price?

4.4) Does anyone in your household borrow money?

... What for?

... How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Knowledge

5.1) How did you learn to catch/raise fish?

5.2) When did you learn to catch/raise fish?

5.3) Do you know the names of all the fish? How did you learn?

5.4) What are the main information sources which contribute to your knowledge of fishing and agriculture?

5.5) Have you taken any training over the last 10 years in either agriculture or fishing/fish raising?

6) Social networks, politics and non-economic structures

6.1) Do you have relations living in this village?

6.2) How are your relations with other people in the village?

6.3) Are you a member of any community organizations?

... If yes, what is your role? ... What benefits does it bring you?

... If no, why? Are there any constraints preventing you from becoming a member

6.4) Out of all the community organizations, which are the most helpful in improving economic security?

... Why are these organisations helpful?

... And which are the least helpful?

... Why are these organisations not helpful?

6.5) Are you a member of a political party?

... If yes, what benefits does it bring?

6.6) Do you receive any form of assistance from government or local institutions to improve your livelihood practices? What kind of assistance?

6.7) Think of your close friends or relatives that you meet regularly?

... What kinds of things do you do together?

... Can you get help from each other (e.g. financial, or sharing of information)?

... Which kind of obligations do you have towards each other?

... Are there people in the village not part of the social groups you are part of?

... Are there any social groups in the village which you are excluded from?

... What are your relations to these groups?

6.7) Do different families in the village have set fishing areas?

7) Policies and institutions governing natural resource use

7.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high?

7.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

... Is there a different rule making process for both the village and for the district government?

... Who makes these rules? What influence do you have over the rule making process?

... If influence is limited, what prevents you from influencing the rule making process?

... How are rules policed? What are the penalties for breaking them?

... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?

7.3) Who else uses the lake/river resources apart from people in this commune?

7.4) Are there any difficulties and disagreements as many people are using the water resources?

8) Concluding questions

8.1) What are the biggest problems facing your household?

8.2) What are the biggest problems facing the river / lake?

8.3) What would you like to change in your life in the future?

8.4) What would you like your children to be doing in the future?

8.5) Do you have any other comments on the issues we have discussed above?

8.6) And finally, do you have any questions for us?

8.7) Can we revisit you in next 4 months? Yes/No

...If yes: when should I visit : evening/morning/afternoon....

Thank you very much for your time. Good luck with your crop and see you soon!

APPENDIX 2

Focus Group Schedules – Women and Men

Instructions for interviewee

SAMPLING FOR FOCUS GROUP: There should be a minimum of 40 Focus Groups completed in each site. The format should be as follows: 10 with men; 10 with women; 10 with boys; and 10 with girls. Within these subgroups we could hold discussions with different livelihood groups, or in the case of boys/girls, with younger children and teenagers. We would also like to include some extra focus groups with additional stakeholders of interest (for example farmers living upstream who use aquatic resources indirectly; market traders who buy or sell aquatic produce). These will be used to compliment household interviews – to fill in gaps and to understand different groups, and do not need to be organised by gender or age.

CONDUCTING THE INTERVIEW:

- Divide roles within the group. One team member should take notes and one should concentrate on asking the questions and interacting. If a third team member is present, then they may observe social interactions within the group (e.g. who is dominating, who is coming/going, what is the mood of participants, who is not participating).
- These questions should only be a rough guide, and the interviewers should be flexible, according to the direction of the discussion. Some questions may have already been answered.
- The same essential questions will be asked for both women and men, but there should be flexibility to add new questions if interesting issues arise in the process of fieldwork.

Materials required

- 2 large sheets of paper
- 5 large pens (different colours)
- 30 beans
- 15 blank cards

1) Livelihood strategy and intra-household relations

1.1) What is your main income source?

[PRA Tool 1] Livelihood activity ranking: *Estimated time, 20 minutes.*

1. Ask participants to brainstorm all of the livelihood activities they participate in. Write as 'spider' diagram with box for each activity
2. Rank these livelihood activities in order of importance
3. Give out 30 beans, or any other small objects (e.g. Pebbles)
4. Ask respondent to distribute them in the boxes to indicate the level importance of each activity.

1.2) Look at the livelihood activities from the ranking which were ranked as most important. For these activities, who control how the income or product is used?

... Are there any livelihood activities where you control the income?

1.3) Out of the most important livelihood activities discussed above, what is the income or product used for?

1.4) What were your main livelihood activities 10 years ago?

...How have your livelihoods changed?

...Are there any new livelihood activities which were not present 10 years ago?

1.5) List of major problems with your livelihood in the last 10 years? Why?

1.6) What has improved in the last 10 years? Why?

1. 1.7) Write each problem on a card and assign them a picture or symbol. Put each card in one of three piles, listed 'big problems', 'small problems' and 'minor difficulties'.

2. Create a chart and ask respondents to list benefits and problems of each strategy.

2) Fishing questions and environmental change

2.1) What species do you collect from the river / lake?

... Where do you collect these from?

... What technologies do you use?

... How long have you been involved in these activities?

... How did you learn how to do them?*[if not already answered above]*

2.2) Over the last 10 years, what are the main fisheries related problems of the village?

... What are the solution to cope with these problems?

2.3) How has the importance of fishing changed compared to 10 years ago? Is it regarded as a good way to improve one's economic security?

... What are the barriers for people who want to improve their income from fishing or fish raising?

... How has the price for fish changed over time? Has it been different for different species?

... Is it easier to reach the market now when compared to 10 years ago?

2.4) What are the peak months and low months for fish catches?

... Do you know the reasons for these seasonal changes?

... How do you cope during the low season?

2.5) Are there any cyclical changes which occur across years? e.g. a good year each 5-10 years.

... over the past 10 years, which were good years and which were bad?

... Do you know why?

2.6) What has happened to people's access to natural resources over the last 10 years?

... Is access to rivers and forests easier or more difficult than before?

.. Are the natural resources you have access to closer to or further away from the village compared to before?

2.7) Do you know how the river / lake has changed since your grandparents time?

[Suggested PRA tool: With participants, draw a map of the river or lake with major landmarks and village names marked. Ask them to indicate where they go to catch certain species/products.]

2.8) What would you do if the lake/river was no longer there?

2.9) Has there been any sudden changes to the river / lake (e.g. a drought, natural disaster)

... How did it affect your income generating activities?

... How did you cope?

3) Rules and access

3.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high

3.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

... Is there a different rule making process for both the village and for the district government?

... Are there conflicts as a result of these differences?

... Who makes these rules?

... What influence do you have over the rule making process?

... If influence is limited, what prevents you from influencing the rule making process?

... How are rules policed? What are the penalties for breaking them?

... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?

... Do you know how the rules have changed since your grandparents time?

3.3) Do rules and regulations mean that some social groups have permanent rights to use the river/lake resources while others are excluded?

3.4) Are there any difficulty when different users use water/ catch fish from river/lake resources?

3.5) Have people from outside been using the river/lake resources of your community?

... If so, what effect have they had on the resource (abundance, distribution and ease of harvest)

3.6) Out of all the community organizations, which are the most helpful in improving economic security?

... Why are these organisations helpful?

... And which are the least helpful?

... Why are these organisations not helpful?

... Are there people in the village who are disadvantaged by these organizations?

... Why?

4) Markets

4.3) How is the price set for both products?

4.4) When selling fish, how do you decide which trader to sell to?

4.5) If the price is poor, can you easily move to sell to a different trader?

4.6) Do you have a strong relationship with a particular trader?

4.7) Are you satisfied with the price you receive? If not, what prevents you from achieving a more favorable price?

4.8) How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Status of women

5.1) How has the status of women changed in this village over the last 10 years?

... Are there more women headed households than before?

... Are there activities women do now that they did not perform before?

... Are there any livelihood activities women are not permitted to do?

... Are there any livelihood activities women only can do?

6) Division of labour

6.1) Tell me about who does what in your household. What are the men's tasks, what are the women's tasks, what are the boys tasks and what are the girls tasks? See table below if necessary.

Activity		Who does what?			
		Men	Women	Boys	Girls
Fishing					
Repairing nets					
Sowing crops					
Transplanting rice					
Ploughing fields					
Weeding					
Harvesting					
Tending kitchen garden					
Travelling to market to <i>buy</i> produce					
Travelling to market to <i>sell</i> produce					
Cleaning					
Cooking					
Maintaining house					
Collecting firewood					
Looking after babies					

Cleaning house					
Washing clothes					
Other					

7) *Wellbeing and non-use values*

NOTE: Much of this will be gathered informally through participant observation, and will emerge throughout the discussion in interviews. However, there are some questions below which can maybe stimulate debate.

7.1) What does happiness [appropriate local term] mean to you?

7.3) when do you feel really happy with your lives?

7.4) What else would you like to improve in your lives apart from improved economic security?

7.5) How would you rank the following factors:

a) Preservation of your traditional culture and values:

Very important

Quite important

Not very important

Do not care

b) Economic security:

Very important

Quite important

Not very important

Do not care

c) Maintenance of good relations with family and friends:

Very important

Quite important

Not very important

Do not care

7.6) What other benefits do you gain from fishing aside from food for the household and income?

7.7) What other benefits to you gain from agriculture aside from food for the household and income?

Concluding questions

19) What are your visions for the future?

How would you be in the next 5 years/ 10 years?

20) Do you have any other comments on the issues we have discussed above?

21) And finally, do you have any questions for us?

APPENDIX 3

Focus Group Schedules – Boys and Girls

Instructions for interviewee

SAMPLING FOR FOCUS GROUP: There should be a minimum of 40 Focus Groups completed in each site. The format should be as follows: 10 with men; 10 with women; 10 with boys; and 10 with girls, across the three villages. Within these subgroups we could hold discussions with different livelihood groups, or in the case of boys/girls, with younger children and teenagers. We would also like to include some extra focus groups with additional stakeholders of interest (for example farmers living upstream who use aquatic resources indirectly; market traders who buy or sell aquatic produce). These will be used to compliment household interviews – to fill in gaps and to understand different groups, and do not need to be organised by gender or age.

CONDUCTING THE INTERVIEW:

- Divide roles within the group. One team member should take notes and one should concentrate on asking the questions and interacting. If a third team member is present, then they may observe social interactions within the group (e.g. who is dominating, who is coming/going, what is the mood of participants, who is not participating).
- These questions should only be a rough guide, and the interviewers should be flexible, according to the direction of the discussion. Some questions may have already been answered.
- The same essential questions will be asked for both women and men, but there should be flexibility to add new questions if interesting issues arise in the process of fieldwork.
- We will need to be adapt how we ask the questions according to the age of the boys/girls.

Materials required

- 2 large sheets of paper
- 5 large pens (different colours)
- 15 blank cards
- 30 beans

1 Young peoples contribution to work

1.1 [PRA Tool 1:] Community mapping: Estimated time, 15 minutes.

1. Ask participants to draw a map of the community.
2. Ask them to indicate the major landmarks (e.g. river, pond, lake, forest, main road), ask them to mark their house on the map, then ask them to indicate where they go to carry out particular jobs].

1.2 [PRA Tool 2] Job ranking: Estimated time, 20 minutes

1. Ask children to brainstorm all the jobs they carry out, ask them to add them to a spider diagram
2. Put each job on a card
3. Ask them which jobs they feel are most important. Ask them to place the cards into three piles, 'most important', 'quite important' and 'not so important' for the family.

4. Ask them why these jobs are important
5. Ask them to rank which activities as 'most enjoy', 'don't enjoy or dislike', and 'least enjoy'.
6. Ask them about their decision.

2) Young peoples use of aquatic resources

2.1 [Optional follow up PRA tool]: Community Mapping: Estimated time, 5 minutes

If this has not already been recorded in 1.1, on the map which has been created, ask respondents to map where they go to use aquatic resources

2.2) We would now like you to think about your work in the river and lake.

- a) What species do you collect?
- b) Where do you collect these from?
- c) What technologies do you use?
- d) How long have you been involved in these activities?
- e) How did you learn how to do them?

2.3) How has the river/lake changed over the last few years?

2.4) Do you know the names of the different fish? How did you learn?

2.5) Do you know where the best sites are for fishing? How did you learn?

2.6) [Optional follow up PRA tool: Community mapping]

If they respondents know this and it has not been done already, ask them to indicate the best fishing grounds on the map

2.7) What other activities do you do in the river and lake apart from helping your parents with work?

2.8) If the lake/river is no longer there, what would you miss/lose? [

This could also be asked as] Would you be sad if the river/lake disappeared? Why?

3) Work and relations with other household members

3.1) Think of the work you help your family with. Who tells you which jobs to do?

3.2) Do any of you have brothers or sisters who help you with these jobs?

3.3) Are there any jobs your brothers or sisters do, that you do not help with?

... Why is this?

3.4) Are there any jobs that you do but your brothers and sisters do not help with?

... Why is this?

3.5) If you are doing a job you do not enjoy or do not have time for, can you ask your younger brother or sister to do it for you?

3.6) Do boys/girls younger than yourself do different jobs from you?

3.7) Do boys/girls older than yourself do different jobs from you?

4) Benefits of work

4.1) When you work, do you get the chance to retain the product or income for yourself?

... do you have any control over how the product or income is used?

4.2) when you earn some money, what do you like to spend it on?

5) Education and leisure

5.1) Do you like school?

5.2) Why / Why not?

5.3) Do you think you will study until University/High School/Secondary School?

...Why / why not?

6.3) What would you like to be doing 10 years from now? What are your dreams for the future
6.4) What would your parents like you to be doing 10 years from now?

5.4) [PRA tool 3: Activity Chart]

1. Provide the group with a large sheet of paper with a chart for the day, for example:

Time	Activity
Morning	
Afternoon	
Evening	

2. Provide the group with pens and ask them to list on the chart, the activities they do in a day from when they wake up to when they sleep.
3. Give the group 30 beans. Ask them to consider which activities are most important. Ask them to distribute beans next to each activity accordingly.

6) Concluding questions

6.1) What do you think are the biggest problems in your lives?

6.2) What do you think the solutions are?

6.3) Is there anything else you would like to tell us about?

6.4) Do you have any questions for us?

Section 2

**Report on livelihoods dependent on
highland aquatic resources in the Central of Vietnam.**

Report on livelihoods dependent on highland aquatic resources in the central of Vietnam

By

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The report were results of 91 Households interviewed quantitative and qualitative as well as results from 22 focus groups discussed in 3 villages of Cu Pua, Ka Lu and Chan Ro in Dakrong communes of Dakrong district, Quang Tri province. In addition the positive supporting from leaders of there villages (Mr Ho Enot, Mr Ho Phien, Mr Ho Van Cai), communes (Mr Ho Van Linh, Mr Ho Thanh, Mr Nguyen Van Hieu), districts (Mr. Pham Van Hung, Mr. Le Dac Quy) and province (Mr. Nguyen Van Huan, Mr. Nguyen Huu Ninh) and broad stakeholders in Quang Tri make successful activities of HighARCS project.

We would like to send to you all the deeply thank you and wishing you all wealthy, happiness and successful.

On behalf of RIA1 team

Nguyen Thi Dieu Phuong

PART I: INTRODUCTION

1.1 Introduction highland aquatic resources conservation and sustainable development.

In the context of climate change and depletion of natural resources throughout the world, poor communities in mountain regions are particularly vulnerable. In this context, the livelihoods, food security and natural resource utilization patterns of highland communities are of considerable interest to governments and international organizations.

Highland Aquatic Resources Conservation and Sustainable Development is project which explores the livelihood and biodiversity value of aquatic resources in upland regions in the context of economic and ecological change, and the challenges and opportunities of managing these resources. This research fills a gap in scholarship as while the study of aquatic resource use in lowland regions has been well established, there has been little work on how these resources are used by communities in upland areas. The project focuses on communities who utilise highland aquatic resources in five sites across Vietnam, China and India. The interdisciplinary approach employed by this project will enable sustainable and wise-use of aquatic resources while safeguarding ecosystem services, biodiversity and livelihoods of poor and vulnerable groups.

This report seeks to analyse the livelihood patterns of communities who utilise highland aquatic resources in Quang Tri, Central Vietnam, in the context of environmental and economic change. This will facilitate the provision of solutions to livelihoods diversification, will enhance poor livelihoods, conservation and sustainable development.

1.2 Objectives

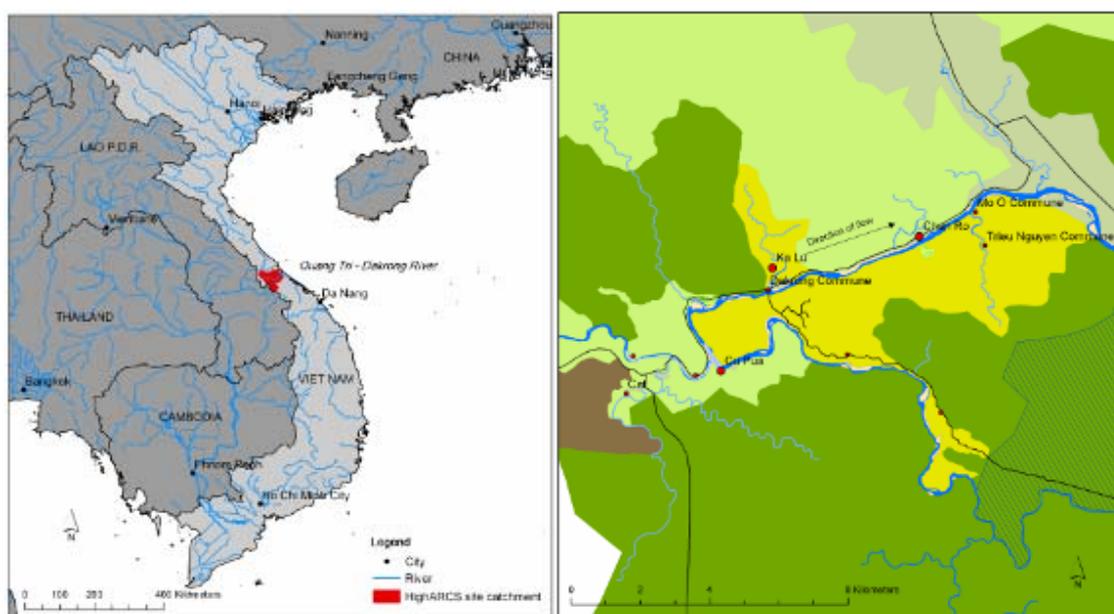
The overall objective of this study was to produce in detail a holistic overview of livelihood of households who are involved in Aquatic resources in central of Vietnam. The more specific objectives of the study were:

- The livelihoods of households dependent on highland aquatic resources derived goods and services will be assessed and understood in relation to both gender and age of different household members
- The nature, productivity and resource-use in highland aquatic resources-dependent farming, fishing communities will be analysed
- The role of highland aquatic resources derived ecosystem services in benefiting the poor and sustaining societal systems will be better understood and evaluated.
- The effects of seasonality, trends and shocks on access to ecosystem services assessed and impacts on producers, intermediaries, consumers and society will be evaluated.

1.3 Research contents

- To investigate current status of agriculture production system and social economic condition of people in Đakrông communities.
- To identify the difficulties of local people in agriculture activities, economic development, fishing and aquaculture.

Map 1. Study site in Central Vietnam and (Cu Pua, Ka Lu and Chan Ro villages of Dakrong commune, Dakrong district, Quang Tri province)



Map made by Kevin Smith

II. METHODOLOGY

2.1. Study site and time

This research was carried out at three villages (Cu Po, Ka Lu and Chan Ro village) in Dakrong commune, Dakrong district in Quang Tri province (see Map 1). These communities are located in the south-west of Dakrong district about 5 - 20 km far from Dakrong town, the district centre which lies along road No 9 from Dong Ha city to the Lao Bao international border gate. This research was carried out from May, 11st 2010 to November, 10th 2010.

2.2. Data collection

2.2.1. The questionnaire method

The data was collected utilising integrated methods, including household interviews, focus groups and observations. Questionnaires were developed by Dr Fraser Sugden, and the RIA1 team, who translated the questionnaires from English into Vietnamese and then piloted questionnaires in Tuong Ha commune in Vietnamese language. Feedback from the pilot questionnaires was used to help revise the finalized questionnaires.

In carrying out this study, a list of households was collected from head of three villages. To begin with key informants were selected. They included the Chairman of the Farmers Union, Vice President of the Village and the Chairwoman of Women's Union. These groups understood the social and economic conditions in the village. These key informants were then requested to organize participants for the PCA study. Subsequently, they were asked using their own criteria to categorize the village households into three distinct well-being groups, namely Poor households, medium households and rich households. Based on the agreement during the "Methods, Tools, Communication and Planning" training workshop carried out from 17-20 March, 2010 about the sampling schedule in each field site, three communities were selected namely (Cu Po, Ka Lu and Chan Ro) and 30 households (10 poor, 10 medium, 10 rich) were randomly selected in each commune for interview by prepared questionnaire. The questionnaire

included two parts: Qualitative and quantitative. The information is collected concerned income sources, expenses in the household and the effect of climatic and ecological change on local people's lives. The questionnaire is in Appendix 1. Detailed information about the sampling schedule is described in Table 1.

2.2.2. Focus group

A total of 34 focus groups were carried out during May and October 2010 in Đakrong commune. The participants were chosen so they were representative of a broad range of groups stratified by age, gender and level of dependence on aquatic resources. Each focus group included 4 to 6 participants. All groups children (boy/girl, 9 - 13 years old; boy/girl, 14 - 20 years old), better off men/women, medium men/women, poor men/women) were requested to discuss a set of issues raised by the research team . Aside from encouraging general discussion, tools used in the PCA included community mapping, timelines, seasonal calendars, an activity matrix, resource mapping, problem ranking and well-being ranking. The detail content of the focus groups are present in Appendix 2 and Appendix 3. The detailed information about number focus groups in each commune is presented in table 1.

Table 1: Sample size for household interview and focus group discussion in selected communities

Province	District	commune	Village	Number of Households interviewed	Total Households living in commune	Total population	Number of focus group carried out	Ethnic composition
			Chan Ro	30	86	482	9	Vân kiều Kinh
Quảng Trị	Đakrông	Đakrông	Ka Lu	30	121	677	7	Vân kiều Kinh
			Cu Po	31	56	313	6	Vân kiều Kinh

2.2.3. The PRA

Information was also collected through informal interviews, reference to documents which were collected from the Agriculture and Rural development office at the province and district level, Đakrong people committee's annual reports, and Đakrong commune's annual reports. Furthermore, livelihood activities and environmental changes were observed and recorded through field trips. A SOS meeting (State Of System) with different stakeholders from the commune, district, provincial level was organized.

Figure 1: Focus group men and girl at Cua pua village



2.3. Data entry and analysis

All the information and data produced was coded and entered into SPSS 13 and then initially analysed with a significance level of 95%.

III. RESULTS AND DISCUSSION

3.1. Livelihood change and history

The indigenous peoples of the forested Truong Son Mountains have historically lived in relative isolation. They have historically had less contact with the central state with a much lower uptake of wet rice cultivation. In this context the livelihoods of communities such as the Van Kieu have remained dominated by shifting cultivation and hunting-gathering throughout the colonial and post-colonial period (Ngyuen, 2004).

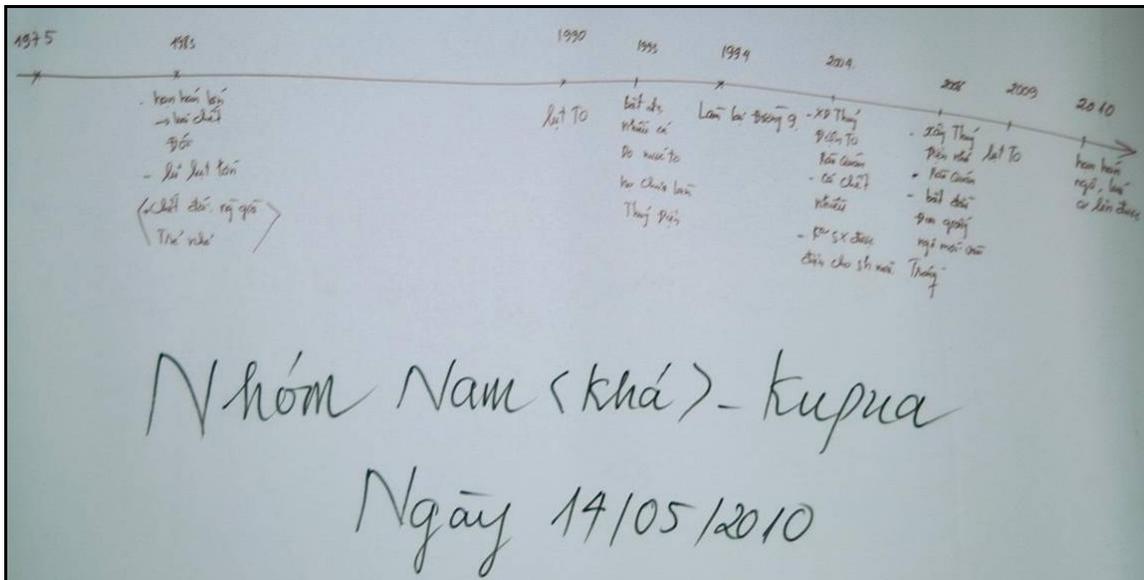
During the colonial period, the valley of the Dakrong river was on the main trade route between Laos and the coast and coffee plantations were developed around Khe Sanh in the early 20th century. Although some of the Van Kieu had taken up employment on the plantations to supplement their livelihoods, local evidence suggests that the majority retained their traditional livelihood of shifting cultivation, gathering forest produce and fishing. Following independence in the 1950s, the region became part of then South Vietnam. It therefore did not experience the collectivization drive pursued in the north. The regions location on the Ho Chi Minh trail and at the border of North and South meant it experienced extensive fighting during the conflict. Elder respondents recalled that this was a period of great hardship. For example, the entire population of Ka Lu village were forced to relocate more than 40km away towards Laos to escape the conflict. The conflict also had a lasting impact on the natural resource base across Quang Tri province. Forests were damaged following the extensive use of dioxin herbicides and other chemicals by American and South Vietnamese forces, a legacy which will take decades to wear off.

Table 2: Timeline of villages

<i>Year</i>	<i>Events</i>
1983	The big drought come so that river dry, agricultural plant death, in this year flood came also. Each village had some people die because of lacking of food.
1990	There was flood made poultry died and people lack food, house removed
1992	The big flood
1994	Rebuilt No 9 national road
1995	Made mini hydroelectric power
2004	Begin to Build big Rao Quan hydroelectric company in Khe Sanh
2007	Start to Build small Rao Quan hydroelectric company in Dakrong
2008	The PLAN project supported book and notebook and built school
2009	The big flooding remove four houses in Cu Po The cholera disease made many people in Cu Po village must to come hospital
2010	The drought made decrease productivity of agriculture some agricultural area did not harvest

(general focus group notes, 11/5-29/5)

Figure 2.: Historical profile of the community drawn by wealth men group in Cu Po



After the reunification with the North, collectivisation was pursued in some regions of Vietnam, although the farmers of Dakrong were unaffected. While life was still hard there were some improvements when the government removed the system of budget subsidies and invested in built infrastructure. There was economic development with the upgrading of Highway 9 from Laos to the coast and the establishment of the Lao Bao Economic Development Encouragement Area on the Khe Sanh plateau nearby.

There have been environmental changes over recent years (see Table 2). After the building of the Rào Quán hydro power scheme in 2004, water pollution in the river increased due to oil from Rao Quan hydro power company and waste water from Thai Hoa coffee company. Local people said that fish stocks had decreased in the river. One household member noted that 10-20 years ago, they could catch 10kg of fish in one night. At that time he did a lot of fishing. With regards to agriculture also, the quality of soil has decreased considerably, and the density of people has increased so that the area of land per person dropped. The government restrictions on shifting cultivation have also put further pressure on livelihoods. In the past local people would leave fields fallow for several years at a time allowing natural fertility to return, farming new plots in the mean time. However, now it is more common for farmers to cultivate the same plots continuously (*Interview general hhs from 11/5/2010 to 10/11/2010*)

3.1 Characteristics of household and wealth differences

Livelihoods in each of the three communities are today highly diverse. On the whole livelihood strategies are dependent upon agriculture and are subsistence oriented, whereby food is produced for household consumption. However, there is an increasing level of involvement in the cash economy in all villages with more households producing food to sell, as well as selling handicrafts. Highland aquatic resources play a supplementary role in the livelihoods of most inhabitants of the valley, as they provide a source of nutrition through (fish and molluscs) as well as drinking water.

In a study from Tanzania, Birch-Thomsen et al (2001) divide livelihood strategies into three types. Households pursuing an ‘accumulating’ strategy are those that are actively investing their surplus to expand their asset base and increase their wealth. Households pursuing a ‘peasant’ (better termed ‘subsistence’) strategy are those that have livelihood security and can meet their basic subsistence needs, while they have limited surplus to sell to increase their wealth. Finally, a ‘coping strategy’, applies to households that struggle to meet their minimum subsistence needs, have limited income, and are dependent partially upon common property resources as well as labour for others.

A similar framework was described in the HighARCS overview livelihood report (Sugden and Punch, 2011). There were not however large divergences in wealth within the villages, and most households experienced some level of livelihood insecurity. In this context, the livelihood strategies pursued by most households would realistically fall into the ‘coping’ or occasionally ‘peasant’ strategy. Nevertheless, some differences in wealth were still present which are significant for decision making and planning. Respondents were asked to define what was needed to be classified as rich, medium and poor. Although there were differences in opinions there were also some common traits which emerged in all three villages, which are outlined in Table 3. The terms ‘better off’, ‘medium’ and ‘worse off’ were used to define wealth differences, as the livelihoods of most respondents was insecure and none of the households could realistically be classified as ‘rich’.

Table 3: Class categorization

Better off households	‘Subsistence’ or medium households	Worse off or households
<ul style="list-style-type: none"> • Not really ‘rich’ but ‘normal’ as opposed to poor and very poor: ‘better off’ • More land for agriculture • More savings than medium group • Motorbike • Cows/buffalo owned • Much spare labour • Better built, more stable accommodation • Access to capital, which can be used to set up business • More knowledge • Better health due to better nutrition. • Microenterprise • Skilled employment 	<ul style="list-style-type: none"> • More chances/livelihood opportunities than the poorer groups • More labour • More land • Access to social support such as scholarship for children put one hh into the ‘medium’ from ‘worse off’ category. • Possession of livestock, but perhaps less successful at income generating than richer groups. For example, one household had borrowed money to buy 4 cows. The loan was fully repaid. A poorer household also took this loan, but only one cow survived and the loan has not been repaid. 	<ul style="list-style-type: none"> • Weak housing • Not able to work • Young household (e.g. newly married couple with limited labour) or old household (e.g. household headed by elders where son and daughters have moved away and are too poor to support parents). Note for both types of household shortage of labour is the key problem. • Illness • Little access to land • Unable to speak Vietnamese • Greater dependence on natural resources • Greater dependence on labour

Households classified as or ‘better off’ generally had access to larger agricultural plots which offered them a more secure supply of food, allowing them to divert of resources into other activities such as livestock rearing or micro-enterprises. Such households were also able to invest more in education and the maintenance, upgrading or expansion of their homes, as Figure 3 suggests. Another source of wealth for these households included income from skilled or semi-skilled employment, which is in turn connected to their higher investment in education.

Figure 4 shows that over the last month, ‘better off’ households have earned on average VND 401,923 from skilled employment, compared to just 124,747 VND earned by ‘medium’ households, and no income by ‘worse off’ households.

Medium households on the other hand, still were able to gain a basic level of food security from their land, although holdings were smaller and less livestock was owned when compared to their richer counterparts. Some medium households had invested in education, occasionally facilitated by access to scholarships (see Table 3), although levels of skilled employment are lower than their poorer counterparts. As a result of their lower income, levels of day to day expenditure are lower than for their ‘better off’ counterparts.

Figure 3: Proportion of total expenses by household group over last year

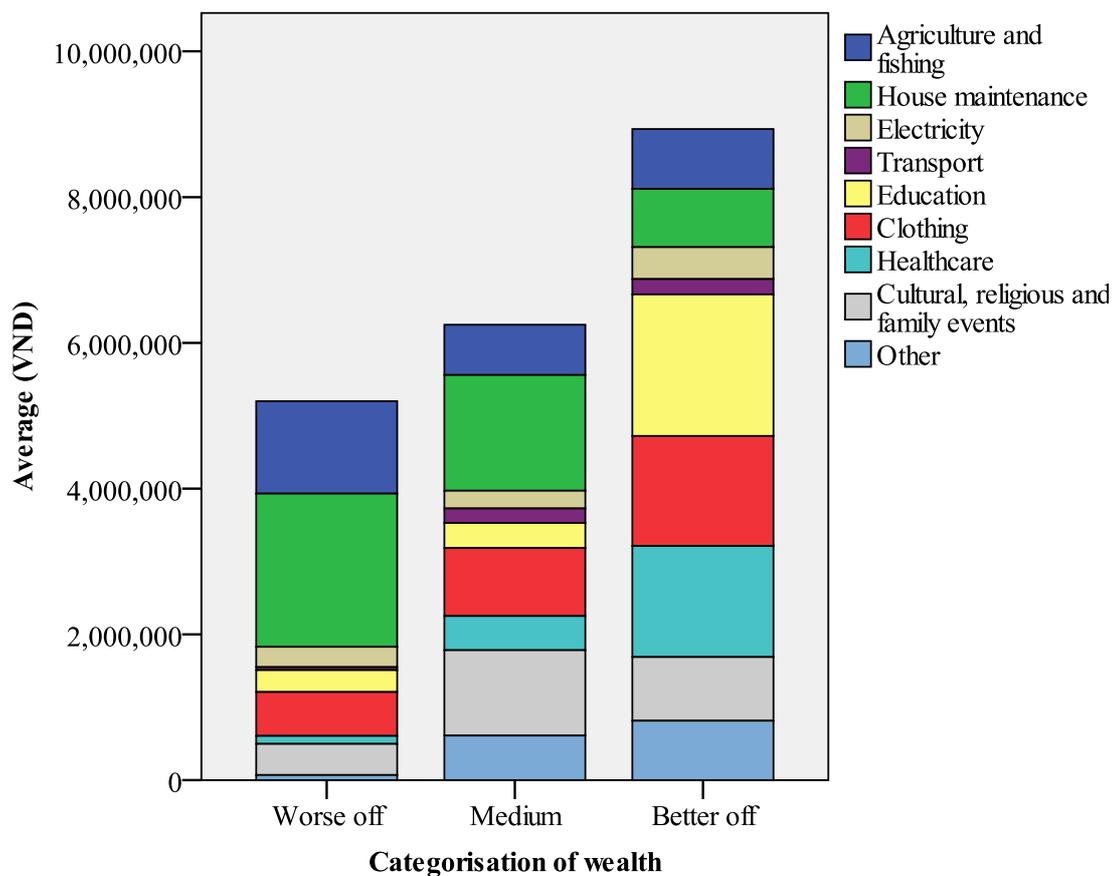
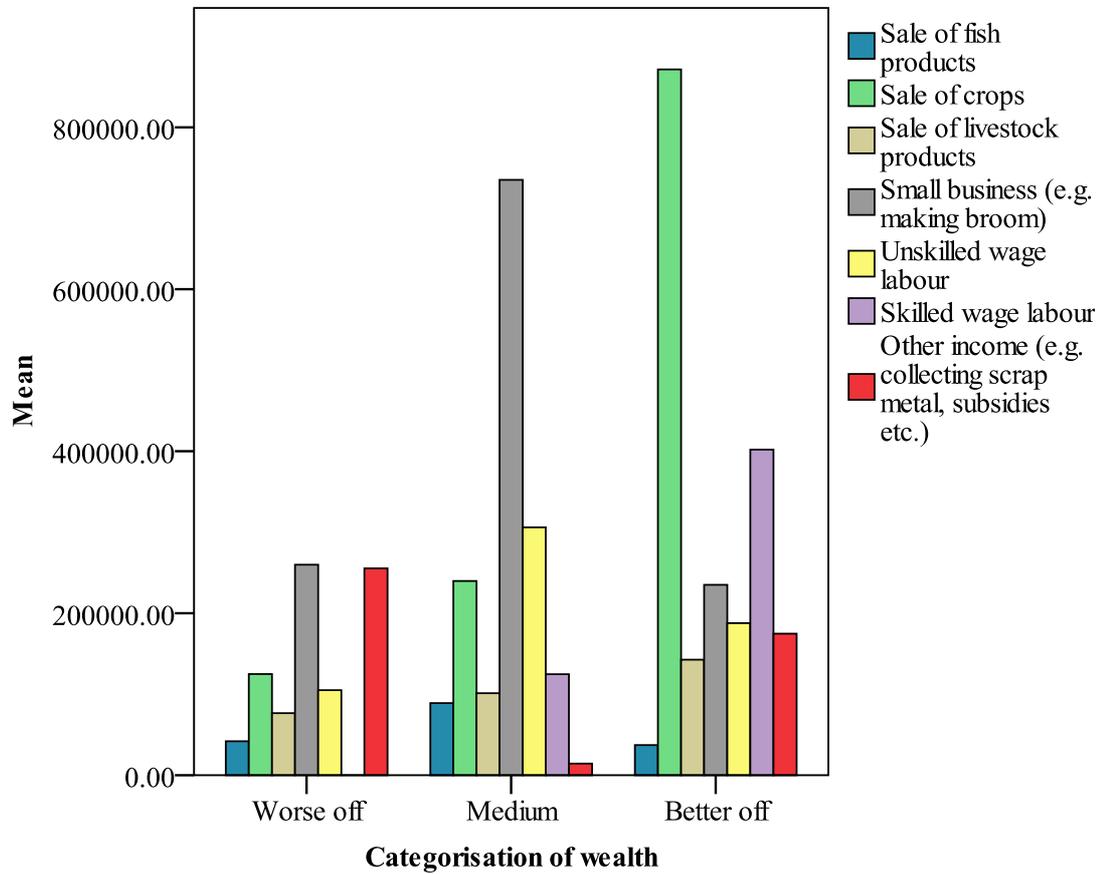


Figure 4: Sources of income over the last month by wealth group



Many households classified as ‘worse off’ have insufficient land or livestock to meet the households subsistence needs. As a result they are more dependent upon labour or natural resources to survive. However, there are also more complex factors. For example, some households experience a lack of labour. These include households where adult members are unable physically to work due to illness, or households headed both young newly married couples with no children, or by elders, whereby sons or daughters have migrated and are unable to support them financially. The lower income or food security as a result of lack of labour or land inevitably reduces such households capacity to invest in education, and some can not even speak Vietnamese. This constrains households from increasing their wealth through access to skilled employment.

3.3. Livelihood resources

According to the Sustainable Livelihoods framework, one's capacity to pursue different livelihood activities is dependent upon the livelihood resources one has at their disposal (Scoones, 1998, 2009). Scoones categorizes these livelihood resources into several types. These include: *economic capital*, such as money and other assets; *social capital* such as networks of mutual support; *human capital*, such as knowledge and education; and finally *natural capital* such as land and aquatic ecosystems such as rivers and lakes or non-aquatic ecosystems such as forests. The particular combination of assets one has access to has a bearing on the livelihood strategy one will pursue (Scoones, 1998). The key livelihood resources present in Quang Tri are discussed below:

3.3.1. Natural resources

Water resources: Across the commune 16.5 ha of land is classified as water surface¹, most of which is the Dakrong river's surface and the Quang Tri river's surface. Because the topography is high mountain in three villages there are only three small ponds which represent 70 – 90 m² of area. With the exception of a few small fish ponds which are owned by households, all water resources are common property and can be used by all wealth groups according to their needs.

Box 1. Aquatic resources

Mr Hồ văn Thui who usually collects fish at Ka Lu village said that before construction of Rao Quan hydro powerdam there were a lot of fish in river. He used to go fishing for around half an hour and would be able to catch 5 kg fish. Nowadays the number of fish has decreased very much. He goes fishing for 4 hours, but he catches only 1 kg and some kinds of fish are no longer available. As a result he has now works as a Xe Om (motorbike taxi) driver at Dakrong bridge.

The Dakrong river can not only be used by local people for fishing, but it also supports mineral resources as gold and sand which offer an income generation opportunity for some people.

¹ ibid

Almost all of the water sources for the village came from the Đakrong river. Chan Ro and Ka Lu have a piped water system installed by the 134 and 135 program. It is not enough for whole the year. In Cu Po, people have to collect water from the river for drinking and washing.

There was the perception that the ecosystem of the river was increasingly under threat. Rising population combined with economic development on the Khe Sanh plateau upstream, have taken their toll and stocks are now reportedly falling with some species such as ambula (eel) no longer present. Furthermore, a hydro-power dam was built around seven years ago upstream on the Quang Tri river, while another is under construction near Ku Pua village along the Dakrong river itself. The dam reportedly causes fluctuations in water levels, making fishing dangerous. Furthermore, debris from the construction site had undermined the quality of water. Other respondents suggested that the waste released from the coffee factories upstream was released into the river. Households reported that they suffered from skin complaints after swimming, and now have to walk further than before to collect drinking water from more distant streams. One local person reported that *“Đakrông river is very polluted from waste of Thai Hoa company which produced coffee. Beside Rao Quan hydroelectric company in the neighbouring district made river pollution with oil”*.

Hill land and dry fields: The total area land for cultivated agriculture was 679,6 in Dakrong commune. The area of wet rice cultivation is 172,3 ha, dry rice cultivation is 280 ha, corn is 197 ha, casava is 35 ha, vegetable is 4 ha, while sweet potato and others represent 50,5 ha². However, in the three villages in the study site there is a lack of land for rice cultivation, especially wet rice land. Only Chan Ro has 0.3 ha of wet rice land. Most cultivation is of dry rice, corn and cassava. However, the quality is bad, and local cultivation techniques are limited and dependent upon climate, leading to low rice productivity at only 1,2 ton per ha. ‘Better off’ and medium households own comparatively more land than their poorer counterparts, as can be seen in Figure 5, forming the basis for their more secure livelihoods. Households classified as ‘better off’ have access to 1.12 ha of the primary upland fields while those classified as medium own 1.11 ha on average. ‘Worse off’ households on the other hand have access to just 0.534 ha. ‘Better-off’

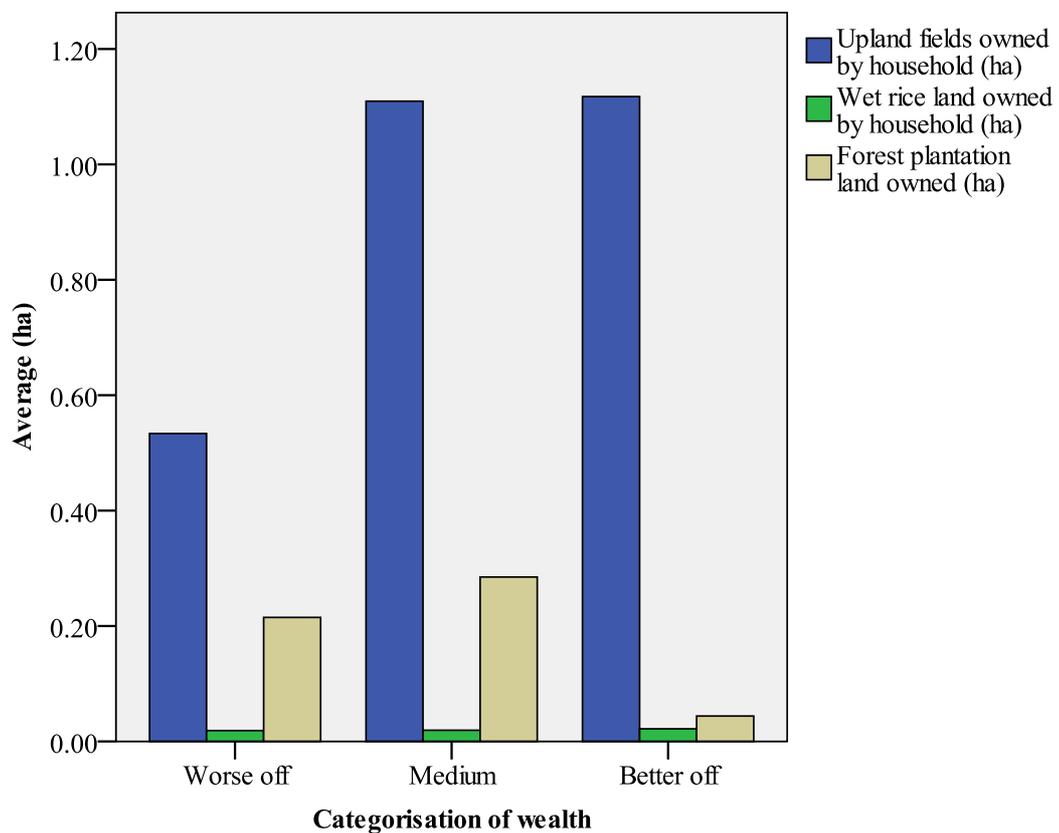
² Data source: The social and economic report, Dakrong commune, 2009

households not appear to have a significantly higher agricultural income than their 'medium' counterparts in

Figure 4. Although holdings are of a similar size, the quality of land owned by wealthier households may be greater. ‘Better off’ households may also be able to increase productivity through their larger labour capacity and enhanced investment in inputs, allowing them to generate a greater saleable surplus.

There was a perception that agricultural yields have been falling however for all households and soil erosion has been increasing. This may partially be due to the decline in shifting cultivation, which means land is left fallow for shorter periods.

Figure 5: Ownership of land by household wealth category



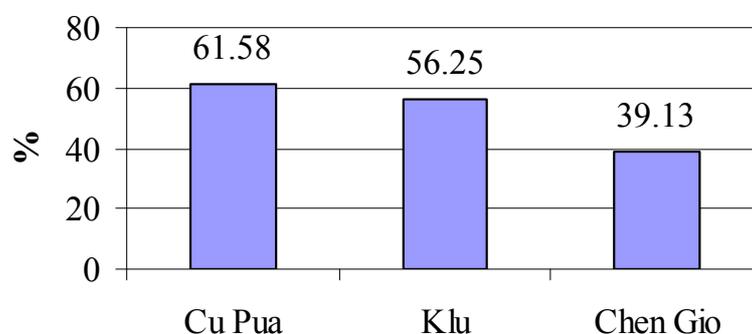
Plantation and managed forest: Forests play an important role in local livelihoods and forest cover reduces the impact of climate change, controls soil erosion and increases air quality. After the war forests were damaged significantly. The government has a number of programmes to replant forest in conjunction with local people (*Hồ Ê Nót head of Cu Po village*) and strict forest

laws have been promulgated for all the people in the study side. Much of the forest that was destroyed in the war has now been re-planted as keo trees (*Acacia mangium*), bạch đàn tree (*Eucalyptus camaldulensis* Dehn). Besides, local people have also planted also other trees such as: jack-fruit (*Artocarpus integrifolia*), mango (*Idioscopus niveosparsus*) and butter tree (*Persea americana*). Households from all wealth categories operate forest plots, although Figure 5 suggests that ownership of forest land is higher for ‘worse off’ and ‘medium’ households. This may be because their land is less conducive to agriculture than their richer counterparts.

3.3.2. Human capital

In Dakrong commune there were 272 Households with 1373 people, and the of annual birth rate is high at approximate 1,4%³ compared with the rate of annual birth in the whole country which is 1,2% (GOS 2010). In Dakrong commue, the number of young people is high. There are therefore abundant labour resources in the study site, however the education and skills of labour is more limited. Furthermore, while the average number of household members is from 5 – 6 members per household, the number of active labourers is still limited, as more household members are children and old people. In Cu Po village the proportion of productive labour is the highest at approximately 61.58 % whereas in Chan Ro village it is lowest 39.13% (see Figure 6), suggesting there are more dependent family members such as very young children and elders in this wealth group.

Figure 6 Proportion of productive labourers in each village



³ ibid

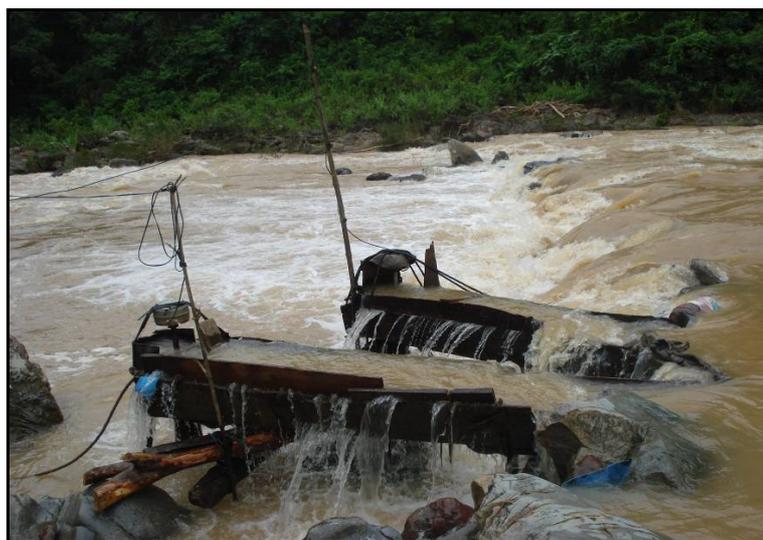
At the moment most of household members have only graduated from secondary school. Only 22.9% of heads of household can read and write. According to the survey, there is just one household with two children studying at university in Ka Lu village and only 20 children studying at high school. Students usually graduate from secondary school and then do not go to school but stay at home and work in the field, while other households do not have enough money for children to go to school or require them to stay at home to labour.

The capacity to invest in education was dependent upon the wealth of the household. ‘Better off’ households had invested on average 1,943,500 VND in education over the last year, while ‘medium’ households had invested just 344,000 VND and poor households had invested only 299,500 VND (see Figure 3). Richer households have a more secure income from their land and therefore can afford to invest more in education.

3.3.3. Physical capital

Infrastructure has improved significantly in recent years, especially the highway to the district centre. However infrastructure is still limited in the three villages. Only Ka Lu and a part of Chan Ro village have electricity and most villages have no road access or piped water system.

Figure 7. Mini- hydro power at Cu Po village



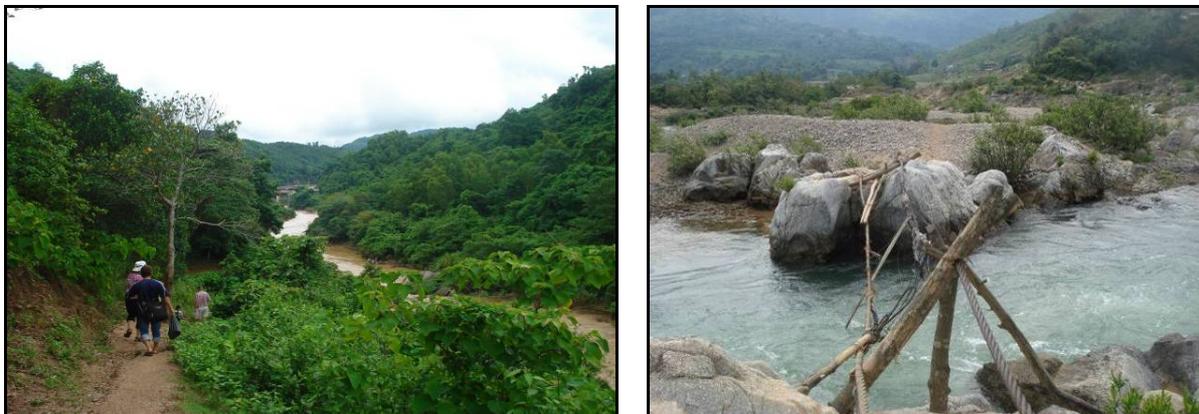
Electricity: Electricity plays a very important role in improving local people's technical knowledge and awareness of policies and laws as it gives local people better access to TV or radio services. It also helps pupils study at night. Currently there is electricity in Ka Lu village and small part of Chan Ro village. Most of Households in Cu Po and Chan Ro village use oil for light. Some wealthy households have invested to build mini-hydro power devices to make electricity (see

Figure 7), but the Mini-hydro power stations are often damaged by floods.

The road: The study site is along road Number 9 connecting Dong Ha city to the Lao Bao international border gate on a good quality road. However, there is no proper road in the village itself. Some villagers live at other side of the river and there is no bridge linking to two sides. People have waded the river to reach the field and market. It is difficult for children go to school when flooding comes (see

Figure 8).

Figure 8: The road and rope bridge to reach the far side of Cu Po village



School: Dakrong commune has two primary schools, a secondary school and a ten room kindergarten. There are 170 students in secondary school, 620 students primary school and 294 students in kindergarten, although as mentioned above, a number of poorer children do not attend.

Healthcare centre: The healthcare service in the village is well organized, and annually the health centre in the district distributes nets to local people and exterminates mosquitos.

Market: Local people have to travel very far from their home to reach the nearest market. In Cu Po, they walk to Khe Sanh town (15 km far from home), a whole day return trip. They often come to market occasionally to buy petrol and salt for their family.

3.3.4. Financial capital

Most of the local people were poor, so did not have the ability save money. However, each village has from 8 to 10 wealthy households who can save money through animal husbandry or their salary from the government.

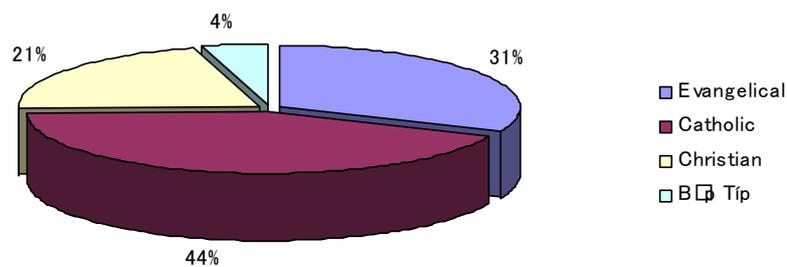
Households can access financial capital through several government run microfinance banks including the Policy Bank and Agricultural Bank. A member of the local farmers union said that it is much easier for him to borrow money because he is a member. He borrowed 5m to buy 4 baby goats. There is some private money lending but it is not common (*Ka Lu village interview, hh726, 16/5*). The Vietnam Bank for Social Policy (VBSP) offers “short-term, medium-term and long-term loans for the purpose of production, business, job creation and living standard improvement” (*Vietnam bank for social policy, 2010*). Many respondents took loans from here. Collateral apparently is not required. Many households in Chan Ro had taken loans of 20-30 million VND. They are expected to repay the loans within 5 years.

The taking of loans for non-productive purposes in Vietnam was noted in a study by Rankin and Shakya (2008). Many people are heavily in debt. There seem to be two primary reasons. While some households borrow money for productive purposes such as animal husbandry, some others also use money for non-productive purposes such as wedding parties or buying motorbikes. Furthermore, some households report that they do not know how to repay money to the bank. It seemed quite common for households to take new loans to repay previous loans.

3.3.5. Ethnic composition

There are two main ethnic groups in the study site as. The Vân kiều people represent approximately 95 – 97% and Kinh people represent 3 – 5 % of the population.(*vice director Dakrong commune Đakrông Hồ Văn Linh*). They live in the same villages. At present there are four main religions followed locally: Evangelical religion (31.25%), Catholic religion (43.38%), Christian religion (20.96%) and Bap tip religion, a branch which is derived from the Evangelical religion (4.41%).

Figure 9: The proportion of religion at study site



3.4. Aquatic and non-aquatic resource based livelihoods

3.4.1 Aquatic resource based livelihoods

As a consequence of the increasingly unstable resource base, the aquatic resources of the Quang Tri and Dakrong rivers are a particularly valuable element of rural livelihoods. Not only is the river a direct source of drinking and washing water, in villages with no electricity, micro-generators provide temporary lighting to houses, as discussed above.

Furthermore, and most significantly, poor soil fertility means that agricultural yields are not sufficient to give sufficient to give households food security for the entire year. It is in this context that fishing is a very very important source of food, particularly in Ka Lu and Chan Ro which have the steepest and poorest poorest quality agricultural land (see **Figure 10**). Local people harvest fish, snails and crabs which are caught using baskets, hand nets or even traditional cross-bows. Fishing is small scale, and although catches are generally not high, at just 0.5 - 2kg per day, the fish provide households with a valuable source of protein.

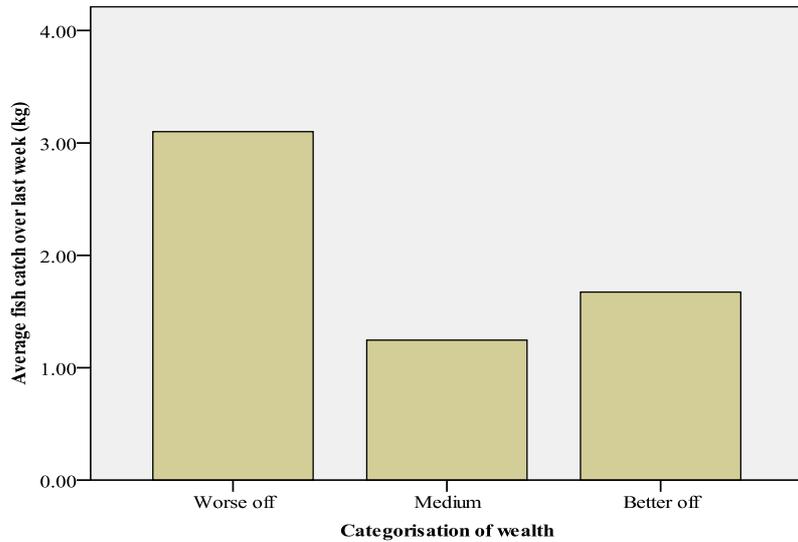
However, with falling fish stocks there is increased pressure on this important livelihood activity. Another interesting use of aquatic resources is the panning for gold from the river (see Figure 13). If a household is lucky they can earn between VND 100,000 and 300,000 per week, and the gold is a valuable non-perishable form of saving. It can be retained and sold when the household needs food.

Figure 10: Fishing in the Dakrong River



Discussions in the village suggested that poorer households are more dependent upon fishing. Over the last week, ‘worse off’ households have caught on average 3.10 kg of fish, compared to 1.2kg which has been caught by medium wealth households and 1.63 kg caught by ‘better off’ households. This suggests that ‘poor’ households invest more time and resources in fishing. As they have more limited access to good agricultural land, they are dependent upon common property resources such as the river.

Figure 11: Average fish catch over last week by wealth category



3.4.2. Agricultural

Most the livelihoods are based on farming the from upland fields where local people cultivate dry rice (*Oryza sativa*), maize (*Ostrinia nubilalis*) and cassava (*Manihot esculenta*). Many people do not have enough food from their land for the entire year. Local people usually get up very early to walk to the upland fields for their day’s labour, eat lunch their, and return mid-afternoon (Ka Lu observation, 14/5). Agricultural activities are seasonal in nature, as is suggested in Table 4.

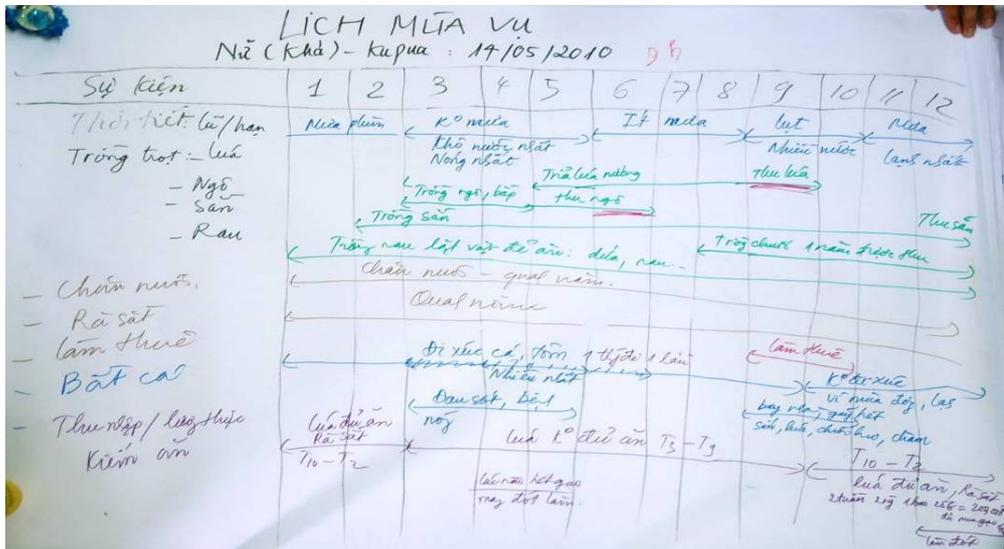
As discussed above, traditionally people would carry out shifting cultivation, or slash and burn agriculture, whereby a field would be established from the jungle, and the vegetation burnt. After a couple of years they would move on to another field. Although this is a sustainable form of agriculture, the forest authorities no longer allow it. Most households now cultivate set plots of former forest land in the hills above the village. However, we observed that in the more remote locations that some people do still carry out shifting cultivation, although it is increasingly rare. The clearing of new fields is dangerous due to unexploded ordnance. When local people open a new field, they first set aside an area of land and burn the undergrowth. They then go far away. If there are any mines they will be detonated. Very few households use manufactured inputs such as fertilizer or pesticides, and yields are very low. Crops are also vulnerable to pests.

Table 4: Seasonal calendar of agricultural activities in Cu Po

Activities	Jan	Fe	Mar	Apr	Ma	Ju	Jul	Au	Sept	Oct	Nov	Dec
Preparing field												

Planting corn crop 1												
Planting rice												
Cutting grass on field												
Harvesting rice												
Planting corn crop 2												
Planting cassava												
Harvesting cassava												
Harvesting corn crop 2												
Cutting grass												
Picking coffee												

Figure 12: The seasonal calendar as drawn in a women's focus group in Cupua



3.4.3. Animal husbandry

Animal husbandry is the second most important livelihood activity after agriculture. It represents approximate 10% of total income in Ka Lu village, 22% in Chan Ro village and 24% of income from Cu Po. In 2007 the break out of a livestock disease, the flooding in early 2010 and Storm Number 9, killed a lot of animals and households did not have money to repay the bank. At the moment, the commune has 634 buffalos, 383 cows, 750 pigs, 370 goats.

Some households in the community do not have capital so they raise buffalos for wealthier households and share the calves. Animal husbandry is a form of insurance for households. Animals can be sold at times of financial need (*Focus group in Cu Po, 14/5*). In 2009, the agricultural department supported the provision of small pigs and cows for poor households, offering training in the treatment of disease for the animals, but this was not effective

3.4.4 Other livelihood activities

Aside from agriculture, there are a number of forest planting programs that have been carried out including including the 661, 134, 135 and 327 programmes, which have led to a successful increase in forest resources. forest resources. Some households earn income by managing plots of forest and planting trees for the

the government, as was discussed above. Besides, people can collect material to make brooms from the forest and sell it with a price of 5000 – 7000 VND per kg (see

Figure 13). This is an extra income resource for local people. Other handicrafts production activities include the weaving of cloth to sell to travelers or *xe om* (motorbike taxi) drivers.

Figure 13: Collecting gold in Dakrong river and making broom in Cu Po village



Box 2. Local people's livelihood

According to Mr Ho E of Cu Po village, local people's livelihood is becoming more and more difficult. Work in the fields is the main job but the soil is bad quality and flooding as well as drought comes so they do not have enough food for their family. Some extra jobs such as Collecting steel and gold, are dangerous but are another source of income. The biggest difficulty is lack of clean water and electricity.

Beside the main livelihood activities such as agriculture and animal husbandry there is some involvement in the labour market. This was primarily on a seasonal basis. Picking coffee in Khe Sanh (15km from home), in the Autumn (September/October) is common (see Table 4). Some work for up to two months, with extra tasks including portering of fertilizer. Labourers can normally earn up to 50,000 – 60.000 per day. There is some limited migration to other parts of Vietnam for work – for example, some unmarried women had migrated to another province to sew clothes for the government. An agent actually came to encourage local people to migrate overseas, but everyone refused. There is limited permanent migration – we met one household whose parents had moved away to a different region, a 'new economic zone' to find better land (interview, 21/5). Some households have members who work abroad to countries such as

Malaysia, Taiwan, Saudi Arabia to work earn money, although they must first they go to Ha Noi to study english (*hh805, Chen Gio, 24/5*).

After the harvest local people also go deep into the forest to collect steel left over from the American war to sell and earn extra money to buy the food for family. Metal objects such as the shells of bombs are sought after, and given the risk of unexploded ordance, this is a extremely dangerous livelihood activity.

3.5. Policies and project were carried out at study site

3.5.1. Government programmes supporting livelihoods

There are several government programs for poor and excluded communities in Đakrông. One of the biggest problems however, is the lack of follow up. Many had for example, taken training in livestock rearing, and had received animals for loans, but when the livestock died due to disease, a lot of money was lost (*General notes from Interviews, 12/5-19/5*). There are a number of other programs:

- The 134 program supports housing, land and systems for clean water provision for ethnic and poor people. This program supports 64 houses and has distributed up to 2.8 ha of wet rice land for households in Dakrong commune.

- The 135 programe develops the social and economic situation in marginal communes and mountain regions. The total capital was 247 million for Dakrong commune, and it supported 174 marginal Households. *The 135 program for poorer and most remote districts offers free healthcare to local people* (Ka Lu village interview, 16/5). The households have been supported by the government to build a new house. They were offered 12 million, while they had to invest 10 million themselves.

Other sources of government support include various social programs. For example, one household we met received 500,000 VND in the last year as a child allowance for poor households. During the storm which destroyed the rice crop, the government gave 3kg of rice per person and second hand clothes, as well as some essentials such as cooking oil and salt as relief (*hh interview, 21/5*). The Policy Bank loan money to invest in agriculture and animal husbandry:

Households were loaned money by the Government also through the social bank and agricultural bank to invest agriculture or animal husbandry with low interest rate was 0,32% per month compare 0,65% per normal interest rate.

The government has some policies to develop local people's knowledge such as exempting children from fees at primary school and offering reduced fees for secondary school, and to every year support households by providing notebooks, pens, and bags for pupils.

3.5.2 NGO programmes

There are also several NGOs working in Đakrông, including Save the Children and Plan International. Both have been involved in the distribution of corn seeds and sometimes fertilizers. Also they have been involved in family planning and nutrition training. (*General notes from Interviews, 12/5-19/5*).

- PLAN international: supports pregnant women and children, and many other things.
- Save the Children: gives out seeds and fertilizer.
- ACEP – also builds sheds for livestock, supporting 50% of cost. Also helps farmers make brooms.

3.5.3 Policies and institutions to regulate the management of aquatic and other natural resources

There is only limited evidence of formal management regimes for aquatic resources which determine where and when households can fish. However, informal rules sought to prevent fishers from one village using the waters of another, unless they had a 'contact' or 'friend' to facilitate access. As suggested above however, rules for forest management are a lot stricter, and shifting cultivation is only possible in the most remote forest tracts.

3.6. Gender and age

3.6.1 Gender relations

It is important for this study to not only account for wealth differences between households with regards to livelihood strategies, access to assets and use of aquatic resources, but also to acknowledge the differences within households themselves. Focus groups with men, women, boys and girls sought to explore some of these differences, and participants were asked to complete a PRA exercise whereby they were asked to record the level of labour contribution for men, women, boys and girls respectively (see

Figure 15).

The first axes of differentiation is that of gender. Although there is not severe gender inequality in the study villages, there is an observable gender division of labour, meaning that men and women possess unique sets of skills and ecological knowledge. Although some tasks were carried out by both men and women (see

Table 5), there were some tasks which were more often carried out by men and others were more often carried out by women, even within the context of the same livelihood activity. For example, fishing with a crossbow or hand net out in the middle of the channel was more often considered the work of males. This may be because male fishers would often go out at 4-5pm to catch fish with a hand net, and would return at 3am, using a torch when the fish come out to look for food. Women more often go fishing using basket nets or using bamboo traps to catch shrimp. (*Cu Po observation and informal discussion, 12/5*).

In focus groups it was suggested that agricultural work is carried out by both men and women, particularly for key tasks such as harvesting crops. However, certain jobs are gender specific. For example, women are responsible for preparing fields and husking by hand, with girls helping, while more men are involved in watching livestock and searching for metal. (*Cu Po FG with women, 14/5*). It is mostly men who carry out off-farm labour, although women are also increasingly involved in the labour market.

As in many countries, women play a disproportionate role in household reproductive activities such as collecting firewood, water, cooking and looking after children (see

Table 5 and Figure 14). This of course means that their contribution to household labour is greater than that of their male counterparts as they have a dual responsibility for productive as well as reproductive activities. The cause of women's greater labour burden is complex, but evidence suggests it has worsened with changes in agricultural systems. It was suggested that when shifting cultivation was the predominant form of production, men would go to the forest to cut the big trees and would sow the seeds in the new field. Women would then go in to cut the small trees and grass to prepare the fields, while both men and women would harvest together. Men in this context would rarely cut small trees or collect grass. However, now that shifting cultivation is no longer common due to government regulations, the men's work burden has decreased, while women retain their responsibilities preparing fields and cutting small trees and grass for firewood which is still required for livestock and cooking respectively.

In terms of women's decision making power, it was suggested in focus groups that women participate in discussions on livelihood options in their families. However as men usually go out of the community much more than women, and their knowledge about life outside the village is greater, money is often kept by the men. There were however, some encouraging signs of these relations reversing. There was a tendency for women to play a greater role in the sale of agricultural commodities (see

Table 5), which offer them greater control over income. Furthermore, women were perceived by some respondents to be ‘better accountants’ who were more sensible with household cash than their male counterparts. Some women joked that if their husbands spend too much money on alcohol and cigarettes, they normally take control over the money in the household. For example, if a man earns 100000, they will give women 30000 to manage. Whether this was decided by the woman or the man in the households however, was not clear. Aside from this, women can more easily go outside more and participate in unions and other similar activities, and can borrow money from government programs, something which was less common in the past (*Chen Goo FG with women, 28/5*).

The overall conclusion in focus groups was that the position of women depends very much on the household itself.

Figure 14 Women returning to the village after collecting firewood



Figure 15: Intra-Household division of labour chart prepared in focus group in Cu Po, 14/5/2010

Nhóm nữ khỏe, Cupua 14/5/2010

Công việc	Phụ Nữ	Đàn Ông	Trẻ gái	Trẻ Trai
Làm ruộng	++++	++++	++	+
Múc nước	++++	+	++	+
Giã gạo	++++	0	++	0
Chăn nuôi (Heo)	++++	0	++	0
Bắt cá, tôm	++	++++	+	++
Chăn trâu bò	++	++++	++	++
Rủ sắt	+	++++	0	+++
Làm thuê	++	++++	++	++
Kiểm củi	++++	0	+++	0
Đi chợ mua	++	++++	++	++
Bán SP	++++	0	0	0
Trồng tre?	++++	++	++	++
Nấu cơm	++++	++	++	++
Sửa nhà	0	++++	0	0
Làm bếp sếp	++++	0	0	0
Thu ngô, lúa	++++	++++	++	++

Table 5: Translated version of intra-household division of labour chart recorded in focus group in Cu Po, 14/5/2010

Activities	Women	Men	Girl	Boy
Work on the field	++++	++++	++	+
Collecting water	++++	+	++	+
braying the rice	++++	0	++	0
Collecting meal for poultry	++++	0	++	0
fishing	++	++++	+	++
Take the poultry	++	++++	++	++
Collecting steel	0	++++	0	+++
Working for other households	++	++++	++	++
Collecting wood	++++	0	+++	0
Going to market to buy product	++	++++	++	++
Going to market to sale product	++++	0	0	0

Take care children	++++	++	++	++
Cooking rice	++++	++	++	++
Preparing house	0	++++	0	0
Harvest crop	++++	++++	++	++

(The wealthy man focus group in Cu Po village)

Note: 0: not involved

++++ : Most involvement

+++ : More involvement

++ : Medium involvement

+ : Least involvement

0 : Not involved

3.6.2 Age relations

An often overlooked axes of difference when analyzing livelihood strategies is between the generations. It was evident that there were distinct divisions of labour between children and adults as well as between men and women. Young people played a particularly important role in helping their parents with agricultural activities, collecting firewood and forest produce and fetching water. While these activities were normally carried out with their parents, other activities would be carried out independently. These included looking after their siblings, cleaning the house or tending livestock.

Understanding age differences is particularly important for this research as young people play an important role in fishing activities. Children who fish, begin at about 10-12 years old. Boys and girls usually fish alongside their parents, alone, or with their friends. In Chan Ro the overall livelihood strategy is more agricultural, so parents devote more time to agricultural labour. In this context, fishing was primarily the domain of children. Young people generally use baskets or lines to catch fish. Girls often catch shrimp in a large group.

Fishing is an important livelihood activity for young people as it has a 'leisure' component. Children in Dakrong noted that fishing and shrimp collecting can be combined with swimming in the river, something which was observed by the research team in Chan Ro. In this way, children could enjoy themselves, while also 'working'. In many ways it was the one means through

which they could negotiate their labour contribution. In livelihood ranking excursions with children, fishing stood in contrast to many livelihood activities which young respondents reportedly did not enjoy. These included collecting jackfruits from the jungle, which was perceived as dangerous as they have to climb the trees. They also reported that they do not enjoy cutting wood as the wood is heavy. They have to walk a long way through the jungle with no water. The same applies to cutting grass for livestock. Children also reported that they were scared of snakes and ghosts that live in the forest. Fishing however was reportedly enjoyed by most children (see Table 6 for an example of livelihood ranking results) (*Cu Po FG with boys/girls, 14/5, ages 14-16*)

Within the younger generation, there were some differences between boys and girls whereby their labour responsibilities would partially reflect that of their parents. For example, although many children fished, it was more important for boys, while girls played a greater role in agricultural activities, as well as other jobs their mothers were involved in such as collecting firewood or husking (*Cu Po FG with women, 14/5*). Girls perceived during a focus group in Chan Ro that if they regularly collect water and wood and work hard, then they would more easily be able to get married and find a 'good husband'. As they get older, girls and boys livelihood responsibilities would begin to more closely replicate that of their mothers or fathers respectively.

Children have only a limited role in decision making, and parents would normally give orders for them to carry out particular important jobs such as looking after children or helping with cooking. However, there were power relations between siblings and children would sometimes ask their younger brothers or sisters to help them (*general focus group notes, 11/5-29/5*). Furthermore, for those jobs which are not considered important, children often would not request to help but go voluntarily (*general focus group notes, 11/5-29/5*). Interestingly, independent fishing by children was often not considered important by parents as the quantities of fish they would catch would be small. It was not even considered as one of the household's 'livelihood activities' in Chan Ro, where fishing is primarily the domain of children.

Boys and girls have few direct sources of income, particularly given that most jobs involved either (i) helping their parents with existing household productive activities tasks (e.g. working in the fields, collecting firewood), often with other family members; or (ii) household reproductive

activities (e.g. cleaning floor, washing clothes/dishes, looking after siblings). Most children stated that if they had their own money they would like to buy clothes. One boy wanted to buy a bicycle to go to school, or buy a notebook. They have no source of 'pocket money'. If they need some money for important purchases such as school notebooks, they have to ask their parents and they will buy it for them (*Chan Ro 9-14 boys FG, 26/5*)

There are few productive activities carried out only by children, which could potentially offer them some of their own income. Those that do included fishing (when done independently) and collecting fruit. In all these circumstances however, children reported that the product is given directly to their parents, and they can not retain or sell the product for themselves. Girls in Ka Lu noted that the big fish are given to their mothers to sell, while the smaller fish are given to cook with the family dinner. The research team asked them why they could not keep anything for themselves, as they go fishing whenever they want, and do not necessarily tell their parents first. They did not respond however. They were perhaps scared that the team would tell their parents. In other focus groups, children noted a sense of 'responsibility' to their parents. The one exception whereby young people were reported to retain some personal rewards was in Chen Do. In a focus group, boys said that when they pan for small quantities of gold from the river, their parents let them retain some of the money for themselves. For example, if they collect 500000 they can keep 100000 for themselves to buy clothing and shoes alone in the district centre. Usually their parents would sell the actual gold, and give them a little money as a reward (*Chan Ro 9-14 boys FG, 26/5*)

The research team also observed that when children go to collect fruit, they can sometimes keep some for themselves or share it with their friends. The team observed a large group of children emerging from the forest and stopping to play in the river. While doing so, they shared out some of the mangoes with their friends, and ate some before returning to the village. It is clear here that they are exercising some 'agency' by retaining some fruit for themselves and playing while away from the eyes of their parents.

Table 6: Ranking activities of boy and girl groups

Issue	Boys	Girls
<p>The livelihood activities considered most important</p>	<p>-Take care buffalo because buffalo can plough, birth small buffalo and sell it get money buy rice. Family loan money from the bank to buy buffalo if it die, we will not enough money repay the bank -Cooking, working on the field help parents, harvest rice on the field, planting rice, collecting water for drinking and use domestic, collecting grass on the field for rice grow (boy 13-19 Cu Po 14/5/2010) -Planting rice, collecting water, collecting wood to cooking and sell get money to buy rice -Cooking rice, Collecting grass on the field, -Take care buffalo and cleaning the house (boy 9 -12 Ka Lu 15/5/2010)</p>	<p>-Do homework, braying rice, cooking, collecting water and washing bowl -Work on the field was important activities also (girl 13 – 19 Cu Po 17/5/2010) -Work on the field, cooking, planting rice, preparing food for pig, collecting wood (girl 14 – 20 Ka Lu 15/5/2010)</p>
<p>The livelihood activities consider least important</p>	<p>-Collecting steel: in free time people go to forest finding steel, shell of bomb and sell 4000 per kg. - Picking up coffee: people pick up coffee from September to October get extra income (boy 13- 19 Cu Po 14/5/2010) -Go fishing, Collecting mango, plating tree in forest, collecting steel (boy 9 –</p>	<p>-Collecting wood and catching shrimp (girl 13 – 19 Cu Po 17/5/2010) -Cleaning the house, take care goat (girl 14 – 20 Ka Lu 15/5/2010)</p>

	12 Ka Lu 15/5/2010)	
The livelihood activities most enjoy.	<p>-The boys enjoy going to the river to fishing and swimming. When young, they usually go with their friend, but when older they have gone to school and help their parents work on the field. (boy 12 – 19 Cu Po 14/5/2010)</p> <p>-Go to school, prepare food for chicken and pig, go hooking and trap bird in the forest (nhóm trẻ em nam 9 – 13 thôn cu po 14/10/2010)</p>	<p>-Go to school, do homework, swimming in river, catching fish and take younger sister or brother</p> <p>-Catching fish: make food for family and we can swimming in river with our friend</p> <p>-Take younger sister or brother because we can help parents and not hard work (girl 13 -19 Cu Po 17/5/2010)</p> <p>-Catching fish and prepare food for pig and chicken because not spent a lot of time (girl 14 – 20 Ka Lu 15/5/2010)</p>
The livelihood activities least enjoy	<p>Trapping wild pig in forest they run very fast some time we were bit by bee (nhóm trẻ em nam 9 -13 thôn cu po 14/10/2010)</p>	<p>: E.Kê Nít said that: Braying rice was very tired, if rice will clean, we must bray 7-8 times,</p> <p>Collecting wood and take care cow also very tired because go very far from house. (girl 13 – 19 Cu Po 17/5/2010)</p> <p>Collecting vegetable for pig, working on the field, take care goat, collecting water and collecting wood (girl 14 – 20 Ka Lu 15/5/2010)</p>

PART IV: CONCLUSION AND LIVELIHOOD ACTIONS PLANS

4.1 Conclusion

This report has demonstrated the diversity and fragility of livelihoods in the Dakrong valley. While restrictions on shifting cultivation and population growth have put pressure on agricultural livelihoods, aquatic resource dependent activities are important to supplement household livelihoods, along with activities such as laboring in the coffee plantations of Khe Sanh, and small scale forest dependent activities such as making brooms. Aquatic dependent activities are particularly important for young people whereby they represent a combination of work and play, while also being a way through which they can learn about their environment while contributing to household livelihoods.

It is clear that the study communities face considerable challenges in the years to come. Local people still lack an adequate supply of water for drinking or domestic use, despite the proximity to the river, a process worsened by urban development upstream and rising pollution. Furthermore, the social isolation of many of the communities has meant they have limited access to technical knowledge relating to agriculture, while aquatic resource based incomes are falling in the context of ecological decline. Gender and age relations have changed in recent years, with more equality of income, although there are still inequalities in the distribution of labour hours and control over income, and these divisions may be strengthened as the natural resource base is undermined.

Some programs, policies and projects (e.g. 134, 135, 30a, PLAN, Save the children) were operating in the study site and these have had some positive results in improving local people’s livelihoods. However there have still been some problems, particularly in following up projects once they have finished.

4.2 Livelihood action plans

In the community, a series of key problems and solutions were discussed during the focus groups and stakeholder meetings in the district centre. These are outlined below in Table 7 and will form the basis of the HighArcs action plan for the Quang Tri field site, which will attempt to address some of the critical problems households may face in the years ahead.

Table 7: Problems and solutions identified by stakeholders

Problems	Solutions
Lack of bridge and road to Cu Po village. In the flood season people can not pass the river come to the hospital when falling ill.	Involve government and local people to build road and bridge over Dakrong river. The government will invest capital and people to do this.

There are many children, lack of knowledge of birth control.	Awareness raising to improve local people's knowledge about birth control.
Lack of electricity is a big problem raised by some households (<i>General notes from Interviews, 12/5-19/5</i>)	Petition government and organizations invest to build electric systems for developing the use of mini-hydro power devices.
The natural resources and soil quality are declining	Find the trees suitable for quality soil to limit soil erosion.
Lack of clean water	Build the water tank system in households using simple materials at community level
The local people's knowledge was limited, many people did not know to read and write.	Making long term programs for education help people improve knowledge, exempt school fee and making opportunities work...
Lack of techniques in planting and animal husbandry	Offer training in cultivation, livestock raising, forestry, and treating poultry diseases.
No addition occupation	Maintain and develop additional occupations and income generation opportunities at a community level to improve income for people, e.g. making brooms in Cu Po village, weaving cloth in Ka Lu.

(General focus group notes, 11/5-29/5)

According to local people, some further related proposals were suggested:

- Increase awareness and offer training in fish conservation laws and methods for pupil at secondary and high school through examinations.
- Guide local people to build and fill a water tank system for each house hold.
- Maintain and develop addition occupations at a community level to improve income for people as: making bloom in Cu Po village, weaving cloth at Ka Lu.

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Annex 1: Household interview form

Statistical data

Introduction to be given by interviewer

The purpose of this survey is to collect information on how people use aquatic resources, so the findings can be used to better inform policy makers of the importance of aquatic resources in highland areas, how they may be protected, and how income generating activities can be strengthened.

1 Interviewee details

Name of respondent _____

Date _____

Gender of respondent (tick): F _____ M _____

Ethnicity of household _____

Village _____

Interviewer _____

Household code _____

Wealth category (please select) *Poor* [] *Medium* [] *Wealthy* []

2 Household head details

Name of household head	
What is the age of the household head?	
Contact information (Tel/add)	
Gender of household head?	M _____ F _____

3 Details of house:

[To be filled in by interviewer themselves].

What are the <i>wall</i> construction materials? (please tick)	Wooden	Brick	Concrete	Earth	Bamboo	Other
What is the quality of wall construction	High quality		Medium quality		Low quality	
What are the <i>roofing</i> construction materials? (please tick)	Wooden	Tile	Metal	Thatch	Leaf	Other
How many floors? (please tick)	1 floor		2 floor		3 floor	
What is electricity supply? (please tick)	Mains electricity		Solar cell		Diesel generator	
Other comments (e.g. material goods)						

4) Household background information

4.1) Tell me about the people who *normally* live and eat in this household.

What are the names of the immediate family members?	What is their relation with the hh head?	Gender	Age?	Up until what level have they studied? (please tick)				What is their main occupation?	Have any migrated in the past?
				Primary	Secondary	High school	University		
1.									
2.									
3.									
4.									
5.									
6.									

4.2) When did you build this house? _____

4.3) Was household head born in community? _____

4.4) I will quickly ask about your households' main income source over the last year?

What are your three main income sources? (please tick)	Approximately what percentage of your income comes from each source	Can you rank these activities according to their importance?
Fishing		
Fish culture		
Agriculture		
Labouring		
Migrant remittances		
Other		

5) Productive activities of household

5.1) Do you fish? (If no, go to question 5.3)

How long do you spend fishing each day? _____

What time of day do you go fishing? _____

5.2) I would like to ask you some questions about your fishing activities.

What <u>species</u> of fish and mollusc have you caught in the last <u>year</u> ?	What months did you catch each species?	What are the <u>peak</u> times of year for this species?	What is a typical daily catch during the <u>peak</u> months? (kg)	What would be a typical daily catch during the <u>low</u> months? (kg)	How much of each of these species have you caught over the last week?	For each species caught in last <u>week</u> , where were they harvested?	For each species caught in last <u>week</u> , what were they used for?	For each species, how much of the <u>weekly</u> catch do you sell? (kg)	What was the price for each species you sold?	Where were they sold?	Who were they sold to?

5.3) Are there any other products you collect from the lake/river/wetland? (e.g. aquatic plants) (If no, go to question 5.4)

What has been collected over the last year? (state species if applicable)	What times of year were they collected?	What was the total quantity collected over the last week? (kg)	For each product collected in last week, where were they harvested?	What form each product was collected? (e.g. was the whole plant/species removed, or only part)	What was each product collected in last week used for? (e.g. for consumption, for housing materials)	Over the last week, how much of each product have you sold (kg)	What was the price for each product you sold? (thousand VND per kg)

5.4) Do you culture fish? (If no, go to question 5.6)

Which fish have you cultured over the last one year from now?	Source of fish for culturing? (please tick)		Which system did you use to culture each species of fish? (please tick)			
	Wild caught from river/lake	Captive bred	Cage	Pen	Pond	Other

5.5) I would like to ask you some more about your recent fish culture activities

Over the last <u>week</u> , what quantity of cultured fish have been consumed? (kg)	Over the last <u>week</u> , what quantity of cultured fish have been sold?	What was the price for each species you sold over the last <u>week</u> ?

5.6) I would now like to ask some questions about your agricultural production.

What crops have you planted in the last year from now?	What was the area cultivated? (ha/m ²)	What was the yield for each harvest?		Over the last <u>week</u> , how much of each crop have you sold? (kg)	Over the last <u>year</u> , how much of each crop did you sell? (kg)	Average price per kg
		Harvest 1 (kg)	Harvest 2 (kg)			
Wet rice						
Dry rice						
Cassava						
Maize						
Sweet potato						
Vegetables						
Soya bean						
Aquatic plants (e.g. morning glory)						
Sesame						
Forestry						
Other						

5.7) I will now ask some questions about the livestock you own.

Which animals / birds do you own?	How many of each species do you own?	How many have you sold over the last <u>month</u> ?		How many have you bought over the last <u>month</u> ?		How many have you used for home consumption over the last month?
		Qty.	Price	Qty.	Price	
Chicken						
Duck						
Pig						
Cattle						
Buffalo						
Goat						
Other						

5.8) Does anyone in your household operate a non-farm or fish related business? (If no go to question 5.9)

What is the business?	Approximately how much do you earn in a typical week?	Approximately how many months a year does this business operate?

5.9) I would like to ask you about your water use. For each of the following purposes, what is the water source?

Purpose	Water source				
	Tap or well in household	Tap or well in village	River or stream (specify where along the river water is collected)	Canal (specify where along the canal water is collected)	Lake (specify where in the lake water is collected)
Drinking					
Washing clothes					
Bathing					
Irrigation of rice fields					
Irrigation of upland fields (e.g. maize, cassava)					
Irrigation of kitchen gardens					
Other					

6) Household inputs and expenses

6.1) I would now like to ask you about the inputs over the last year from now for fishing, agriculture and livestock?

Input		How much of each input have you used over the last year from now? (e.g. kg / no. of items)	Typically how much would you pay for these inputs? (in <i>local currency</i>)
Category	Input item		
Fishing inputs (e.g., fuel for boat, bait)			
Fish culture inputs (e.g. fish food, medicines)			
Agriculture / Livestock inputs (e.g. fertilisers, pesticides, fuel for irrigation pump, animal feed)			
Other aquatic resource dependent activity			

6.2) I would like to ask about any other expenses over the last year for fishing, agriculture and livestock

Expense item	Expense
Maintenance of fishing equipment (e.g. repairing nets)	
Maintenance of farm equipment (e.g. repairs to machinery)	
Tax on agricultural / aquatic activities	
Other	

6.3) Approximate non-food household expenses over last year from now

Expense	Amount (local currency)	Who bears expense		
		Men	Women	Both
House maintenance				
Electricity				
Fuel for cooking				
Fuel for motorbike				
Transport (bus etc)				
Education				
Clothes				
Health/medical				
Transport				
Cultural/religious				
Family events (e.g. wedding)				
Gifts				
Other				

7) Asset ownership

7.1) Now lets talk about the land only your household owns or rents at present (not community land).

How much land do you operate and what type of land is it?	How much is both <u>owned and cultivated</u> by the household (appropriate local unit of measurement)	How much is owned by household but is <u>rented to others</u>			How much is <u>owned by others</u> but rented by household		
		Amount	Payment	Who is rented to?	Amount	Payment	Who is rented from?
Irrigated land (e.g. for rice)							
Rain-fed (e.g. for maize)							
Kitchen garden							
Fish pond							
Forest plantation							
Uncultivated forest/scrub							
Land for house							

7.2) Now lets move on to other economic resources you own

Which of the following items do you own?		What is both <u>owned and used</u> by the household (state quantity)	What is owned by household and <u>rented to others?</u>		What is <u>owned by others</u> but is rented by the household?	
			Quantity	What is the rental payment?	Amount	What Is the rental payment?
Fishing / Fish culture apparatus	Boat (state size)					
	Boat motor					
	Fish nets (state types)					
	Fish cages					
	Fish hooks and line					
	Other					
Agricultural assets	Irrigation pump					
	Tractor					
	Thresher					
	Husker					
	Other					

7.3) I would like to ask you about property which has been acquired in the last 10 years?

Asset	How much of each form of property has been <u>bought</u> in the last 10 years?	When were they bought?	Who was the seller?	How much of each form of property has been <u>given</u> to household as gift or inheritance in the last 10 years?	Who was the giver?	When was it received?
Land						
Agricultural machinery						
Boat (state size)						
Boat motor						
Other assets						

7.4) I would like to ask you about property which has been lost over the last 10 years?

Asset	How much of each form of property has been <u>sold</u> in the last 10 years?	When were they sold?	Who was the buyer?	How much of each form of property has been <u>given away</u> by household in the last 10 years?	Who was the recipient?	When was it given?
Land						
Agricultural machinery						
Boat (state size)						
Boat motor						
Other assets						

7.5) Let us talk briefly about other goods you own at present.

Which of these goods do you own?	How many?	How many years have you owned these goods?
TV set		
Fridge		
Motorbike		
Bike		
Other		

8) Labour relations and income

8.1) Think again of your household members (those who normally eat and sleep here). Did any members of this household work for others (e.g. other households, businesses, the government) during last month, if no go to question 8.2.

What kind of work did your family members do?		How many days in the last month has each household member worked on these tasks? What was the wage (or was it unpaid), and approximately how many months a year do they work?					
		1 (state name)	2 (state name)	3 (state name)	4 (state name)	5 (state name)	6 (state name)
Work for other household in <i>fishing</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work for other households in <i>fish culture</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work on other household's <i>farm</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work on <i>construction/road maintenance</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work in <i>factories</i>	No of days in last month						
	Wage paid						
	No of months per year						
Other work	No of days in last month						
	Wage paid						
	No of months per year						

8.2) Did any people from outside the household work for your household over the last week: If no, go to *question 8.3*.

Production system	How many workers from outside household were employed over the last week?		How many days did they work over the last week?		What is the daily wage for paid workers? (<i>local currency/day</i>)
	Paid	Unpaid (as exchange)	Paid	Unpaid (as exchange)	
Fishing					
Fish culture					
Livestock					
Agriculture/ Aquatic plants					
Other					

8.3) Do you have any family members who once lived in this house, but are now living outside the community?

Name of family members who are living away from the village right now?	Where do they live?	Why did they move away?	How long have they been away?	How many times did they visit in last year and how long for?		When they return, do they bring any goods back apart from money?	How much money have they given the family in the last year?
				No of visits	Length of stay		

8.4) *What are the benefits of household members working outside, as opposed to working within the community?*

8.5) *What other sources of income does your household have?*

Income source	Approximate income in last year from now
Subsidies	
Pension	
Any other sources we have not yet considered?	

Qualitative section

NOTE: It is essential to complete the entire quantitative section of the form for the 30 households in each community. The qualitative section is however, more flexible. While we would endeavor to cover all sections and questions, respondent fatigue or time constraints may mean this is not possible. Some issues are also covered in the focus groups, so if one is short of time or the rapport with a particular respondent is weak, the interviewee can focus on a particular section of the form. The section of focus can be chosen according to: (i) the relevance to the household being interviewed, e.g. it will not be important to speak about agriculture to a household that engages primarily in fishing; (ii) The level of data already collected on a particular topic e.g. if there is little data on certain issues from the interviews and focus groups already completed in a given community, one may choose to focus on related questions for the household interview.

1) Livelihood strategy

- 1.1) How have your income generating and food producing activities changed over the past 10 years?
- 1.2) Do you feel your family was poorer or wealthier during your grandfather/grandmother's time

2) Environmental change

- 2.1) Think about the river/lake 10 years ago and beyond. How has it changed today?
Have certain parts of the river/lake changed more than others?
- 2.2) Think back 10 years ago and beyond, are there *more* or *less* fish than are present today?
... What types of fish have *declined* in numbers in the last 10 years (note species names)?
... What do you think are the causes of the decline?
... How have you adjusted your livelihood practice to cope with the decline in fish catch and fish types?
... What types of fish have *increased* in numbers in the last 10 years (state species names)?
... what do you think are the causes of this increase?
- 2.3) Think about fishing today. Are there any areas of the river/lake you do not fish?
Why?
- 2.4) Are there any times of year you do not fish?
Why?
- 2.5) How do the fish populations change over the seasons, in terms of species, quantity and size?
- 2.6) Do you know why they change?
- 2.7) Have there been any sudden environmental or economic changes which have put pressure on your income generating and food producing activities over the last 10 years? How did you respond?
- 2.8) What would you lose if the lake / river was no longer present?

3) Class relations and livelihood change

- 3.1) Over the past 10 years and beyond, have you invested in more fishing /fish culture equipment and boats than was previously owned?
... If not, what constrains you from investing?

Have the fishing gears you use changed? If so, how have they changed and why?

3.2) What do you think needs to change for you to increase your catch and achieve a better income from fishing or fish culture?

3.3) Is fishing or fish culture viewed as a good way to increase one's wealth? [*for other aquatic resource dependent activity*]

... Would you like your children to be involved in fishing or fish culture? Why?

3.4) Are there any income generating activities you would like to engage in but are unable to? What are the constraints?

3.5) Have you increased agricultural production in the last 10 years?

... If not, what do you think needs to change for you to increase production for the market and achieve a better income from agriculture? What prevents you from increasing production?

3.6) How easy is it to increase your ownership of land?

4) Market relations, credit and class

4.1) How do you decide which species to sell and which not to sell?

4.2) Do you ever sell fish to traders or middlemen? (If no, go to question 4.4)

...When selling fish to traders and middlemen, how do you decide which particular trader to sell to?

...If the price is poor, can you easily move to sell to a different trader?

...How many traders do you normally sell to?

...Do you have a strong relationship with one particular trader (for example, one who gives you a particularly good price)?

4.3) Are you satisfied with the price you receive for your fish? If not, what prevents you from achieving a more favorable price?

4.4) Does anyone in your household borrow money?

... What for?

... How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Knowledge

5.1) How did you learn to catch/culture fish?

5.2) When did you learn to catch/culture fish?

5.3) Do you know the names of all the fish? How did you learn?

5.4) What are the main information sources which contribute to your knowledge of fishing and agriculture?

5.5) Have you taken any training over the last 10 years in either agriculture or fishing/fish culture?

6) Social networks, politics and non-economic structures

6.1) How are your relations with other people in the village?

6.2) Are you a member of any community organizations?

... If yes, what is your role? ... What benefits does it bring you?

... If no, why? Are there any constraints preventing you from becoming a member

6.3) Out of all the community organizations, which are the most helpful in improving economic security?

... Why are these organisations helpful?

... And which are the least helpful?

... Why are these organisations not helpful?

6.4) Are you a member of a political party?

... If yes, what benefits does it bring?

6.5) Do you receive any form of assistance from government or local institutions to improve your livelihood practices? What kind of assistance?

6.6) Think of your close friends or relatives that you meet regularly?

... What kinds of things do you do together?

... Can you get help from each other (e.g. financial, or sharing of information)?

... Which kind of obligations do you have towards each other?

... Are there any social groups in the village which you are excluded from?

6.7) Do different families in the village have set fishing areas?

7) Policies and institutions governing natural resource use

7.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high?

7.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

... Is there a different rule making process for both the village and for the district government?

... Who makes these rules?

... What influence do you have over the rule making process?

... If influence is limited, what prevents you from influencing the rule making process?

... How are rules policed? What are the penalties for breaking them?

... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?

7.3) Who else uses the lake/river resources apart from people in this commune?

7.4) Are there any difficulties and disagreements as many people are using the water resources?

8) Concluding questions

8.1) What are the biggest problems facing your household?

8.2) What are the biggest problems facing the river / lake?

8.3) What would you like to change in your life in the future?

8.4) What would you like your children to be doing in the future?

8.5) Do you have any other comments on the issues we have discussed above?

8.6) And finally, do you have any questions for us?

8.7) Can we revisit you in next 4 months? Yes/No

...If yes: when should I visit : evening/morning/afternoon....

Thank you very much for your time. Good luck with your crop and see you soon!

Annex 2: Focus group schedules for men and women

Instructions for interviewee

SAMPLING FOR FOCUS GROUP: There should be a minimum of 40 Focus Groups completed in each site. The format should be as follows: 10 with men; 10 with women; 10 with boys; and 10 with girls, across the three villages. Within these subgroups we could hold discussions with different livelihood groups, or in the case of boys/girls, with younger children and teenagers. We would also like to include some extra focus groups with additional stakeholders of interest (for example farmers living upstream who use aquatic resources indirectly; market traders who buy or sell aquatic produce). These additional focus groups will be used to compliment household interviews and the gender/age focus groups, to fill in gaps and to better understand the needs of all stakeholders.

CONDUCTING THE INTERVIEW:

- Divide roles within the group. One team member should take notes and one should concentrate on asking the questions and interacting. If a third team member is present, then they may observe social interactions within the group (e.g. who is dominating, who is coming/going, what is the mood of participants, who is not participating).
- These questions should only be a rough guide, and the interviewers should be flexible, according to the direction of the discussion. Some questions may have already been answered.
- The same essential questions will be asked for both women and men, but there should be flexibility to add new questions if interesting issues arise in the process of fieldwork.

Materials required

- 3 large sheets of paper
- 5 large pens (different colours)
- 30 beans
- 15 blank cards

1) Livelihood strategy and intra-household relations

1.1) What is your main income source?

[PRA Tool 1] Livelihood activity ranking:

1. Ask participants to brainstorm all of the livelihood activities they participate in. Write as 'spider' diagram with box for each activity
2. Rank these livelihood activities in order of importance
3. Give out 30 beans, or any other small objects (e.g. Pebbles)
4. Ask respondent to distribute them in the boxes to indicate the level importance of each activity.

1.2) Look at the livelihood activities from the ranking which were ranked as most important.

...For these activities, who controls how the income or product is used?

... Are there any livelihood activities where you control the income?

1.3) Out of the most important livelihood activities discussed above, what is the income or product used for?

1.4) What were your main livelihood activities 10 years ago?

...How have your livelihoods changed?

...Are there any new livelihood activities which were not present 10 years ago?

1.5) [For China and Vietnam] How did your income and food security situation change since the decollectivisation of agriculture? Is it more or less secure?

1.6) [PRA Tool 2]: Livelihood problems and benefits.

1. Openly ask group to list what they feel are the major problems they have faced over the last 10 years with earning money and producing food.
2. Write each problem on a card and assign them a picture or symbol. Put each card in one of three piles, listed 'big problems', 'small problems' and 'minor difficulties'.
3. Create a chart and ask respondents to list benefits and problems of each strategy. For example:

Problems	Benefits

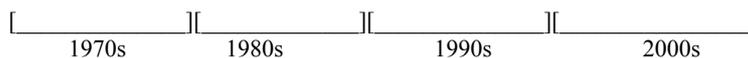
1.7) How has your ability to produce food and earn money improved in the last 10 years? Why?

2) Fishing questions and environmental change

- 2.1) What species do you collect from the river / lake?
... Where do you collect these from?
... What technologies do you use?
... How long have you been involved in these activities?
... How did you learn how to do them?*[if not already answered above]*

2.2 [PRA tool 3: Historical Timeline]

1. On a large sheet of paper draw a line for the last 30 years, for example:



2. Along the timeline, ask participants to note down major events which had affected their income generating and food producing activities (e.g. natural disasters, building of a dam, agricultural decollectivisation)
3. Ask participants how they were affected by these events and how they coped.
4. Ask participants whether any events are increasing or decreasing in frequency? (especially natural disasters)
5. Ask participants to indicate which years the harvest of river and lake resources were good and which were poor.

2.3) Ask participants what they feel the major problems are with river lake resources today.

... What are the solutions?

2.4) How has the importance of fishing changed compared to 10 years ago? Is it regarded as a good way to improve one's economic security?

- ... What are the barriers for people who want to improve their income from fishing or fish raising?
- ... How has the price for fish changed over time? Has it been different for different species?
- ... Is it easier to reach the market now when compared to 10 years ago?

2.5) Do you know how the river / lake has changed since your grandparents time?

2.6) [PRA tool 4: Seasonal calendar]

1. On a large sheet of paper, draw a timeline for the year, for example:



2. Ask participants to look at the map and indicate the time of year for the following processes:

- Fishing: When is most fishing carried out? When are stocks highest? When is the price highest? Are different forms of fishing gear used at different times?
- Fish raising: When are ponds stocked? When are fish released and sold?
- Agriculture: When are different crops planted and harvested?
- Labour: When is particular outside employment carried out?
- Environmental problems: Any droughts, storms or floods?

Draw symbols next to each process if necessary.

3. Ask participants to indicate which times of the year it is most difficult to produce enough food and money.

2.7) What are the peak months and low months for fish catches?

... Do you know the reasons for these seasonal changes?

... How do you cope during the low season?

2.8: [PRA tool 5: Community mapping]

1. With participants, draw a map of the river or lake with major landmarks and village names marked.
2. Ask them to indicate where they go to catch certain species/products.
3. Are there any places near or on the river/lake of cultural or religious importance? Ask them to mark them on the map.
4. Are there any places where they go for recreational activities? Ask them to mark them on the lake.

2.9) What would you do if the lake/river was no longer there?

2.10) What other benefits do you gain from fishing aside from food for the household and income?

3) Rules and access

3.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high?

3.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

- ... Is there a different rule making process for both the village and for the district government?
- ... Are there conflicts as a result of these differences?
- ... Who makes these rules?
- ... What influence do you have over the rule making process?
- ... If influence is limited, what prevents you from influencing the rule making process?
- ... How are rules policed? What are the penalties for breaking them?
- ... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?
- ... Do you know how the rules have changed since your grandparents time?

3.3) Do rules and regulations mean that some social groups have permanent rights to use the river/lake resources while others are excluded?

3.4) Are there any difficulties when different users use water or catch fish from the same river/lake?

3.5) Have people from outside been using the river/lake resources of your community?
 ... If so, what effect have they had on the resource (abundance, distribution and ease of harvest)

3.6) Which of you in the group are members of community organizations? Please note in table.

Community organisation	Number of people

3.7) Out of all the community organizations, which are the most helpful in improving economic security?

- ... Why are these organisations helpful?
- ... And which are the least helpful?
- ... Why are these organisations not helpful?
- ... Are there people in the village who are disadvantaged by these organizations? Why?

4) Markets

4.1) Where do you sell your fish (or other aquatic products)?

4.2) How is the price set for fish?

4.3) When selling fish, how do you decide which trader to sell to?

4.4) If the price is poor, can you easily move to sell to a different trader?

4.5) Do you have a strong relationship with a particular trader?

4.6) Are you satisfied with the price you receive? If not, what prevents you from achieving a more favorable price?

4.7) How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Status of women

5.1) How has the status of women changed in this village over the last 10 years?

... Are there more women headed households than before?

... Are there activities women do now that they did not perform before?

... Are there any livelihood activities women are not permitted to do?

... Are there any livelihood activities women only can do?

6) Knowledge

6.1) How did you learn to catch/raise fish?

6.2) When did you learn to catch/raise fish?

6.3) How did you learn the names of all the fish?

6.4) What is your main source of agricultural and fishing related knowledge? How did you learn?

6.5) Have you taken any training over the last 10 years in either agriculture or fishing/fish raising?

6.6) Do you discuss any of the following issues with neighbors and friends

... Agricultural and fishing techniques with neighbors and friends?

... Environmental issues such as the best fishing areas?

... The market situation, such as prices for produce

6.7) If you needed legal advice, would you know where to go?

7) *Division of labour*

7.1) Tell me about who does what in your household. What are the men's tasks, what are the women's tasks, what are the boys tasks and what are the girls tasks? See table below if necessary.

Activity	Who does what?			
	Men	Women	Boys	Girls
Fishing				
Repairing nets				
Sowing crops				
Transplanting rice				
Ploughing fields				
Weeding				
Harvesting				
Tending kitchen garden				
Travelling to market to <i>buy</i> produce				
Travelling to market to <i>sell</i> produce				
Cleaning				
Cooking				
Maintaining house				
Collecting firewood				
Looking after babies				
Cleaning house				
Washing clothes				
Other				

8) *Wellbeing and non-use values*

NOTE: Much of this will be gathered informally through participant observation, and will emerge throughout the discussion in interviews. However, there are some questions below which can maybe stimulate debate.

8.1) What does happiness [appropriate local term] mean to you?

8.2) What do you think is necessary to live a good life?

8.3) When do you feel really happy with your lives?

8.4) What else would you like to improve in your lives apart from improved economic security?

8.5) **[PRA tool 5: Wellbeing]**

1. Draw the following table:

Measure of wellbeing	Ranking
Economic security	
Protection of traditional culture and values	
Maintenance of good relations with family and friends	
Maintenance of good health	

2. Give respondents 30 beans. Ask them to place beans next to each measure to state how important they consider them.

9 Concluding questions

9.1) What are your dreams for the future?

9.2) How would you like to be in the next 5-10 years?

9.3) Do you have any other comments on the issues we have discussed above?

9.4) And finally, do you have any questions for us?

Annex 3: Focus Group Schedules for Boys and Girls

Instructions for interviewee

CONDUCTING THE INTERVIEW:

Materials required

- 2 large sheets of paper
- 5 large pens (different colours)
- 15 blank cards
- 30 beans

1 Young peoples contribution to work

1.1 [PRA Tool 2] Job ranking:

1. Ask children to think of all the jobs they carry out, ask them to write them out on the sheet
2. Put each job on a card
3. Ask them which jobs they feel are most important. Ask them to place the cards into three piles, 'most important', 'quite important' and 'not so important' for the family.
4. Ask them why these jobs are important
5. Ask them to rank which activities they 'most enjoy', and which they 'least enjoy'.
6. Ask them why they like/dislike particular activities.

2) Young peoples use of aquatic resources

2.2) We would now like you to think about your work in the river and lake.

- a) do you participate in any fishing activities?
- b) do you use the river for any other purposes?

2.3) How has the river/lake changed over the last few years? *Already asked*

2.4) Do you know the names of the different fish? How did you learn? *Already asked*

2.5) Do you know where the best sites are for fishing? How did you learn?

2.6) If the lake/river is no longer there, what would you miss/lose? *Already asked*

This could also be asked as- Would you be sad if the river/lake disappeared? Why?

3) Work and relations with other household members

3.1) Think of the work you help your family with. Who tells you which jobs to do? *Already asked*

3.2) Do any of you have brothers or sisters who help you with these jobs? *Already asked*

4) Benefits of work

4.1) When you work, do you get the chance to retain the product or income for yourself? *Already asked*
... do you have any control over how the product or income is used?

4.2) when you earn some money, what do you like to spend it on?

5) Education and leisure

5.1) Do you like school? *Already asked*

5.2) Why / Why not?

5.3) Do you think you will study until University/High School/Secondary School? *Already asked*
... Why / why not?

5.4) What would you like to be doing 10 years from now? What are your dreams for the future? *Already asked*

5.6) What would your parents like you to be doing 10 years from now?

5.7) **[PRA tool 3: Activity Chart]**

Provide the group with a large sheet of paper with a chart for the day, for example:

Time	Activity
Morning	
Afternoon	
Evening	

Provide the group with pens and ask them to list on the chart, the activities they do in a day from when they wake up to when they sleep.

6) Concluding questions

6.1) What do you think are the biggest problems in your lives? *Already asked*

6.2) What do you think the solutions are?

6.3) Is there anything else you would like to tell us about?

6.4) Do you have any questions for us?

Section 3

**Report on livelihoods dependent on
highland aquatic resources: a case study at Shaoguan, China.**

**REPORT ON LIVELIHOODS DEPENDENT ON
HIGHLAND AQUATIC RESOURCES**

---A CASE STUDY AT SHAOGUAN, CHINA

by

Liu Yiming, Shang Chunrong, Fraser Sugden, Luo Shiming, Chen Fengbo,
Wang Wenzhong, Jiang Baoguo, Gao Min, Li Huashou, Ye Yanqiong



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South China Agricultural University

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EXECUTIVE SUMMARY

Context

While the link between environmental degradation and increased vulnerability of poor communities is well known, only limited information is available concerning communities in highland areas, and even less regarding those dependent on aquatic resources and associated ecosystem services in such settings. Moreover, the role of aquatic resources is not well understood in relation to livelihoods among food-insecure households. The project “Highland aquatic resources conservation and sustainable development”, supported by European Union, has sought to better understand how to sustainably manage highland aquatic resources and to coordinate demands from multiple users and multiple goals. The primary objectives of this project include developing an understanding of the importance of aquatic resources in highland areas of Asia, and formulating conservation, livelihoods and policy action plans with local communities (HighARCS 2010). The livelihoods assessment of the Beijiang River Site was one of five case study assessments undertaken through the project.

The Beijiang River (North River) is the second largest water system in the Pearl River basin. It’s also one of the most important rivers in Guangdong Province. There are two sources of the upper Beijiang River. One is the Zhenjiang River-the east branch which runs from Xinfeng county of Jiangxi Province. Another one is the Wujiang River-the west branch which runs from Linwu county of Hunan Province. The two sources join together in Shazhouwei of Shaoguan City. Then it is called Beijiang River. The whole upper reach and the most part of the middle section of Beijiang River are located in Shaoguan City, which is the reason we selected Shaoguan city as the research site. Shaoguan City is in the south of the Nanling Mountain which lies in the Hunan Guangdong Fold Belt with complex geological structure. Shaoguan is in the subtropical humid monsoon climate zone and affected by the monsoon all the year. The vegetation in Shaoguan City belongs to subtropical evergreen forest with rich forest resources. The total land cover in Shaoguan is 17100 km² which is 92.8% of the total area within the Boundary of Shaoguan City. The remaining 7.2% is covered by water. The aquatic resources of Beijiang River and the associated ecosystem services provide great benefits to local people, but inappropriate development and over exploitation has serious negative impacts on the biodiversity, the continued supply of ecosystem services, and ultimately livelihoods of people in particularly poor and vulnerable groups. It is important to understand the aquatic ecosystem services and biodiversity values, the livelihoods dependent on aquatic resources, and the institutions, policies and conflicts of the Beijiang River.

Study aims and methods

This report explores the livelihoods of communities dependent on highland aquatic resources in Shaoguan, which is located at the upper reaches of the Beijiang River. This study aims to monitor highland aquatic resources-derived goods and broader ecosystem services and benefits to the poor through observation and discussion with people from different social and economic groups. The overall objectives of this report are as follows:

- To analyse the character, productivity and levels of aquatic resource use in highland fishing and farming communities.

- To better understand the role of highland aquatic resources derived ecosystem services in benefiting the poor and sustaining societal systems.
- To assess the multiple livelihood strategies of households dependent on highland aquatic resources derived goods and services, and understand how the use of aquatic resources varies according to both the gender, age and social class and age of different household members users;
- Role of highland aquatic resources derived ecosystem services in benefiting the poor and sustaining societal systems better understood and evaluated;
- To identify the effect of seasonality, trends and shocks on access to ecosystem services assessed and understand the impacts on producers, intermediaries, consumers and society. evaluated;
- To identify conflicts and tension between livelihoods described and to develop potential reconciliation strategies proposed in Livelihoods Action Plans (LAPs).

A multi-disciplinary team of experts was assembled to undertake a series of literature and field studies relating to the biodiversity, livelihoods and economic values of the watershed. Participation methods were widely used in the fieldwork for the study.

Main findings

In the watershed of the Beiji River, the livelihood strategies of different social groups are varied. The main livelihood strategies of the fishing communities are fishing, trading fish, working outside (labour), planting vegetables, raising livestock, gathering woods from the river or the forest. The fishing communities are more directly dependent upon fishing, particularly for the older generation.

Although the status of fishers' livelihoods are analyzed based on the wealth group which are defined as rich, medium and poor groups, the majority of fishers would probably more realistically to be fitted into the 'coping' category, especially if they have health problems or no outside income source. Otherwise some may be categorized as the "subsistence" category. There are only very few fishing families which can be fitted into the category of "accumulating".

While the rich households have higher income from fishing, interviews suggest that the poor households are more dependent upon fishing. Within the fishing communities, there was little evidence of unequal class relations. The economic status of most fishers are poor, and there is some commonality across households in access to productive resources. They can therefore be considered as a single economic class with the exception of a few engaged in business activities. There was no evidence of unequal relations between fishers and farmers, although fishers depend upon the wealthier farmers to buy their fish. However, there are clearly significant disparities in wealth and in access to government resources between fishers and farmers. The gradual undermining of the environmental resources fishers depend on and their unfavourable access to state resources suggest that fishers are becoming slowly alienated from their traditional livelihoods, and are entering the urban or rural working class. As there are only limited significant differences in terms of economic status within fishing communities, and between fishers and farmers, the most unequal relations that fishers are integrated into are with the powerful social classes in towns and cities.

Fish stocks have declined in all villages. There are a number of explanations for falling stocks. Hydro dams and sand mining are considered the most important two factors. The income of fishers is therefore low. They sell

most of their fish in locally, often eating the lower quality fish by themselves. Opportunities for large investments that would offer accumulation opportunities are limited in this context. Few fisher households take loans. If they do need to make a big investment, most households can not access to institutional credit as they lack sufficient collateral and it is complex to apply for a formal loan. They mostly take loans from family members or other relatives who work outside. There are no private money lenders. Either way, most of the fishers do not think loan can improve their family economic status.

The insecure economic status of fishers is compounded by their weak political position. The fisher households have limited access to political power and there was a strong feeling of powerlessness within their communities. The state pays insufficient attention on their problems. There appeared to be a perception that the farmers have greater access to political power than the fishers and receive a lot more support from the government. Although there are some national and provincial regulations relating to aquatic resources and protection of the resources, there is a lack of local management regimes for fishing communities. There are no formal or informal organizations such as Fishermen's Association or Fishermen's Cooperatives for fishermen to participate in Shaoguan City. Such organisations would at least offer the community the opportunity to voice their concerns and shape the a management of a declining ecosystem. Even community organizations at the basic level in the fishing communities themselves are limited.

In terms of gender and age relations, the report found that most husbands and wives go fishing together and have quite equal status, but there are still some job divisions between them. Generally, women are responsible more for housework and men are responsible more for heavy jobs. Most of the children do not go fishing with their parents and their parents also do not hope their children go fishing in the future. Most of the children engage in some of the housework while young, and then aspire to move to urban centres to work outside the fishing economy when they are older

REPORT ON LIVELIHOODS DEPENDENT ON HIGHLAND AQUATIC RESOURCES

1. INTRODUCTON

1.1 BACKGROUND AND OVERALL RESEARCH QUESTION COVERED BY THIS REPORT

While the link between environmental degradation and increased vulnerability of poor communities is well known, only limited information is available concerning communities in highland areas, and even less regarding those dependent on aquatic resources and associated ecosystem services in such settings. Moreover, the role of aquatic resources is not well understood in relation to livelihoods among food-insecure households. Given the dynamic nature and high vulnerability of aquatic resources particularly in the light of global climate change, there is an urgent need to improve existing knowledge on:

- The significance and conservation status of biodiversity in upland ecosystems in terms of the local ecology and regional socio-economic systems,
- Changing conditions in the upland environment and conflicting demands of those dependent on its resources.

The HighARCS project mobilizes the strengths and expertise of a multi-disciplinary research team from European and Asian institutions to better understand how to sustainably manage highland aquatic resources and to reconcile demands stemming from multiple-use. The primary objectives of this project include developing an understanding of the importance of aquatic resources in highland areas of Asia, and formulating conservation, livelihoods and policy action plans with local communities. Best practices aimed at conserving biodiversity and sustaining ecosystem services will be communicated to potential users to promote uptake and enhances policy formulation (HighARCS brochure, 2010).

The Beijiang River in Shaoguan city of China is one of the research sites of HighARCS project and is the focus of this report. The Beijiang River (North River) is the second largest water system in the Pearl River basin. It's also one of the most important rivers in Guangdong Province. There are two sources of the upper Beijiang River. One is the Zhenjiang River-the east branch which runs from Xinfeng county of Jiangxi Province. Another one is the Wujiang River-the west branch which runs from Linwu county of Hunan Province. The two sources join together in Shazhouwei of Shaoguan City. Then it is called Beijiang River. The whole upper reach and the most part of the middle section of Beijiang River are located in Shaoguan City, which is the reason we selected Shaoguan city as the research site. The Shaoguan City is in the south of the Nanling Mountain which lies in the Hunan Guangdong Fold Belt with complex geological structure. Shaoguan is in the subtropical humid monsoon climate zone and affected by the monsoon all the year. The vegetation in Shaoguan City belongs to subtropical evergreen forest with rich forest resources. The total land cover in Shaoguan is 17100 km² which is 92.8% of the total area within the Boundary of Shaoguan City. The remaining 7.2% is covered by water. The aquatic resources of Beijiang River and the associated ecosystem services provide great benefits to local people, but inappropriate development and overexploitation have had serious negative impacts on biodiversity, the

continued supply of ecosystem services, and ultimately livelihoods, in particular, those of poor and vulnerable groups. No in-depth and comprehensive study has been conducted to understand these constraints and explore possible ways of addressing them. It is important to understand the aquatic ecosystem services and biodiversity values, the livelihoods dependent on aquatic resources, and the institutions, policies and conflicts of the Beijiing River.

This report focuses on livelihoods dependent on highland aquatic resources at Shaoguan which is located in the upper reaches of the Beijiing River. This study aims at monitoring highland aquatic resources based goods, ecosystem services, and the benefits to the poor through participative observation and focus groups investigation which included men, women and young people. This research included (1) the evaluation on income and food security provided by highland aquatic resources, (2) wider benefits relating to sustaining the livelihoods and the society in the area, (3) discussion about the conflicts and tensions between livelihoods relating to access resources, (4) the changes in production and harvesting strategies according to gender and generation by collaboration with local stakeholders, and (5) considering the opportunities or synergy amongst livelihoods and demands of different stakeholders. Based on this assessment, Livelihoods Action Plans (LAPs) will be formulated through a process of participatory approach involving all stakeholder groups.

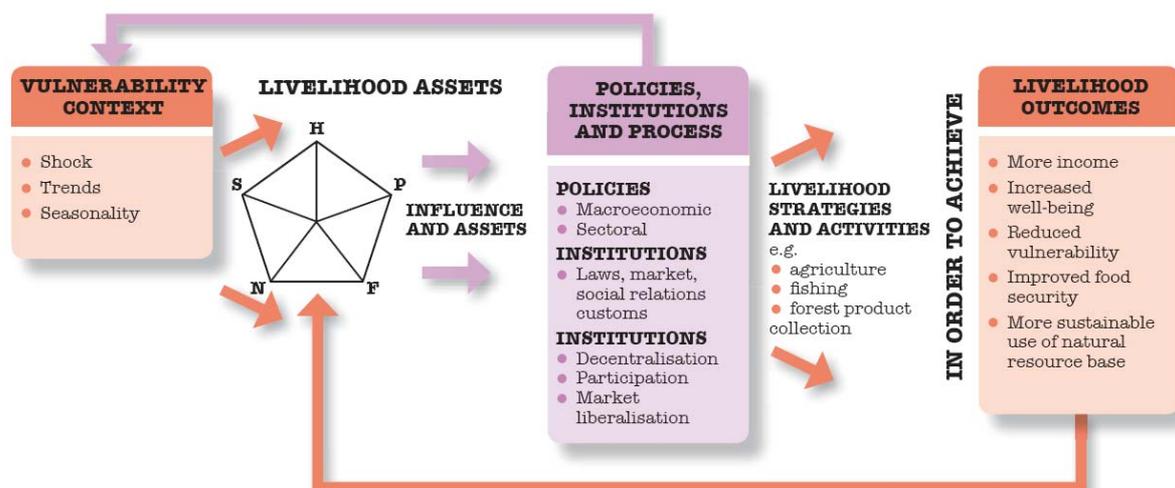
The overall objectives of livelihood research are as follows:

- To analyse the character, productivity and levels of aquatic resource use in highland fishing and farming communities.
- To better understand the role of highland aquatic resources derived ecosystem services in benefiting the poor and sustaining societal systems.
- To assess the multiple livelihood strategies of households dependent on highland aquatic resources derived goods and services, and understand how the use of aquatic resources varies according to the gender, age and social class of users;
- To identify the effect of seasonality, trends and shocks on access to ecosystem services and understand the impact on producers, intermediaries, consumers and society.
- To identify conflicts and tension between livelihoods described and to develop potential reconciliation strategies proposed in Livelihoods Action Plans (LAPs).

1.2 CONCEPTUAL FRAMEWORK & METHODOLOGY USED AND SOURCES OF DATA

An adaptation of the sustainable livelihoods framework which was developed by the Department for International Development (DFID; UK government) is used in this report. The sustainable livelihoods framework presents the main factors that affect people's livelihoods, and typical relationships between these (see Figure 1-1). The key concept illustrated here is that household livelihoods are based on the use of assets in livelihood strategies and activities. This is within a vulnerability context, and livelihoods are also mediated and affected by "policies, institutions and processes". Ultimately activities lead to outcomes which are hopefully able to improve the existing condition in various ways (IUCN, 2009).

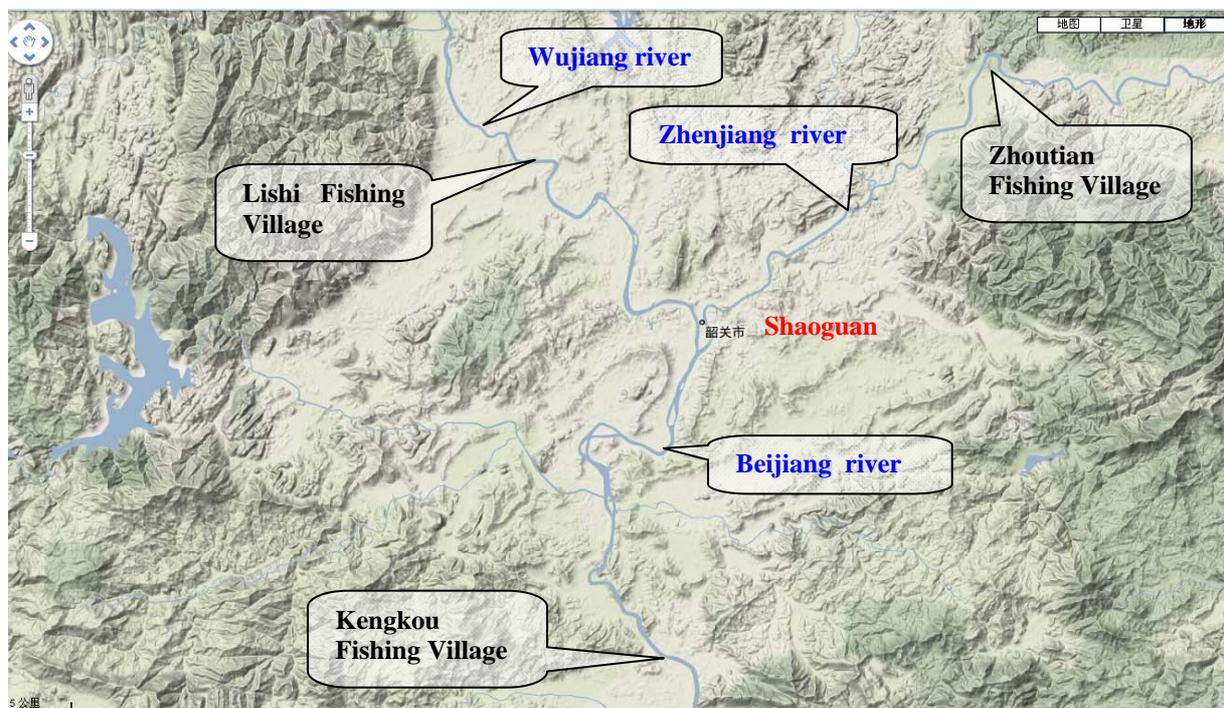
Figure 1-1: The Sustainable Livelihoods Framework (SLF from DFID).



Source: H: Human; P: Physical; F: Financial; N: Natural; S: Social (Oliver Springate-Baginski, David Allen and William Darwall, 2009)

To understand the livelihood status of the research site, we selected three fishing communities for detail surveys; Lishi, Kengkou, and Zhoutian (see Figure 1-2). Lishi is located at the lower end of the Wujiang River which flows into the Beijiang River from the north-west. There are about 70 households in the community and about 30 households depend upon fishing. The major characteristic of this community is that it located along the river and the channel is particularly deep. Kengkou is located on the Beijiang River downstream from Shaoguan city.

Figure 1-2: Locations of the three selected fishing communities of this research project. Note that all sample communities are located in the mountainous area of the upper reach of the Pearl River and villagers are heavily dependent on fishing.



(sources: <http://www.chinabaik.com/article/sort0525/sort0543/2007/20070801157011.html>, <http://www.ipe.org.cn/index.jsp?qybh=1911> and Google Map)

There are around 50 households living in the community, of which about 30 depend upon fishing. The major characteristic of this community is that there are some industrial firms which emit the pollutants into the river. Zhoutian is located on the Beijiang River upstream from Shaoguan city. There are around 60 households in the community and about 30 households depend upon fishing. The major characteristic of this community is that the river is quite shallow because of the hydro power station upstream. Furthermore, unlike the other two communities, there is a community committee responds to the management of the community including fishing. Seven primary research tools were utilised for this study, and are outlined below (IUCN, 2009):

1) Stakeholder interviews: we interviewed government officials, representatives of sanding mining companies, industry firms, restaurants, farmers, and fishers to understand the general situation and conflicts among them.



Figure 1-3: Discussion with different stakeholders in Shaoguan

2) Market surveys: We visited the wholesale market and free market to survey the fish species and the price of the fish.

3) Key informant interviews: Generally, we interviewed the leader and some elder fishers of each fishing communities.

4) Village group discussion and PRA exercises

- **Wealth ranking:** Wealth ranking was conducted in each of the three selected fishing communities. We asked the leader and some elder fishers to help us rank the fishers into three categories as poor, medium and rich. We used the main assets own by fishers as an indicator to rank the families (see Figure 1-4).
- **Institutional reviews:** We asked respondents from different focus groups (divided by gender) the rule or policies about fishing and usage of other natural resources such as forest.

- **Delphi method:** This was used to understand the views of multiple stakeholders on the management measures which may improve the management of for aquatic resources and improve the livelihood of fishers.
- **Village livelihood timeline:** We asked respondents from different focus groups (divided by both gender and age) to tell us how their livelihood changed over the past 5 or 10 years, including things that have got worse or better, and some general points on environmental change.
- **Resource mapping:** We asked respondents in different focus groups (divided by gender and age) to map the river and the location of their primary livelihood activities (see Figure 1-5).

Figure 1-4: Wealth ranking, Kengkou



Figure 1-5 Mapping in Focus Group, Zhoutian



5) Focus group discussion and PRA exercises (separating groups by gender and age): Focus groups were conducted in three selected fishing communities with separate groups of women, men, girls and boys, to understand their livelihood activities, strategies, attitudes, and their local knowledge.

Figure 1-6: Focus Group with Women, Zhoutian



Figure 1-7: Focus Groups with Children, Zhoutian



6) Participant observation: Dr. Fraser Sugden and one of the graduate students, Mr. Cai Jian stayed around two weeks in and around the three selected communities with the fishers to observe their lives.

Figure 1-8: Focus Group with Men, Kengkou



Figure 1-9: Focus Group with Women, Kengkou



7) Household surveys: Three fishing communities were selected in the Beijiang River watershed, Lishi, Kengkou, and Zhoutian. 30 households of each community and totally 90 households were surveyed to understand their livelihood activities, livelihood assets, etc. All the quantitative data used in this report is from the field survey of HighARCS project.

Figure 1-10: Household Survey, Kengkou



1.3 BRIEF OVERVIEW OF THE CONTENTS OF THE REPORT

The second part of the report discusses the livelihood strategies of people in the research sites, where people are heavily depending upon aquatic resources. The evolution of livelihoods was also discussed. Part three evaluates the livelihoods strategies of households and levels of dependence upon aquatic resources according to their wealth group or 'class' position. Economic power relations, market and credit relations of different wealth groups and their access to political power and social networks are also discussed. Part four discusses the environmental changes of the watershed and their impact on aquatic resources. Part five summarizes the national and provincial policies and institutions related to aquatic resources and discuss the impact of local management regimes on aquatic resources. Part six and seven focuses on gender and age issues, analysing the intra-household division of labour, intra-household power relations and the different understandings of the environment by

different gender and age groups. Part eight discusses the non-use value of the aquatic resources based on gender and age. The last part concludes the focus issues faced by the fishes and put forward some suggestions to improve the ecosystem and the livelihoods of fishers.

2. LIVELIHOOD STRATEGY

2.1 OVERALL LIVELIHOOD STRATEGY AND RELATIVE DEPENDENCE UPON AQUATIC RESOURCES

In the watershed of Beijiang River, the livelihood strategies of different social groups vary considerably, particularly according to whether they are traditionally engaged in agriculture or in fishing. While the focus of this study is on fishing households, who are most dependent upon aquatic resources, it is important to look at the livelihoods of peasant farmers, given that they represent the majority of households in the rural parts of the watershed.

To the agricultural communities, the main livelihood strategies include cultivation of grain staples and cash crops, the trade in agro-products, livestock raising, and work in urban areas.

At the end of 1970s and the beginning of 1980s, rural reform was taken place in China. Before that, farm lands were collectively owned by the production team of the village community and the farmers worked collectively. Agricultural products were bought by the government and farmers got payments from the production team according to their work hour contributed to the production. After the rural reform, although the ownership of land remained unchanged, the right of land use was switched to individual farmers. Most of the farmers contracted with village community to get the use rights of arable land for farming. All the products belong to the farmers who produce them. Therefore agriculture is one of the important livelihood strategies in rural areas. The main crops cultivated include rice, maize, potato, tobacco, peanut, soybean and sugarcane. While some farmers are subsistence farmers, others specialize in the market oriented production of vegetables, fruits, or some other cash crops. Most of the subsistence farmers only sell their surplus produce after they have met their family's subsistence needs. The commercialised farmers on the other hand, such as the orange cultivators inland from Zhoutian, buy their staple foods from the market and sell their cash crops (see box 2-1).

Interestingly, farmers rarely engage in fishing activities, even those who live alongside the the Beijiang River. An important reason may be because they do not have a fishing license.

As with fishers, farming livelihoods are complemented by income from family members working outside the village. In most households, young people and some middle aged farmers work outside the community, with only the elderly and children staying in the community. This is different from the fishers where many middle age persons still reside within the village for fishing. To most of the households of fishers, only the young people are working outside. This may be because fishing requires the cooperation of two people, usually, husband and wife.

Most of the households in the agricultural communities raise livestock, and the main animals include pig, chicken, aquatic animals and silkworm. Some households specialize in raising one type of animal and on quite a big scale. Livestock production is therefore on a much larger scale than in the fishing communities.



Figure 2-3: Fish Raising at Nanshui Reservoir by floating net-cage method

Although farming households' *direct* dependence on the aquatic resources of the Beijiang river basin is limited, it is important to note that across the watershed, they are still *indirectly* dependent upon its resources. For example, farmers throughout the watershed use the river for irrigation. Although there is also some fishing in the upland villages along the river, it is mostly on a small scale, and fish are caught mostly for family consumption. In the past, many of the highland communities had raised fish in their rice fields. However, due to the use of pesticides, the rice paddy ecosystem is no longer suitable for fish raising.

There are still some fish raising activities in the Beijiang watershed. Although there are some small scale household enterprises run by peasants or fishers, many are large scale capitalist businesses. The Nanshui reservoir in particular, was once popular for fish raising. However, as a result of a blue-green algae blooming 2009, the government called for a phasing out of fish raising (see Figure 2-3). It now hopes to turn the reservoir back to a pure resource for drinking water.

There are some more unusual indirect uses of the river ecosystem that benefit farming households. The region around Nanling mountain national park is popular for activities such as rafting (the small hydro dams release water to make this possible when the levels are low!), and the gorge is a popular tourism site because of its natural beauty. The benefits for farmers through tourism however, are mostly indirect. For example, some tea growing households in the upland villages sell their produce to tourists who pass through. There are also some restaurants set up by the river or even on the river such as those, in the Shaoguan urban area.

Box 2-1: Diversification of Livelihood Strategies in Agricultural Communities in Beijiang Watershed

Inland from Zhoutian village there is a valley with extensive orange cultivation. They began orange cultivation 20 years ago. They learned themselves to produce oranges and did not receive outside assistance. In this area, many farmers buy rice and sell cash crops. However in the villages by the river, the farmers are primarily subsistence producers with a focus on rice. The farmers in the valley are wealthier than the fishermen and the farmers by the river. In the highlands of Ruyuan county and parts of southeast Hunan which also fall within the Beijiang watershed, livelihoods are very diverse. There is considerable tea cultivation. Many of the farmers in Zhong Jia village in southeast Hunan were shifting their agricultural land to tea plantation due to the suitable soil and weather. The most expensive tea is 200 Yuan RMB per kg, and the cheapest tea is about 40-50 Yuan RMB. It is home for the Yao minority as well as Han people. Interestingly, in this village, there had been much less out-migration due to the favorable agricultural conditions. The higher altitude gives them a competitive advantage over the lowlands in production of certain crops, such as tea. They also produce honey and vegetables to sell. (*informal discussion near Nanling, 2010-07-24*)

While the farmers utilise aquatic resources directly, the fishers who live along the Beijiang River are mostly *directly* dependent upon in the aquatic resources of the watershed, which is why they are the focus of this study. Fishing is central to their lives, particularly for the older generation, although it is increasingly supplemented with alternative livelihood activities such as the trading of fish, working outside as labourers, raising livestock and gathering wood from the river and forest.

Generally fishers use seine nets and cages. The cage nets are put out in the water for a long period, and they are only picked up once day to see if any fish have been trapped there. The seine nets are left out overnight and collected in the morning. Fishing couples usually go out in the evening around 5 to 6 pm and return in the early morning. On their return they go directly to the market to sell their fish alive. The vast majority of harvested fish are sold and are seldom retained for personal consumption.

In the three selected fishing communities, the households' livelihoods are dependent upon fishing to some extent (see Table 2-1). In Lishi, Kengkou and Zhoutian respectively, 80.64%, 78.14%, and 53.33% of the households are engaged in fishing. Furthermore, 35.48%, 34.38%, and 3.33% of households respectively, entirely depend on fishing with no alternative sources of income. It is clear that households in Lishi and Kengkou are more dependent on fishing than Zhoutian. This may be due to the fact that there are less aquatic resources in the Zhoutian section of the river which is located upstream. For this reason around 66.67% households depend upon outside laboring in Zhoutian. Although most of the income of fishers actually comes from outside laboring in this context; fishing is still essential to supplement their livelihoods, particularly for the older generation.

Table 2-1: Percentage of households' income from fishing or laboring in the three sampling villages

Name of the sampling village	Lishi	Kengkou	Zhoutian
100% of income from fishing	35.48%	34.38%	3.33%
50%-100% of income from fishing	25.81%	28.13%	30%
under 50% of income from fishing	19.35%	15.63%	20%
Total household which have income from fishing	80.64%	78.14%	53.33%
100% of income from laboring	9.68%	0.00%	6.67%
50%-100% of income from laboring	25.81%	12.50%	36.67%
under 50% of income from laboring	12.90%	6.25%	23.33%
Total household which have income from laboring	48.39%	18.75%	66.67%

Data sources: from household survey in the selected fishing communities

Aside from fishing itself, some women earn income from collecting the harvested fish from the fishers and selling it in the market. A particularly important income source to the households with grown up children is from work carried out by sons and daughters outside the village. Usually, they work in cities or towns in industrial sectors such as transportation, trade, manufacture, and construction, or service sectors. In most of the fishing communities, fewer and fewer young people continue to engage in fishing today. Not only themselves but also their parents, anticipate finding a job in the city or town.

Although the Beijiang valley is well cultivated, most fishers do not own any arable land, and agriculture is limited to some very small plots for vegetables for family consumption (see Figure 2-1). Most vegetable plots are along the river bank or behind fishers' living houses; although some households acquire plots of land which have been abandoned by agricultural households due to the distance from the farming village. Most of the households raise very limited livestock on their small plots. Some households even raise chickens on fishing boats themselves (see Figure 2-2).

Figure 2-1: vegetables plots in fishing communities



Figure 2-2: Raising chickens on fishing boat



Other important livelihood activities include the gathering of wood from the river or the forest as fuel, and the collecting of debris from the river. In one of the selected fishing communities, Zhoutian, women in buy vegetables from farmers and sell them in the market to increase their income. The livelihoods of some poor households are also dependent upon the help offered by their relatives and the government.

Today, most of the people engaged in fishing are quite old. The ages of the youngest fishing group are about 31-32 years old.

2.2 EVOLUTION OF LIVELIHOODS

The difference between the farming and fishing communities can be better understood when one considers that fisher families have been engaged in this unique livelihood strategy for generations, as was suggested by oral histories conveyed during the interviews.

Around 200 years ago the ancestors of the Lishi and Kengkou fishers, all of whom have the family name Luo, migrated there from Heyuan city which is located at the northeast part of Guangdong Province. In Zhoutian, it was reported that they came from Shixing County which is located at Shaoguan city, nearly 200 years ago. Before that they had been farmers. They were very poor and they used to farm tobacco. Because of increasing population and limited land, they came to Zhoutian to work pulling ferries. In those days the large boats would be pulled across the river by ropes along the bank. They migrated here to pull the boats. When they started their families, they found out that they were no longer possible to support their family with this low income. So they diversified their income by fishing, setting the foundations for their current livelihood

In 1957, mutual-aid teams were established among the fishers under the policy of the Chinese government. In this context, fishing cooperatives were established in 1958. In 1960s, fishing team were established on the base of the fishing cooperatives. At the end of 1960s, the fishers began to live on land with houses provided by the government and so they no longer had to live on their boats, as was the case in previous generations. Today, only a few households live on their boats. In Lishi for example, there are only 8-10 households living on their boats. In one case, the father has moved to boat to make way for his son's family in the house.

Under the centrally planned cooperative system before 1980, households would fish together. They would put their catch together within a community and sell them together to the government controlled market and would receive payment. Sand mining was also done collectively. In those days, sand was mined manually without any machine. They received payment according to work hours. In those days, although their lives were difficult, it was not significantly different from the present situation according to interviews, although there are more varieties of foods e.g. chicken, and pork now in their table than 30 years ago when there was only fish. However, their lives have transformed to a far lesser degree when they are compared to other groups in the society.

It was in decollectivisation drive of the 1980s that fishing began to be done privately by individual families. Some fishers also began to diversify their livelihoods, going outside for jobs. At that time, a lot of rural industries had begun to be established and most of the fishers went to these new industries nearby and were paid a salary. However, in the last 20 years, many small rural industries were closed, and often replaced by larger enterprises in cities. This pattern of declining local job opportunities obliged fishers to return fishing or to find work in the cities (Box 2-2 and Box 2-3). Nowadays, more young people like to work outside and the situation of fishers is becoming increasingly insecure as fish stocks decline, making them increasingly poor when compared to their farming counterparts. The increase of fish price in the market could not catch up with the living cost.

Box 2-2: The Change of Livelihood Strategies in Kengkou

We were informed In Kengkou village that the wealthier people who live alongside the river, traditionally were those who involved in the river transportation industry. However, this sector has been in decline for many years. There was a large river transportation company shipping goods downstream from there. It was operated in cooperation with Shaoguan Municipal government who provided half the startup investment. However, around 10 years ago, due to the great progress in land transportation systems and the construction of dams across the rivers obstructing river transport channels, the corporation went bankrupt. There is a large building which was used for the employees of that company. This now stands empty with the exception of one retired man who chose to stay. The building can not be sold as the company was bankrupt and could not pay back the loan it owes. Although only few local fishers worked in this big cooperation, the negative impact caused by the bankruptcy of it on the local economy has had an indirect effect on the fishers.

There are some new factories in the surrounding areas of Kengkou such as an iron mine. However, whether the new industries will provide local work opportunities is not yet clear. We were told that only farmers work there, as well as poor laborers from Guanxi and Jianxi. We were told that the young fishers prefer to move to the big cities to find work rather than the iron mine nearby. The older people who remain in the village are too old to work in factories.

Box 2 -3: Change of Livelihood Strategies in Lishi

Around Lishi village, there were many closed down and derelict factories. Many of these were run as workers cooperatives in the 1970s by the fishers of Lishi itself. However, they could not compete with the larger enterprises and closed down 20 years ago. Sand mining became mechanized in the 1990s, and now few fishers work in sand mining. In this case, small scale sand mining operations in those days are now large enterprises, but with fewer labor opportunities.

Table 2-3: Evolution of the Livelihoods in the selected fishing communities

Time Period	Main Livelihoods Strategies
1950s-1980s	fishing collectively
	sand mining collectively
	boat-transport collectively
1980s-1990s	fishing individually
	working in local rural industries
1990s-nowadays	fishing individually
	working in the city

3. CLASS (WEALTH GROUP) AND LIVELIHOODS

3.1 CLASS DIVISIONS

3.1.1 Local definitions of wealth

As with any rural setting, the fishing communities of the Beijiang watershed are imbued with divisions and power relations. If one is to understand why households utilise aquatic resources in particular ways, and the distribution of benefits, it is important to assess the wealth differences or ‘class relations’ within the community.

The Sustainable Livelihood Framework asserts that one’s livelihood security is dependent upon their access to different forms of capital or ‘assets’. This has been framed as a series of different types of ‘capital’, i.e. natural capital (which encompasses river, lake and wetland ecosystems); human capital; social capital; financial capital and physical capital (Scoones, 2009). As discussed in the HighARCS overview livelihoods report (Sugden and Punch, 2011) there are often many overlaps between these different forms of capital. In this context, it can be useful to talk more loosely of ‘livelihood resources’ or ‘assets’ as the material and social resources which shape livelihood options. These may include aside from wetland resources; access the means of production or productive assets, which were considered important to fishers and was observed in the survey, as well as education, agro-ecological knowledge and social networks.

Nevertheless, in order to give the respondents a voice in understanding the causes of relative prosperity and poverty, the wealth ranking exercise was used to divide the population into three categories which formed a basis for stratifying the sample, namely ‘rich’, ‘medium’ and ‘poor’. When deciding which category to place households, a number of local criterion were used to define wealth by respondents in the community. These local measures by no means contradict the ‘assets’ based criterion used in the development literature. The amount of material goods owned by households was a particularly important local measure of wealth in the three selected fishing communities. The goods identified can be divided into productive and non-productive (consumption) assets. Measures based upon productive asset ownership include firstly, the size of one’s boat and the type of fishing equipment owned by a household. Non-productive assets, ownership of which also signifies wealth, include TV sets, refrigerators, air conditioners, water dispensers, motorcycles, bicycles, telephones, mobile phones, washing machines, and water heaters. Furthermore, having family members working outside is also important for a household’s wealth because it provides a more secure source of income. Skills were also reported as important determinants of wealth, and being ‘good at fishing’ was linked by respondents to the relative prosperity of a family.

3.1.2 Household wealth category within fishing communities

On this basis, a number of differences could be observed between those households classified as ‘rich’, ‘medium’ and ‘poor’ respectively. As one would expect given the criteria for defining wealth, there are significant differences in asset ownership between households in each category. The first set of assets where differences can be observed relates to housing. In the fishing communities, a few of the households have their own houses, while most of the households live in the houses provided by the government 30 to 40 years ago

(see Table 3-1). These houses were provided free to the fishers. Nevertheless, there are still some of households who must rent a house from local government or live on their boats because the deterioration of the old houses or an increase in family size (see Table 3-1). In the three selected fishing communities, 90.31% of the rich households live in houses and only 9.68% of the households live on their boats, while 83.33% and 87.1% of the poor and medium households respectively live in houses and 16.67% and 12.9% of the poor and medium households respectively live on their boats (see Table 3-1). There are also some differences among the three sampling communities. In Zhoutian, all the households surveyed live in their houses while there are still 30% of the rich households in Lishi living on boats. Some rich households not only have their own houses, but also have bigger houses with more rooms, and higher quality cement concrete structures. All houses have electricity, but the households on boats only use kerosene for lighting.

Table 3-1: Housing Asset of Wealth Group

community	Poor Group		Medium Group		Richer Group	
	%household living in house	%household living in boat	%household living in house	%household living in boat	%household living in house	%household living in boat
Lishi	60	40	72.73	27.27	70	30
Kengkou	90	10	90	10	100	0
Zhoutian	100	0	100	0	100	0
Average	83.33	16.67	87.10	12.90	90.32	9.68

Data sources: from household survey in the selected fishing communities

While housing is important, it is a non-productive asset. Fishing apparatus on the other hand is a more significant set of assets where differences in ownership can be observed according to wealth category. Figure 3-1 demonstrates that the value of fishing equipment owned by households increases for medium and rich households respectively. This is likely due to the fact that richer households, particularly those with secure outside sources of income, can afford to invest in more advanced equipment and newer boats.

Figure 3- 1: Estimated average value of household assets (Rmb) by wealth group

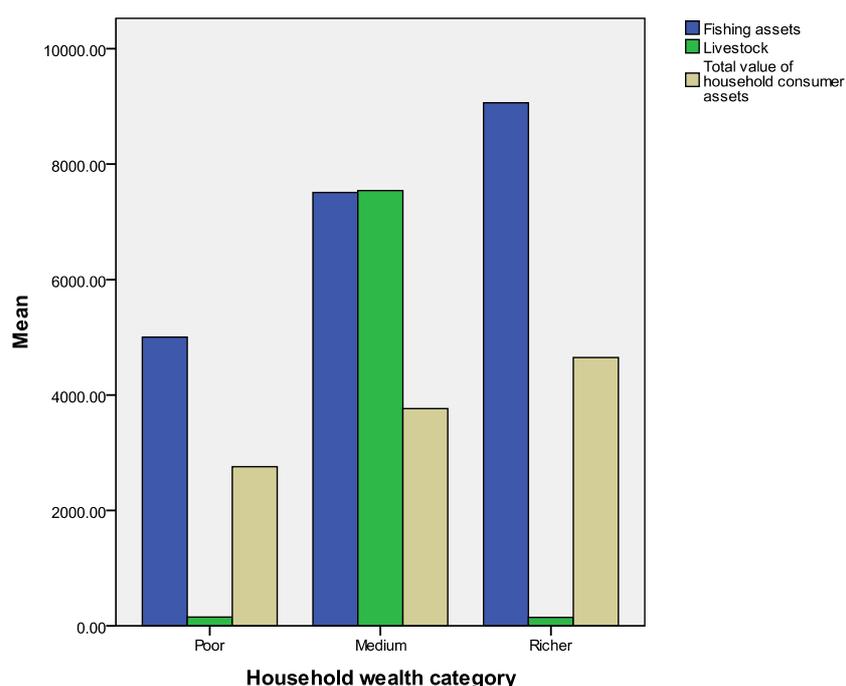


Table 3-2 Fishing assets of the wealth group in the three selected communities

Fishing assets	Wealth group	Lishi	Kengkou	Zhoutian	Average
Number of fishing nets	Poor	28.86	8.78	7	16.17
	Medium	31.18	9	4.89	16.67
	Rich	22	16.44	11	17.63
Number of creels	Poor	28.57	72.78	0	47.50
	Medium	32	35	3.44	23.26
	Rich	21.50	261.11	0	106.88
Number of fishing boats	Poor	1.29	0.89	1	1.06
	Medium	1.09	1.29	1	1.11
	Rich	1	1.44	0.8	1.125
Number of motor for fishing boats	Poor	1	0.67	1	1
	Medium	1.09	0.67	1	1
	Rich	1.1	1.22	0.8	1.08

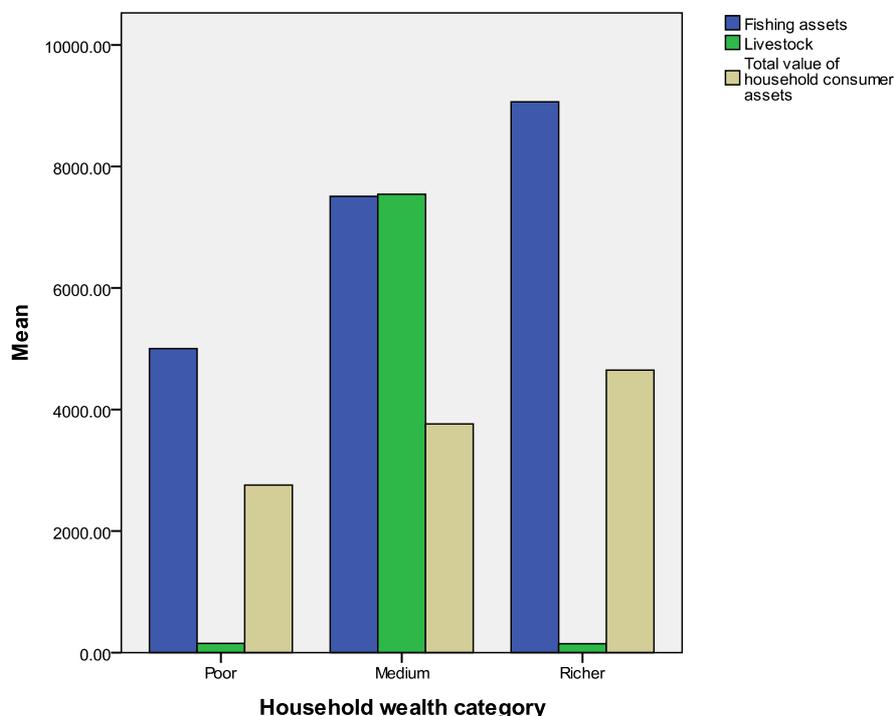
Data sources: from household survey in the selected fishing communities

The average number of fishing nets, creels, fishing boats and motors of the rich group are 17.63, 106.88, 1.125, and 1.08 respectively, higher than those of the medium and poor group (see Table 3-2). Differences are particularly noticeable in Lishi and Kengkou. In Lishi, most of the fishers use fishing nets and creels together, while the medium group has more nets and creels which may indicate that as a group they depend more upon fishing. In Kengkou, more fishers use creels, particularly the rich group who can afford the additional investment. In the survey, some of the fishers said they would invest more in creels because there have been more shrimps in recent years.

Table 3.2 also demonstrates that most of the fishers have their own fishing boats, most of which have a motor. The average number of fishing boats in the poor group is about 1.06 which is only slightly less than that of the medium and rich group. Nevertheless, there are three households who do not own a motor-boat in the poor group while there are only two and one households in the medium and rich group respectively without motor boats. Furthermore, the richer households on the whole have larger fishing boats and larger motors. Table 5-3 notes that the average size of diesel subsidies taken for 'rich' households are higher than those in the 'medium' and 'poor' group. Given that the level of subsidy available is based on the size of the motor, this indicates that the motors in rich group are generally bigger than in the medium and poor group particularly in Zhoutian. It is worth noting that although Table 3.2 suggests that the average number of fishing boats and motors in the rich group is less than in the medium and poor group in Zhoutian, this is because only 50% of the households in the rich group are engaging in fishing in this community. On the other hand, in Zhoutian, there are six and eight rich and poor households respectively do not have fishing boats which indicate that more households do not depend upon aquatic resources in Zhoutian. The aquatic resources are more scarce in Zhoutian, which is located at the upstream of the Beijiang river. Interestingly, to the rich group, less aquatic resources forced them to find other opportunities to improve their livelihood but, to the poor group, it is very difficult to them to sustain their livelihoods.

Richer fishers not only have access to better productive assets, but also invest more in fishing on a day to day basis. Figure 3-2 suggests that average expenditure on variable costs such as diesel and net maintenance is significantly higher for those households classified as rich and medium.

Figure 3-2: Variable costs for fishing by wealth group (Rmb)



Another productive asset which varies according to wealth is land, although this is not as significant as only a small portion of the land is used for agriculture. Rich households with ownership of land possess an average holding of 113m², compared to 89m² for medium and 65m² for poor households. The above figure on land does not however include two very large holdings owned by two rich households in Zhoutian, at 20130m² and 40480m² respectively.

As one would expect, aside from owning a fewer productive assets, 'poor' households also own fewer consumption assets than the 'medium' and 'rich' households (Table 3-3). As Table 3-3 shows, around 66.67% of the poor households own TVs while 90.32% of the medium and rich households own one. Refrigerators are important to the fishers not only as a consumption asset but also as a productive asset to store the fish. 16.67% in the poor group own their refrigerators while this number is 51.62% and 58.06% for the medium and rich group respectively. Not too many households own motorcycles and bicycles. There are only 13.33% and 23.33% of the poor households who own motorcycles and bicycles respectively and this is also less than the rich group. Most of the households own mobile phones particularly the rich households, but few households own fixed telephone lines as it is more convenient to use a mobile phone. Interestingly, Lishi is an exception as more households of the poor group own consumption assets, such as TV sets, bicycle, computers and DVD players than the medium or even rich group. The fishers from poor households in this village told us that most of these assets were gifts bought by their children or relatives.

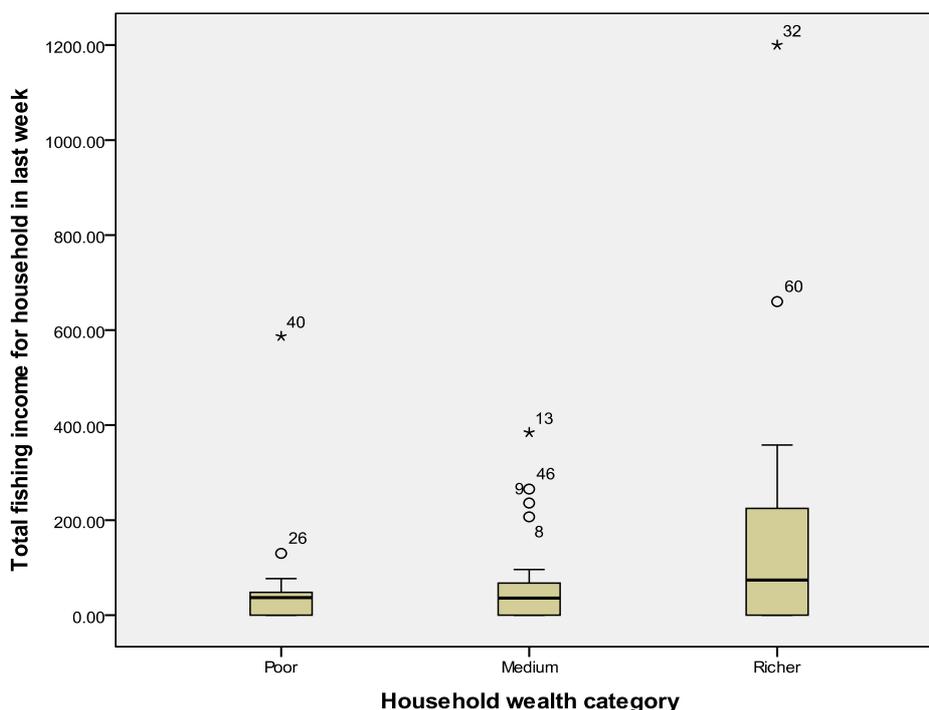
Table 3-3 Percentage of Household who own consumption assets by wealth group (%)

Consumption assets	Wealth group	Lishi	Kengkou	Zhoutian	Average
TV set	Poor	70	80	50	66.67
	Medium	90.91	90	90	90.32
	Rich	80	100	90	90.32
refrigerator	Poor	20	10	20	16.67
	Medium	45.45	50	60	51.62
	Rich	30	63.64	80	58.06
motorcycle	Poor	10	10	20	13.33
	Medium	0	30	50	25.81
	Rich	20	27.27	40	29.03
bicycle	Poor	30	20	20	23.33
	Medium	27.27	10	20	19.35
	Rich	60	18.18	30	35.48
telephone	Poor	30	30	10	23.33
	Medium	27.27	40	40	35.48
	Rich	20	18.18	70	35.48
Mobile-phone	Poor	70	30	60	53.33
	Medium	81.82	60	70	70.97
	Rich	90	63.64	90	80.65
Air conditioner	Poor	10	0	0	3.33
	Medium	0	0	0	0
	Rich	10	18.18	40	25.81
computer	Poor	10	0	0	3.33
	Medium	0	0	0	0
	Rich	0	0	10	3.33
DVD	Poor	20	10	0	10
	Medium	20	0	0	6.45
	Rich	0	20	0	6.45
water dispenser	Poor	10	0	10	6.67
	Medium	27.27	20	0	16.13
	Rich	20	36.36	40	32.26

Data sources: from household survey in the selected fishing communities

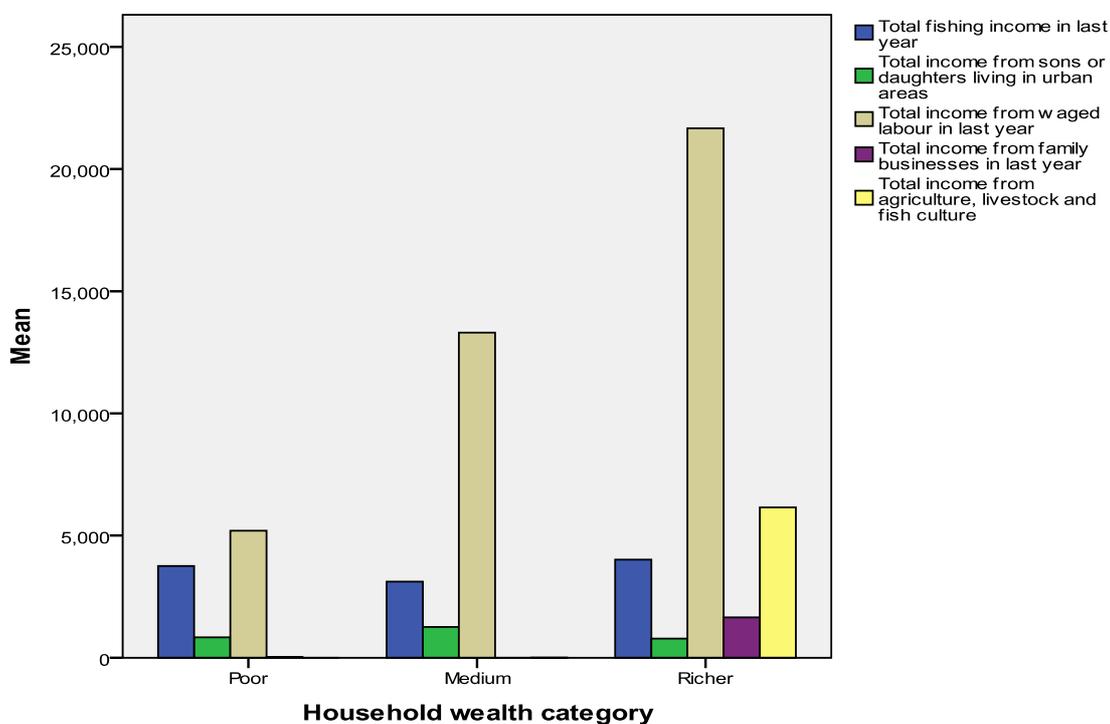
It is now important to explore the implications of these differences in asset ownership on income. Given the higher levels of investment in fishing equipment, it is understandable that Figure 3-2 suggests the average fishing income for ‘rich’ households reported over the last week (on the date of survey) is considerably higher than that for ‘medium’ and poor households respectively. Although this data only includes those in our interview samples who still practice fishing as a livelihood strategy, it is clear that many households have not been fishing in that last week, which explains why the box plotted in Figure 3-4 is heavily skewed towards the bottom of the scale. Nevertheless, out of those who have been fishing, it is evident that with the exception of a few outliers, poor and medium wealth households have a far lower fishing income, and that rich households have the highest fishing income. Excluding outliers, the top fishing income quartile for rich households ranges between 223 to 358 Yuan RMB, while for poor and medium households it ranges from just 47 to 77 Yuan RMB and 75 to 96 Yuan RMB respectively. If we look at the outliers, it is evident that the highest income recorded belongs to one rich household, is a substantial 1200 Yuan RMB. This is understandable given the higher levels of investment in fishing assets by wealthier households.

Figure3-2: Total fishing income in the last week by wealth group (not including non-fishing households) (Rmb)



Note, the shaded boxes represent the middle two quartiles of income (the middle 50%), while the thick black line represents the median value. The vertical line marks the top quartile, with the bottom quartile virtually invisible due to the skewed data. The points represent outliers, extreme cases that are numerically distant from the rest of the data.

Figure 3- 3: Total average annual income by wealth group according to livelihood activities (Rmb)



While asset ownership is important to determine income from fishing itself, Figure 3-3, suggests that other factors raised by the respondents in the wealth ranking are in fact more significant in determining the overall wealth for poor, rich and medium households. It is clear that the higher income for rich households appears to emerge particularly from waged labor outside the community, and to a lesser extent from fishing, agriculture, livestock, aquaculture and business. Average annual income from work outside the community is 5200 Rmb for poor households, 13,304 Rmb for medium households and a significant 21,667 Rmb for rich households. Due to lower levels of education, the old fishers find it difficult to find a job outside the community and mostly their children are responsible for this work. The percentage of the households with family members working outside of the rich group is 80.65%, which is much higher than the medium and poor groups which are 58.06% and 13.33% respectively. The average number of the family members working outside in the rich group is 2.28 and is also higher than the medium and rich group which is 1.89 and 2.07 respectively. This outside income is likely to be significant in explaining the higher fishing income of richer households as they will have greater access to money to invest in productive assets.

An overview of some of the other differences between households can give some insights into why richer households are more likely to have sources of outside laboring income. Firstly, it is clear that family members from the poorer households are on average older than those of the richer households, making it more difficult for them to acquire outside employment (see table 3-4). The average age of the household head of the poor group is about 59.43 years old while the medium and rich group is 49.84 and 48.84 respectively.

Secondly, richer households have on average a greater number of family members, suggesting that they have access to more labour or 'human capital', and in turn can send more sons or daughters to work outside the community. The rich group has on average 4.81 people in each family while the poor and medium group have 3.77 and 3.94 respectively. The average number of children of the 'rich' group is also higher than the 'poor' and 'medium' group.

Thirdly, the wealthier households have a greater level of educational achievement. Wealthier households are not only more likely to have family members working outside, due to the overall higher level of education, family members can acquire better paid semi-skilled jobs. For example, some wealthier households have sons or daughters working for the government or in the service sector. The percentage of households with children at school is about 49.41% in the rich group while it is 33.33% and 38.71% in the poor and medium group respectively. Furthermore, the schooling duration of children from the medium and rich group is 8.25 and 8.38 years respectively. It is equivalent to the level of junior middle. However, the education level is only 5.05 years in the poor group which is at the level of primary school. Richer households can afford to give their children more education. In general, children in primary school need their parents to look after them at home every day after school, while the children in middle schools and higher education stay in school during week days and only go home during weekends or holidays, while their parents may find a job in town or city to diversify their livelihood. The education level of the fishers is generally low and most of them have only got primary education. Some old fishers had no chance to receive any formal education. The average education level of the household head and their spouses of rich group are 4.87 years which is higher than medium and poor groups which are 4.47 and 2.27 years respectively. The average education level of the children in the poor group is 6.5 year while the children in the medium and rich groups can receive their education for 8.06 and 8.49 years respectively.

Although the free 9 year education policy is for every one now in China, the children of the medium and rich groups are younger than the poor group and hence catch up with the opportunity to receive more education.

Figure 3-4: Fishers' House at Lishi



Figure 3-5: Old Fisher living on boat



Table 3-4: Some Characteristics of Fishing Households among Wealth Groups

Household characteristics	Wealth group	Lishi	Kengkou	Zhoutian	Average
Average age of HH head	Poor	55.7	61.6	61	59.43
	Medium	44.18	56.2	49.7	49.84
	Rich	49.2	53.09	43.8	48.84
Average number of HH members	Poor	3.8	3.3	4.2	3.77
	Medium	4.55	3.4	3.8	3.94
	Rich	5.4	4.45	4.6	4.81
Average education level of the wife and husband (years)	Poor	3.45	2.7	0.65	2.27
	Medium	5.14	2.8	5.4	4.47
	Rich	5.4	5.86	3.25	4.87
Average number of children of each HH	Poor	1.9	1.2	2.3	1.8
	Medium	2.09	1.2	1.6	1.65
	Rich	3.1	2	1.7	2.29
Percentage of HH with children at school	Poor	40	50	10	33.33
	Medium	72.73	40	0	38.71
	Rich	60	36.36	30	41.94
Average education level of children at school (years)	Poor	7	3.8	3.5	5.05
	Medium	8.68	7.38	0	8.25
	Rich	8.42	10.75	5.17	8.38
Average education level of children of each HH (years)	Poor	8	4.29	7.56	6.5
	Medium	8.55	6.79	8.5	8.06
	Rich	8.31	9.9	7.25	8.49
Percentage of HH with members working outside	Poor	10	20	10	13.33
	Medium	45.45	40	90	58.06
	Rich	70	81.82	90	80.65
Average number of members working outside of each HH	Poor	2	1	2.43	2.07
	Medium	2	1.5	2	1.89
	Rich	2.71	2.22	2	2.28

Data sources: from household survey in the selected fishing communities

3.1.3 Accumulating, subsistence or coping? Theorising class stratification?

While there are clearly wealth differences within the fishing community, it is important to understand the power relations behind these divisions, and whether there are actually unequal class relations between households. In a study on Tanzania, Birch-Thomsen et al (2001), divides livelihood strategies into three types. An ‘accumulation strategy’, applies to households that are commercialized with a high income and reinvestment of profits to expand their asset base. A ‘peasant strategy’ on the other hand, entails limited market participation and subsistence orientation. Finally, a ‘coping strategy’, applies to households that struggle to meet their minimum subsistence needs, with limited income and dependence upon common property resources.

In the HighARCS overview livelihoods report (Sugden and Punch, 2011) this framework is combined with more conventional Marxian understandings of class stratification (Athreya, Boklin, Djurfeldt, & Lindberg, 1987; Patnaik, 1990). Classical Marxist analysis has placed a particular emphasis on ownership of one critical ‘asset’, the means of production. This includes land, machinery and tools, in other words the resources which allow *production* to take place. Ownership of the means of production tends to affect whether individuals or households are able to receive the full product of their labour. For example, if one does not own their own productive assets such as land and tools they may be dependent on assets which are rented from their better off counterparts. Similarly, they may be dependent upon menial labor for others, whereby they are paid a wage which just meets their subsistence needs. Conversely, those with substantial ownership of the means of production are often able to employ outside workers and produce more than they could as a household, and even rent out excess assets such as land or machinery, providing a source of wealth or ‘accumulation’. This forms the basis of unequal class relations.

There are certainly differences according to ownership of the means of production in the three communities, given the secondary role of productive assets such as boats and equipment in defining income. However, the discussion above has pointed to the fact that the primary source of income for many households is in fact from laboring for others, primarily in the urban sector. Fishing in this context is a supplementary activity, with variations in its profitability according to variations in asset ownership, which in turn are connected to the overall income of the household. There is by no means a significant accumulating class with extensive ownership of the means of production and on whom poorer households are dependent as both labourers or tenants, even within the ‘rich’ category. In fact, most of the surveyed households utilise family labour on their own boats, and actually sell their family labour to outside employers, let alone employ labour.

Nevertheless, there is some limited evidence of ‘accumulation’. One activity which potentially requires considerable capital investment and also offers opportunities for accumulation is fish raising. The two ‘rich’ households engaged in these activities could perhaps therefore be also classified as ‘accumulating’ households. Both of these two households employed outside laborers. Furthermore, both households were involved in other business activities. One household also owned a large pig farm, explaining the particularly high ownership of livestock assets evident in Figure 3-3 and high average agricultural income for ‘rich’ households. They have some land from where they sell bamboo also. The other household had a shoe business in the town. Some fishers reportedly own a lake behind the village which has been rented out to farmers to raise fish for the last 50

years. The rent is very low though, at only 200 Yuan RMB for one year and it does not offer a source of significant accumulation.

Although there clearly are divisions within fisher communities, the differences were insignificant when compared to the differences between the overall level of wealth for fishers and the economic position of neighboring communities. The majority of fishers, particularly those classified as 'poor' would probably more realistically fit into the 'coping' category, especially if they have health problems or no outside income source. Otherwise some may be categorized as 'subsistence'.

Within the fishing communities therefore, there was little evidence of unequal class relations, as the economic status of most fishers is poor. They themselves can be considered a 'class', with the exception of some of the few 'accumulating' households engaged in business activities. There is only one incidence for example, of fishers, renting out land to other fishers, and there is limited evidence of poorer households laboring for other fishers. In fact, cooperative relationships are more common. Sometimes brothers from different families go fishing together, while wives stay at home. This is reciprocal rather than exploitative relationship. When households face difficulties, such as those relating to children's schooling or medical treatment of household members, the fishers always borrow money from their relatives.

On the other hand, there were clearly unequal relations within farming communities. There are a greater number of farmers who could be classified as accumulating, but they are not included in the survey. In the valley above Zhoutian in particular, there is a wealthier village specializing in commercial orange production. There is some evidence of differentiation here.. The biggest farmer has 7000sqm of land while the smallest farmer has 1300sqm. Although most agricultural work is done using family labour, some households hire outside labourers to pick the oranges, either from the town or from within the village. Some evidence of early capitalist social relations therefore exist in agriculture. Nevertheless, this is limited, and many households still can not produce enough to subsist, instead depending on income from their sons or daughters who live outside. In the farming village adjacent to Zhoutian fishing village in particular, households are poorer, and there does not seem to be as much 'accumulation' of wealth. Farmers produce little for the market as their land holdings are smaller and after producing rice to eat, they often do not have enough land to put towards cash crop production. On average, land ownership was reported to be only 3 mu per household, while it is closer to 4/5 mu in the village in the orange growing valley. There is also some evidence of poorer farmers renting land from their wealthier counterparts, although rent is very low. Some people pay around 50-100 Yuan RMB per year for 1 mu to rent land from other farmers. Generally, this is due to the family members of the wealthier households working outside, so they do not have enough family labors to continue agriculture, thus renting some or all of their land to other households.

Between fishers and farmers, there was not evidence of unequal relations whereby fishers depend on their wealthier farming counterparts for their livelihoods. However, there are clearly significant disparities in wealth and in access to government resources. Furthermore, the gradual undermining of fishers livelihoods due to environmental change suggests some level of differentiation at a society wide level, whereby fishers are gradually alienated from their livelihoods, only to enter the urban and rural working class.

3.1.4 The labour economy and migration

As there are few differences in wealth between fishers within the community, and between fishers and farmers, it appears that the most unequal relations that fishers are integrated into are those with social classes outside the village. Most notably, this occurs through the laboring for others in urban areas, the work which many are dependent on.

While sometimes work is available in the vicinity of the village, more commonly, young adults, predominantly males, have to spend long periods away from their homes living in the factory accommodation and working long hours and sending money home. Sometimes family are not even allowed into the compounds to visit their sons/daughters. For example, one worker from the village was sick, but his father was not allowed into the compound to give him medication. Sometimes however, young men migrate with their wives and children and live as a family, sending limited funds to their parents periodically. The out-migration of this group is a primary reason why fishing and the overall composition of the village is becoming increasingly dominated by the older generation. Generally, men work in factories in the burgeoning industrial economy, while women more often work in the service sector (e.g. in restaurants). While few households work for others within the village in aquatic dependent activities, a phenomenon we heard of in Lishi was for fisher households to move to the large cities and operate boats as small businessmen, utilizing their skills acquired through fishing. Most of these boats are for transporting sand, and 80% of those doing this kind of work go to big cities down stream like Foshan or Guangzhou.

It is considered that the households with family members working outside are richer than the households without members working outside, particularly to those households without members working outside. They thought that members working outside can send money back to the households. Generally, the money sent back by the members themselves when they come back during holidays or festival. Some young people who have a stable job with higher rewards may remit money to their parents monthly. Whatever the work, the households with members working outside perceive that the life of urban workers is generally difficult. Payment is around 1000-1200 Yuan RMB per month for a 9-10 hour day doing unskilled factory work. Most concurred that this was not enough to support a typical nuclear family (i.e. husband, wife and children), particularly when additional funds need to be given to the extended family (i.e. parents), so households usually combine factory labour with other livelihood activities. When the family resides within the village this of course includes fishing. However, for families who live outside the community this may involve the other partner, normally the wife, seeking other work to supplement their income. Alternatively, by extending the working day to up to 12 hours they can maybe earn 1600 Yuan RMB/month which is sufficient.

Most of the young people hope they can find a good job with high rewards and can stay in the urban as an urban citizen as well as their parents perceive. But this is quite difficult to these young people particularly to those with less education. Only the young people who graduated from the university may have more opportunity in the urban area but still not easy. Few young people return to the fishing communities. Only one we met in the fishing community who returned from the urban area. Sometimes, if the young people can not find a suitable work, they may come back for a short period and return to the area again if they have other opportunities. The young men we met is a leader in the community and told us that he prefers to the freedom as a fisher. What is

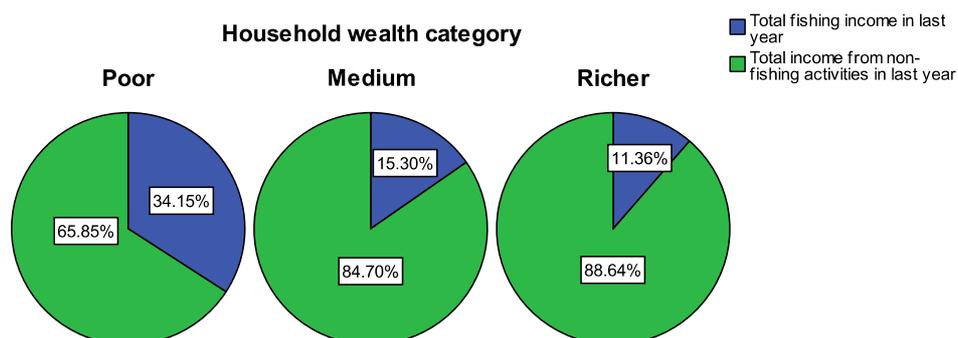
interesting however is that even when the nuclear family can be supported by factory employment, fishing is still important to support the older generation. Most of the older fishers stated that they were too old to work in factories, and the income provided by sons and daughters was not enough to support them, particularly when the entire family was living outside. To some extent, fishing can be considered as a subsidize to the livelihoods of the fisher households, particularly to the households whose members work at the local area; but to the households whose members works in the urban area, the money they send back to the household is a subsidize to the livelihoods of the fisher households

Along with the decline of fish stock, all the children and their parents consider that migration to the urban is the best way to improve their livelihoods. When the fishers were asked whether there would be no fishers in the future if all the young people migrate to urban, the fishers did not worry about that because they believe there are still some young people would come back if they could not find a job in the urban. Even the government also consider migration is a good method for the fishers and the aquatic resources and some programs have already been made to help the fishers to live on land and find a job in the urban.

3.2 DIFFERENT LEVELS OF DEPENDENCE UPON AQUATIC RESOURCES

Having established the differences in relative wealth within the community, the next critical question to ask is how this affects the level of dependence upon aquatic resources. While the rich households have an overall higher income from fishing, interviews suggest that the poor households are perhaps slightly more dependent upon fishing. Figure 3-7 suggests that as a group, fishing for poor households around a 34.15% of their combined annual income, while it is 15.3% for medium wealth households and only 11.36% for rich households.

Figure 3-7: Percentage of aggregate group income from fishing and non-fishing activities for each wealth category



These differences are understandable given that richer households have more outside sources of income from laboring in factories and the urban sector. Nevertheless, given the low wages for urban employment, most households in each wealth category still suffer from relative economic insecurity with ‘coping’ or ‘subsistence’ level livelihoods, and fishing is still a crucial supplementary livelihood activity, particularly for the older generation within the household.

The exception are the wealthiest households in the sample, such as the two ‘accumulating’ households in Zhoutian. While one of these households no longer fished given their alternative income, another still fished for three to four months of the year. It is clear however, that such households can by no means be considered ‘dependent’ upon aquatic resources, and that fishing may be more of an activity carried out for leisure or out of routine, an issue which will be discussed below.

3.3 MARKET AND CREDIT RELATIONS

There are several markets where fishers sell their produce in the early morning on their return from fishing excursions (Fig.3-8). There is the terminal market, retail market and free market in Shaoguan city. The terminal market is mainly for aquaculture products (Fig. 3-9). Fishers are seldom there since the number of fish harvested each day is very small. Generally the fishers go to the retail market or free market and sell their fish directly to consumers. Sometimes the traders or the restaurants may go to the boat to buy fish directly, but no formal or long-term cooperation exists. The fishers consider that it is convenient to sell the fish themselves directly to the end consumer. It does not require any permission, and they only have to pay 1-2 Yuan for market management.

Table 3-6: The price of the fish species in the selected fishing communities*

Fish species	price(Yuan/kg)	Fish species	price(Yuan/kg)
Mandarin fish	40	Snakehead fish	20
River Shrimp	40	Crucian carp	10.4
Yellow catfish	25.2	Silver carp	10.2
Large spiny eel	24.4	Goby	10
Ricefield eel	18	Local Crucian	9
Longnose gudgeon	17	Topmouth culter	9
Taihu lake icefish	15	White semiknife carp	7.8
Catfish	14.6	Common carp	6.2
Snakehead fish	13.6		
Grass carp	11.6	Tilapia	4.8
Onychosotoma gerlachi	20		

This table wants to show the big difference in price.

Fortunately the fishers appear to have relatively good bargaining power. . To identify the value of fish, they make enquiries in the town for price of raised fish whenever they go to sell. The price of fish caught from the river is usually a bit higher than that for raised fish, providing sellers a benchmark. River fish are sought over raised fish for the perceived better taste. Almost all sales are directly to consumers or restaurant owners, which increases the bargaining power of fishers as it removes the middle-man. Either way, the fishers actually do not harvest enough fish to necessitate going to a middle-man.

The price of different fish species is quite different. Some species which are very scarce are much more expensive than common species (see Table 3-6). In one fishing community we surveyed, a young fisher said that they would dry the fish if they can not sell all the fish, offering a higher return for selling the dried fish. The market price of fish fluctuates. Interestingly, the price for fish decreases when pork is expensive, as fish is considered a substitute for fish by some households in the region.

**Figure 3-8 Fishers sell their fish by themselves
Shaoguan in the morning**



**Figure 3-9 The early morning whole sale fish market
Shaoguan in the morning**



Few households take loans, which most fishers feel will not improve their economic status as well as having always been difficult to secure. Loans which are taken are primarily to pay education fees or health care expenses, to purchase food, to repair or build a new house, or to invest in new equipment and boats and repair existing apparatus.

If households need to make a large investment, most households do not have access to institutional credit as they lack sufficient collateral and complex for formal loan. , For this reason many households take loans from family members or other relatives who work outside. There are no private money lenders.

3.4 ACCESS TO POLITICAL POWER

Most of the fishers are very weak with little access to political power, which is a reflection of their class position in relation to other communities. The biggest inequality in access to political power was not between community members, but between fishers and the outside authorities and enterprises. There was an overall feeling of powerlessness by fishers, and there was a feeling that the state pays limited interest in their problems. There appeared to be a perception that the farmers have greater access to political power than the fishers and receive a lot more support from the government. For example, when the power station was built, many farmers apparently received good compensation for loss of land, while fishers received very little, despite the detrimental impact of dams on their livelihoods. Certainly the farmers appear better organized than the fishers. The respondents also noted that when there is a flood, the government expects the fishers to help by providing their boats and skills, but the rest of the time they are overlooked.

One wealthier family in Zhoutian reported how they were losing part of their fish pond due to the new Guangdong-Jiangxi railway. She said however, that they are only receiving 10 Yuan RMB per sqm compensation, when they should be entitled to 100 Yuan RMB. They felt powerless. What is however also interesting, is that this household was consulting a lawyer. It is good that they are aware of their legal rights. However, it would be interesting to see if poorer households would also have the same capacity to consult a lawyer. In the same discussion, the women said that most local fishers have limited education, and would not know how to consult a lawyer if the need arose.

One of the critical barriers in the context of Lishi and Kengkou was the lack of organization within the fishing communities, the presence of which may have increased their political power. When they need something they do not know who to contact. Only one community, Zhoutian, has an organized committee who can lobby the government to solve collective issues. It is particularly interesting that this community has a committee given that only 10 households live in the community, while the remainder (around 20) are scattered throughout neighboring villages, and in the local town. The leader was aware that because everyone is spread out it is hard for people to help each other. Nevertheless, there still seems to be a relatively strong leadership, and the fact that this remains a distinct community, despite the fact they are geographically dispersed is unusual. This may be because that Zhoutian has some forest land as collective assets. The committee rent the land to their neighboring village and the rent can be used to fund the committee.

In the other two select communities, Lishi and Kengkou, there is an informal leader for the community who is in contact with the Fishing Department of local government but there is not a formal committee such as in Zhoutian and no office for the leader where meetings can be held. The leaders in Lishi and Kengkou are younger and wealthier than the leader in Zhoutian. Although they do not think of themselves as 'leaders', they are considered as such by all the other fishers. The leaders of Zhoutian are more active, while the more informal leaders of Lishi and Kengkou primarily take responsibility for the transfer of information from the local government. When the fishers in Lishi and Kengkou require something, they have to organize for themselves and it is very difficult for them to protect their own rights.

A few older fishers are members of the communist party. One community leader has applied for a long time, but can not become a member. Nevertheless, it was not felt to be much use anyway for political power nowadays in the community and was perceived to bring few benefits.

The weak political position of the fishers renders them vulnerable to abuses of power, even within the communities themselves. In Lishi village for example, the nearby dam decided to compensate some of the fishers whose houses were flooded to build a block of flats behind the village. However, the son of a former leader had left the community with a large sum of the compensation money before the block was finished. There was no money to pay the contractor the rest of the money and the building was not yet livable. It now lies empty. Local people believed that the local authorities did not do anything to help. The person who had taken the money now lives in a house in Shaoguan. Local people in Lishi used this example to warn us of the difficulties of effective management. They said that it is difficult enough to manage a household, so it is very difficult to manage a whole village!

Despite the weak political power and limited organisation within the fishing villages, there are strong social networks within the community, particularly in Zhoutian. Fishers regularly discuss techniques and fishing grounds with each other. In the other two selected communities, most of the fishers said they often visited with each other in the same village and talked a lot.. Some of the fishers regularly get together with their friends or relatives and sometimes discuss fishing techniques and help each other when they meet some difficulties.

4. ENVIRONMENTAL CHANGE AND AQUATIC RESOURCES

By far the greatest challenge to the traditional livelihoods of the Beijiang river fishers has been the decline in fish stocks.. It was recorded in Lishi that as of 4 years ago households could earn up to 1000 Yuan RMB per month from fishing. They could catch 2 kg of Yellow catfish per day. Now they are lucky if they can catch just 1kg per week. The village leaders have been fishing for 35 years. In the years 1990-1995, it was reported in most villages that the fish stocks were highest and life was easiest. The biodiversity of fish stock has also declined, with a lot of fish species having decreased or disappeared.

There are a number of explanations for falling stocks. The effects of the hydropower stations on fish stocks are tremendous and potentially long-term (Fig.5-1). The influence of hydropower stations is complex due to the different forms and effects of the river ecosystem functions. Firstly, hydroelectric development has changed the ecological structure, such as hydrology, water quality, sediment, levels of aquatic organisms etc. Secondly, the effects are passed on from the river to shore through the gradual change of the moisture gradient, which has changed the ecosystem of fish habitats (Xiao, J.H., Shi G. Q., Mao C.M.,2006; Xiao J.H., Shi G.Q., Mao C.M.,2007; Mo C.R., Li X., Chen X.G.,2005). The direct impact is that the dams limit the migration of fish having a significant impact on the diversification of the fish stock and the stock of migrated species. Also, when the dam is opened, they lose many of the fish as they are washed downstream. In Lishi, which is upstream, fishers have had to change the nets they use for this reason. The water was much deeper after it was built so they had to use wider nets. In Zhoutian, the main problem is that the power station outflow causes the water to flow too fast much of the time. The fish are washed downstream. In all villages, the distance they can travel is now much less. In Zhoutian they now have only 5 km of the river where they are able to fish.

Figure 5-1: Hydraulic Power Station along Beijiang River



Sand mining is another important factor which impacts the level of fish stocks. Sand mining changes the structure of the river bed and water movement, as well as influencing the hydrological regime and sand silt characteristics. As a result, some river banks have collapsed, the water level has dropped markedly in some channels, fords have been revealed, and channels have become narrow with insufficient deep water, blocking the movement of boats (Han, L. X., Li W., Lu Y.J.,2005; Qian, Y.Q., 2004). It's evident that sand mining has a significant impact on flooding control, inland navigation, water storage, nutrient cycling, environment purification, and soil erosion which have also impacted the ecosystem of fish. In Zhoutian, the fishers said that

the river bed is no longer flat and water moves more slowly. Importantly, there has been a decline in water grasses , having a significant impact on fish breed.

It was only in the last 7-8 years that the water quality has really begun declining because of pollution. In the past, the fishers said they used to swim in the river. In Lishi, where the riverside population is high, the situation is particularly acute. In recent years growing urban prosperity has meant people buy many more manufactured products. As a result there is now much more rubbish in the river. Pollution from iron mines is more common around Kengkou. The fishers there reported that there are about 7 emission points along the river. Boat restaurants, sand mining boats and some fertilizer run-off also contribute to the pollution of the river but these are not so important when compared to the pollution from the factory. Recently new government regulations have encouraged industries to cut down pollution.

The farmers say that too many fish are caught and that is why the stocks have declined. Farmers also go fishing sometimes and that may also impact fish stocks. It was reported by fishers however that some farmers used to fish with electricity, a practice which is forbidden by the local government.

Storms and floods are particularly common in the months of April and May in Guangdong Province, and have reportedly increased in frequency. There was large scale flooding in 2006, especially in Lishi, whereby water reached the roofs of houses, lasting several days. This may have been made worse by dam construction. households lost assets. Many had to live on their boats for a long period while they repaired their homes. No compensation from government was provided though, only 30 kg rice for each household. Other large floods recalled by older members of the community were in 1976. In Zhoutian, the local people felt that flooding had actually increased in frequency after 1995 and this was due to deforestation of the surrounding hillsides. In another community, Kengkou, the river bank collapsed, including houses. This was probably due to sand mining. They also asked the government to give them help, but little support came. The neighbors therefore collected money together and used it to build a wall along the bank. The natural disasters have effect the livelihoods of the fishers, particularly the poor group.

Figure 6-1: Reinforcing dam built by fishers in Lishi

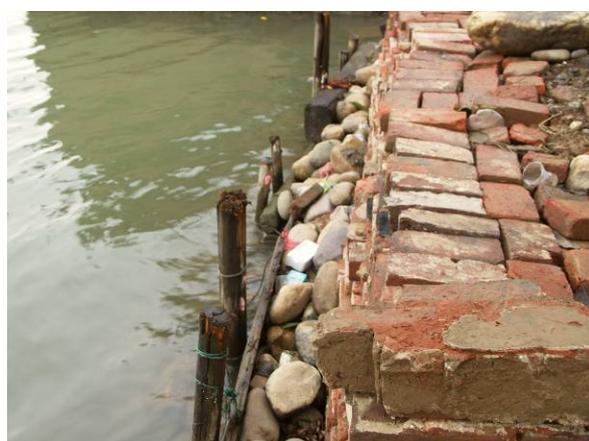


Figure: 6-2 Fishers living on a collapsed bank in Kengkou



5. POLICIES AND INSTITUTIONS AND IMPACT ON AQUATIC RESOURCES

5.1 NATIONAL POLICIES ON MANAGEMENT OF NATURAL RESOURCES

According to the Constitution of People's Republic of China and the "Environmental Law", the Chinese government is responsible for framing environment protection programs and establishing and managing nature reserves. The legal rules on management of key natural resources which relate to the ecosystem and natural resources include legal rules protecting key wild animals, water resources, aquatic resources, forests and farmland resources. All these rules are used as the principle for each of the province to protect the environment and natural resources.

According to national rules relate to environment and natural resources, Guangdong Province enact some policies and measures to regulate the use of the environment and natural resources. Some measures are taken in Beijiang Drainage Area to reserve and allocate the water resources in this area according to "Guangdong Management Ordinance of Water Resources of Dongjiang, Xijiang, Beijiang, and Hanjiang River Watershed" (2008). Pollution control is also emphasized in this area. Measures relate to wetlands protection are formulated according to "Guangdong Ordinance of Wetland Protection" (2006). Measures for protecting the fry and parent of rare aquatic animals are taken according to "Guangdong Management Ordinance for Fishery" (2003). These measures regulate that fishing of the fry and parents of rare aquatic animals should be under strict supervision and control and special licenses should be granted for the importation of alien species. According to "Guangdong Management Ordinance for Sand Mining in River Bed" (2005), measures for controlling the sand mining are formulated to define the behavior of mining sand. Measures relate to drinking water protection are also taken according to "Guangdong Ordinance on Protection of Resources for Drinking Water and its Quality" (2007). These measures and polices provide a foundation for the local management of environment and natural resources in Shaoguan city and also at the fishing communities.

5.2 NATIONAL REDISTRIBUTIVE POLICIES

The systems for rural basic life security, new rural medical care cooperation and rural medical relief are due to be established. Those rural residents without any family member or relatives are entitled to "five guarantees" (guarantees to food, clothing, residence, medical care and burial). Allowances for the relief from natural calamities also have been set up. Despite these entitlements, fishing households receive far less social support when compared to their farming neighbours.

Fishers are registered as urban citizens although they are living in the rural area, but they do not have any pension or minimum basic life security. Fishers do not have the pension besides they buy the insurance by themselves, while the person who has a job in the urban area only need to pay a part of the insurance. On the other hand, the farmers also only pay a part of the insurance and the central government, local government and the local communities will pay the remaining part of the insurance. Most of the fishers consider that it is too expensive for them to pay all the insurance by themselves. There are only a very few poorer households get some support from the government e.g. 200 Yuan RMB per month allowance. Most of such households are

those with disabled family members. Some other poor households also anticipate support from the government but it is very difficult. Medical insurance is not compulsory for the fishers, which means they have to pay 120 Yuan annually to buy it and most of them think it is still too expensive, while the farmers only need to pay 30Yuan medical insurance. It seems that the fishers are omitted by the society and most of the national redistributive policies do not mention the fishers as a group although they also live in rural areas and engage in agricultural production.

There is a provision for a diesel subsidy for fishers who own the fishing license. However, not all households have been able to acquire a license. In 2004 the government had a policy to register all fishers. However, the fishers had to pay 200 RMB each year to extend the license. For that reason, many fishers did not renew their license. Now however, the government has stopped issuing new licenses, making it too late for those who want to benefit from subsidies.

There is a clear relationship between access to a fishing license and the wealth of fishers. As Table 3-4 demonstrates, the percentages of households with fishing licenses in the medium and rich group is 45.16%, much higher than 16.67% of the poor group. In Lishi and Kengkou, more households of the rich group have a fishing license particularly in the latter. However in Zhoutian there are more households in the medium group that have the fishing license because only 50% of the households in the rich group depend on fishing.

The differences according to wealth may because poorer households perhaps are integrated into fewer social networks aside from having a lower level of education, and were thus less aware of the need to renew their license. However, it may also be the case that not having a fishing license is one of the reasons for their poor economic status in the first instance! The fishers can not get the diesel subsidizes from the government if they do not have the fishing license, substantially reducing the profitability of fishing.

Table 5-3: Percentage of the households with fishing license

Fishing assets	Wealth group	Lishi	Kengkou	Zhoutian	Average
Percentage of households with fishing license (%)	Poor	30	10	10	16.67
	Medium	45.45	10	80	45.16
	Rich	50	45.45	40	45.16
Average size of diesel subsidy of each HH of last half year	Poor	2033.33	3000	1000	2020
	Medium	2700	3000	1981.25	2310.71
	Rich	2368	3000	2075	2510

Data sources: from household survey in the selected fishing communities

If the fishers face difficulties for social-economic or environmental reasons, they may seek help from the local residential committee; and if they face difficulties in fishing itself, they may seek help from the Bureau of Fishery, or the Fishery Monitoring Team of the local government. Because the fishers do not have their own organizations and their financial capability is low, it is very hard for them to resolve various difficulties that they may face.

5.3 IMPACT OF LOCAL COMMUNITY GROUPS AND VILLAGE LEADERSHIP

There are no formal or informal organizations such as Fishermen’s Association or Fishermen’s Cooperatives for fishermen to participate in Shaoguan City. There are also no organizations at the local level in the fishing communities themselves, or any NGOs working with the fishers. Although there is an informal leader in each

fishing community, there is no office for the leaders or formal village committee with the exception of Zhoutian. In Lishi and Kengkou the leaders are just a contact between the fishers with the local government. If the local government needs to inform the fishers of anything, the authorities would tell the leader first and then the leader would notify all the other fishers. Since there is no subsidy for the job of village leader, nobody want to take this responsibility. Also because of this, sometimes fishers do not know or understand well about the government's policies. For example, in our survey, some of the fishers do not know any of the policies about pension and medicine insurance. In some of the fishing communities, most of the fishers buy the medicine insurance but in some fishing communities seldom buy the insurance. In Zhoutian, on the other hand, there are three people constituting the village committee. In addition to the community leader, the other two persons are responsible for accounts and finance respectively. In addition to informing residents of local government's notices, the committee also organizes the fishers to discuss the technologies and experiences regularly. If there are conflicts between the fishers and other stakeholders, the leader will represent the fishers to talk to the government and the other stakeholders. However, it is still difficult for them to protect their own rights, as will be discussed below.

5.4 LOCAL MANAGEMENT REGIMES FOR COMMON PROPERTY RESOURCES

There are some policies and measures for common property resources such as aquatic resources and water resources in Shaoguan city and also in the local fishing communities. These local management regimes include the breeding and release of fish, surveying of aquatic resources, stopping net-cage fish culture in some rivers and reservoirs, planting ecological forests, setting up biological fireproof zone and nature reserves, supervising bidding activity for sand mining by coordinating efforts from different law enforcement agencies such as departments of environment protection, water preservation, and land planning, making overall plans for the protection of ecology and resources, and improving law enforcement effort. Development Plan for Ecological agriculture in Shaoguan (2008-2015), Development Plan for Fishing in Shaoguan (2008-2015-2020) and Development Plan for Water Management Agency (2008-2010)) have been formulated. Investigating law infringement cases in large-and-medium reservoirs have been conducted.

In order to protect the local aquatic species and fish resources, according to "Fisheries Law of the People's Republic of China" (1986) and "Protection Law of Wildlife" (1988), nine conservation areas with an area more than 3,780 ha have been set up in order to protect biodiversity in Shaoguan. The protection species include Asian giant soft-shell turtle, marbled eel, wattle-necked soft-shell turtle etc (Table 4-1). At the same time, crude fish killing methods such those involving explosives, poison or electricity were prohibited. Fishers acquire their Fishing License from Shaoguan Fisheries Administration Team. There are 180 families with a Fishing License at present. Fry releasing efforts have also been strengthened in the past decade (Table 4-2) (Fig.4-1, Fig.4-2).

Table 5-1: The aquatic conservation area in Shaoguan (Institute of Aquaculture, Shaoguan City.1991)

Name	Object of protection	Protected areas
Shaoguan Beijiang endemic and rare fish Provincial conversation area	high quality and rare fish in North river	From Guitou bridge in Wujiang River to Haiguan Island, 2820 ha.
Huangmaoxia endemic and rare fish conversation area	high quality and rare fish resources	From Madongji to Baisha Tangkou in Beijiang river, 160 ha.
Wujiang aquatic resources conservation area	Fresh Aquatic fish resources (<i>Semilabeo notabilis Peters</i>)	<i>Semilabeo notabilis</i> Spawning area in Luojiadu, Wujiang river, 400 ha
wattle-necked soft-shell turtle conversation area in Ruyuan	wattle-necked soft-shell turtle	400 ha
Sixi River aquatic animals conversation area	Aquatic animals	Sixi River
Chishijin aquatic animals conversation area	Aquatic animals	Chishijin
Hongshan aquatic animals conversation area	Aquatic animals	Hongshan
Wangshishan Salamander conversation	giant salamander	Wangshishan
Jinjiang fish biodiversity conversation area	Fish	Jinjiang river

Figure 5-1 Fry releasing platform in Shaoguan



Figure 5-2 Practicing fish releasing activity on the platform



Table 5-2 The restocking species in Shaoguan (Department of Aquaculture of Shaoguan City, 2008)

Year	Restocking species	Number released (million)
2005	Carp, Crucian carp	8
2004	Chinese sturgeon, Carp, spotted silver carp, <i>Megalobrama terminalis</i>	8
2003	Carp, Crucian carp, <i>Spinibarbus hollandi</i> , <i>M. terminalis</i>	8
2002	Carp, Crucian carp, Grass carp, spotted silver carp, <i>M. terminalis</i>	7
2001	Same as 2002	7
2000	Same as 2002	6.15
1999	Same as 2002	6.05
1998	Carp, Crucian carp, Grass carp	5.04
1998	Carp, Crucian carp, Grass carp	5.
1997	Carp, Crucian carp, Grass carp	5
1996	Carp, Crucian carp, Grass carp	5
1996	Carp, Crucian carp	5
1995	Carp, Crucian carp	4
1994	No, flood disaster	
1993	Carp, Crucian carp	2.475
1992	Carp, Crucian carp	2.001
1991	Carp, Crucian carp, Grass carp	0.864
1990	Carp, Crucian carp, Grass carp	0.853
1989	Carp, Crucian carp, Grass carp	0.503
1988	Carp, Crucian carp, Grass carp	0.05
1987	Carp, Crucian carp, Grass carp	0.11
1986	Carp, Crucian carp, Grass carp	0.025

There are also some local management regimes for fishing behavior. Fishing licenses, sailors' basic training certificate, the ownership certificate for fishing boats, and inland river boat certificates are required by the local government. However, there are still a lot of fishers without a fishing license, as was discussed above, who risk a penalty. The officials said mostly they just give a warning to them. The fishing license can be used in the whole Pearl Delta, so there is no limit on the fishing zone. However, because of dam construction, the fishers are compelled to always fish between two dams as there is no channel for fishing boats or they have to pay a fee to cross.

Aside from the licensing system, there are also some local informal management regimes for fishers about the fishing areas. Usually, these are simply according to the rules of "first get, first use". In line with national policies, fishing tools are also regulated, some technologies and tools are not permitted particularly electricity, poison, and explosives. Some areas are natural reserves for fish, so there are some areas where they can not fish. In some protection zones, people are not allowed to fish at certain times of year. These are provincial level

regulations. There are no protected areas around the three study villages though, although the hydro companies prohibit fishing immediately below the dams.

To the use of the water resources of the Beijiang River, government regulations oblige companies involved in hydro power dam construction to compensate the damaged party but there are no specific standards now. There are also requirements that waste water emissions should meet the regulated standards and there are charges for the emission firms. Licenses for sand mining are also required for sand companies and there are some detailed requirements to protect the banks and the ecological environment of the river such as ensuring that mining takes place 40m from the bank of the river.

Although, there are already some policies and measures used to protect the ecosystem and the aquatic resources in Beijiang river, the ecosystem is degraded and the aquatic resources are declined which have a significant impact on fishers' livelihoods. The measures of breeding and release of fish do contribute to the preserving of aquatic resources in Beijiang river. In the survey, many fishers said that their harvest increased after fry release but the government officials and other stakeholders said that fishers harvest too many of the fish even the small one. Fishers' own behaviors sometimes also have an impact on the aquatic resources. Although there are definite regulation about fishing technologies and tools, some fishers and farmers still break the rules using the technologies and tools which are harmful to the aquatic resources. The local government said that fishing with electricity is quite popular in Beijiang river. Other rules which regulate the behavior of other stakeholders are also difficult to implement such as the sand mining companies and pollutants. The degradation of the ecosystem not only declines the fish stock and species but also have an impact on the quality of the fish harvest. Fishers said that the price of the fish would decrease because of pollution.

5.5 LOCAL MANAGEMENT REGIMES AND CONFLICT

There are no signs of conflict between fishers but conflicts do exist between the fishers and the hydropower stations, sand mining companies, boat restaurants, and pollution firms. As water level have risen with the building of hydropower stations, the varieties and amounts of fish in the river have decreased, with some lands along the riverbank submerged into water, while river side houses are at risk of collapsing. The slowdown in the river current has also changed the essential environmental conditions for certain fish species and has harmed the traditional fishing. Sand mining has not only contaminated the river but has also polluted the aquatic resources when oil and waste have been discharged in the process, ruining the spawning habitats of fish. Waste discharged by boat restaurants and other polluters has contaminated the drinking water and brought damages to fishing.

However, despite the animosity there are few signs of overt conflict between fishers and sand mining or dam companies. However, the lack of conflict itself is a sign of deeply unequal power relations. It is very rare for the fishers to confront officials from these companies given their weak political position. Only one village, Zhoutian, have been able to talk to the companies and the government given that they are the only village with an fishers organization/committee. On We were informed by women in a focus group that they felt completely powerless and of such a low position in society that they can not even enter any 'conflict' in the first place. They are compelled to simply accept the outcomes of decisions by powerful stakeholders.

6. LABOR, POWER, KNOWLEDGE AND GENDER

6.1 THE GENDER DIVISION OF LABOUR AND POWER RELATIONS

6.1.1 Gender division of labour

There are some differences in income source and livelihood activities between males and females which were revealed during the focus groups. Some livelihood activities are primarily the domain of woman and men respectively. For example, women have a greater income from planting vegetables, raising chickens, and raising rabbits, although these were mainly consumed within their families.

Fishing however, often involves both men and women as it needs two people to help with the many activities, such as sailing out, filling bait, placing fishing net, setting shrimp cages, taking in fishing nets and shrimp cages. This is very different though from the past. There have been some changes as a result of the shifting economic networks the village is integrated into. In the pre-reform era it was reportedly more common for father and son to go fishing together. Now however, as so many young men migrate to cities, it is more often husband and wife. In the past, the wife was more likely to stay at home and look after the nets.

Couples acknowledge that it is difficult for one person to finish fishing operations by alone, and given the out-migration of young people, they usually have tacit agreement to help each other and reportedly seldom quarrel. Otherwise, women stated that they would be unwilling to go fishing. In fact, the one man who fishes alone is divorced from his wife. Nevertheless, during the process of fishing, is a division of roles according to gender. In general, men work in the front of boat, and are in charge of putting down and taking back fishing nets, and women sit on the back of the boat and are in charge of controlling the boat. For most families, it is considered a men's job to repair the fishing nets. Only few families involve both husband and wife in fixing the nets. According to the fishers in Lishi village however, women do not repair the diesel engine.

Fig. 6-1: An interview with women group in Lishi fishing village



Fig. 6-2: An interview with men group in Zhoutian village



Selling fish was usually done by women. Sometimes, husbands and wives would sell the fish together and particularly when they go to the market directly after they finish fishing. Transporting fish to market is done by the cooperation of a couple. However, the selling to consumers and retailers is normally done by woman. There are a few women specialize in selling fish in the fishing community. If the wife and husband all do not have time to sell the fish, they would sell the fish to that woman but generally the household would sell the fish by themselves. It was said that women were better in bargaining than men!

Household reproductive tasks were carried out by men and women, and men in Kengkou even claimed that they did most the work. However, again there was still a loose division of labour and evidence of unequal power relations. For example, females are reportedly primarily responsible for time consuming tasks such as buying food in the market, cleaning the house, cooking, washing dishes, looking after children and elders, and washing clothes. Women respondents went as far as to say that they had to do cooking and look after children after they had finished fishing while men just enjoyed having tea, watching TV, and chatting. Some household tasks were reportedly the male domain, such as repairing the house. Men in Lishi also pointed out that it was usually their task to cut trees for fuel, although sometimes women also did this job.

In terms of cultural activities, women reportedly are forbidden from paddling the ‘dragon boat’ during festivals, while the daily worship is usually done by women as men are ashamed to do this. Females in Zhoutian village said men are reluctant to clean night urine tub. On the whole, women felt that men had more time to rest in most families. It is therefore conceivable that the overall share of the family labour taken by women is greater than that of men.

Table 6-1: “Men’s job” according to the choice from the result of the interviewees

	What do you consider the job which is usually done by men or women?				
	Men’s job		Job for both men and women	women’s job	no answer
	counts	%	counts	counts	counts
Sailing	26	54%	22	0	0
Fill fish net	38	80%	8	2	2
Ship-repairing	36	75%	1	2	0
Buy fishing gear	41	86%	8	3	10
Repair house	34	89%	20	4	14
Saving money	21	62%	4	1	0
Making big decision	26	54%	20	1	

Original resource: deal with the data by focus group on May 2010

Table 6-2: “Women’s job” according to the choice from the interviewees

	What do you consider the job which is usually done by men or women?				
	Women’s job		Job for both men and women	Men’s job	No answer
	counts	%	counts	counts	counts
Selling fish in market	21	46%	13	12	2
Grow vegetable	22	90%	1	1	22
Buy things in market	35	73%	9	4	0
Cleaning house	37	77%	5	3	0
cooking	36	75%	9	3	0
Washing dishes	35	73%	8	4	1
Collecting water	22	85%	6	8	12
Looking after babies	24	53%	19	1	3
Washing clothes	38	80%	9	1	0

Original resource: deal with the data by focus group on May 2010

Table 6-3: “Jobs for both of men and women” according to the choice from the interviewees

	What do you consider the job which is usually done by men or women?				
	Job for both men and women		Women’s job	Men’s job	No answer
	counts	%	counts	counts	counts
Loading bait	19	46%	2	16	8
Laying shrimp cage and fish net	28	90%	1	19	0
Collecting nets cages	29	73%	3	16	0
Collecting firewood	14	29%	17	15	2
Looking after parents	25	75%	13	1	8

Original resource: deal with the data by focus group on May 2010

In order to better understand the division of labour between men and women and back up qualitative testimonies, three columns in our questionnaire were created, including “men’s jobs”, “women’s jobs” and “jobs for both men and women”. Each interviewee could choose one of the columns for the jobs listed in the questionnaire, as is displayed in Table 6-1, Table 6-2, and Table 6-3. If more than 50% of the correspondents were considered a job was “men’s job”, then we listed this job as “men’s job”, and vice versa. If more than 50% considered a job for both men and women, we listed it as “job for both men and women”. From the tables we

can conclude that the division of labor between female and male is very clear. Males are in charge of more of the outdoor duties, while female's do more housework. Both men and women are responsible for jobs like loading bait, laying fishing nets, laying shrimp cages and fishing nest, collection of shrimp cages and fish nets. We found that more things in a family were determined by men and it implies that male had a dominant role in fisher's family.

Table 6-4: The reply from men and women on the division of jobs between sexual groups

	Men's answer (%)			Women's answer (%)		
	Men's job	Women's job	Job for both	Men's job	Women's job	Job for both
Selling fish	35	35	31	15	60	25
Cleaning house	13	70	17	0	95	5
Collecting firewood	48	16	36	14	61	23
Cooking	4	65	30	9	86	5
Washing dishes	12	64	24	5	86	9
Collecting water	31	37	31	12	88	0
Looking after parents	8	22	70	0	47	53
Money saved	59	6	35	65	24	12

Original resource: deal with the data by focus group on May 2010

Interestingly, big differences existed in the perception from men and women of the gender division for the same jobs. In Table 6-4, we listed the jobs with more than 10% difference in the answers between men and women. In all jobs listed in Table 7-4, a much greater percentage of women than men considered these are women's jobs with the exception of saving money. There is only a moderate higher percentage of men considered these jobs are men's job than women except cooking. That means both men and women strongly agree that money saving is a men's job and cooking is a women's job. For other jobs, the perceptions have significant sexual bias. Both men and women weighted themselves more on the role in jobs than the perception from the opposite gender group. Another difference is the percentage about "job for both men and women". The percentage from men was all higher than the percentage from women. That means women have a much stronger feeling than men that these jobs were either women's or men's responsibility rather than being the responsibility of both sex groups.

6.1.2 Household management

In terms of household management, money was generally saved in the name of the husband giving women more limited economic independence. They explained that females were unable to save money as they lack the knowledge for money management. Big decisions are usually made together by husband and wife together, although there are some families that the big decisions are only made by men.

In general, it was agreed that the position of women now is much better than it was during the generation of the fishers grandparents. Now women felt they are no longer treated as if they are less important. On the whole though, it seems that gender discrimination in the fishing communities was not as bad as in farmer communities due to the nature of the work. For example, we were told that fishers have never cared if they have a boy or a girl as both are deemed capable of working on the boat. However, farmers traditionally favoured boys as they were perceived as better farm labourers.

6.2 GENDER DIFFERENCES IN ENVIRONMENTAL KNOWLEDGE

There is a difference in the environmental knowledge base of males and females. There are 48 families in Kengkou village. The wives in 80% of the families were from farmers' families. Usually woman migrates to the home of their husbands' family. If a farming woman marries a fisher therefore, their livelihoods will change to that of the husbands family. As these women in Kengkou did not have a fishing background, they had more limited fishing knowledge, and some even reported feeling 'seasick' on the boat. However, they had knowledge of crop cultivation.. They usually needed 1 to 2 years to adapt to fishing activities on a boat. Talking about their knowledge of fishing, men generally learned from their fathers and grandfathers, while women said their knowledge was from their husbands.

For this reason, males were more aware of the surrounding environment than women. On requesting focus group participants to draw the surrounding environment of the village, males could usually draw more detailed maps. For example, in the gender divided survey of Lishi village, the 'male' group was able to identify 9 power stations which including their position and time of construction in the nearby three tributaries of Beijiang River. Males in Kengkou were also able to clearly draw the positions of Beijiang Hydropower Station, the 5 iron mine factories, 2 chemical factories, and 8 waste water outlets along the river and near the village. However, females were less aware of these locations. This is not only due to different backgrounds, but also because many married females were from other distant villages, and knew less about the history of the environment.

It is also interesting that in the context of the division of labour, the expectations males and females had from the state varied. In the field work of evaluation on environmental policy and administration, there were 38 male fishers, and 26 female fishers who participated in our survey as shown in Table 7-5. We gathered the evaluation scores of the 28 items shown in table 6-6 from the fishers and calculated the averages of each item separately from men and women. We found that there are eighteen items with average evaluation scores above 4, seven items with average scores from 3 to 4, and three items with average scores from 2 to 3. Statistical results show that there are no significant difference s between gender groups on the evaluation of policy and management measures. Generally males and females have quite similar points of views on most of the proposed measures (as what is showed in Fig.6-3 below). The average scores were 3.833 for male and 3.787 for female. There is no significant difference between them. However, they do display distinctions in some of the measures. There are 16 items with higher scores from women than from men, and 12 items with higher scores from men than from women. For example, males tend to be more sensitive to management issues, so they gave higher marks to measures such as "(19) reduction of tax and fees", "(20) reduction of administrative procedures", and "(30) improvement of fishermen organization" than females. Females tended to care more about daily life, so they gave higher scores on item such as "(24) building of tap water facilities". This perhaps reflects the division of labour whereby females bear a disproportionate role for household reproductive activities when compared to men.

Table 6-5 Number of fishers participating policy evaluation from Kengkou, Lishi and Zhoutian villages

	Male	Female	Total
Kengkou	13	12	28
Lishi	17	6	23
Zhoutian	8	8	16
Total	38	26	64

Original resource: deal with the data by focus group on May 2010

Fig. 6-3: Impact of Sex group on the average score of each measure

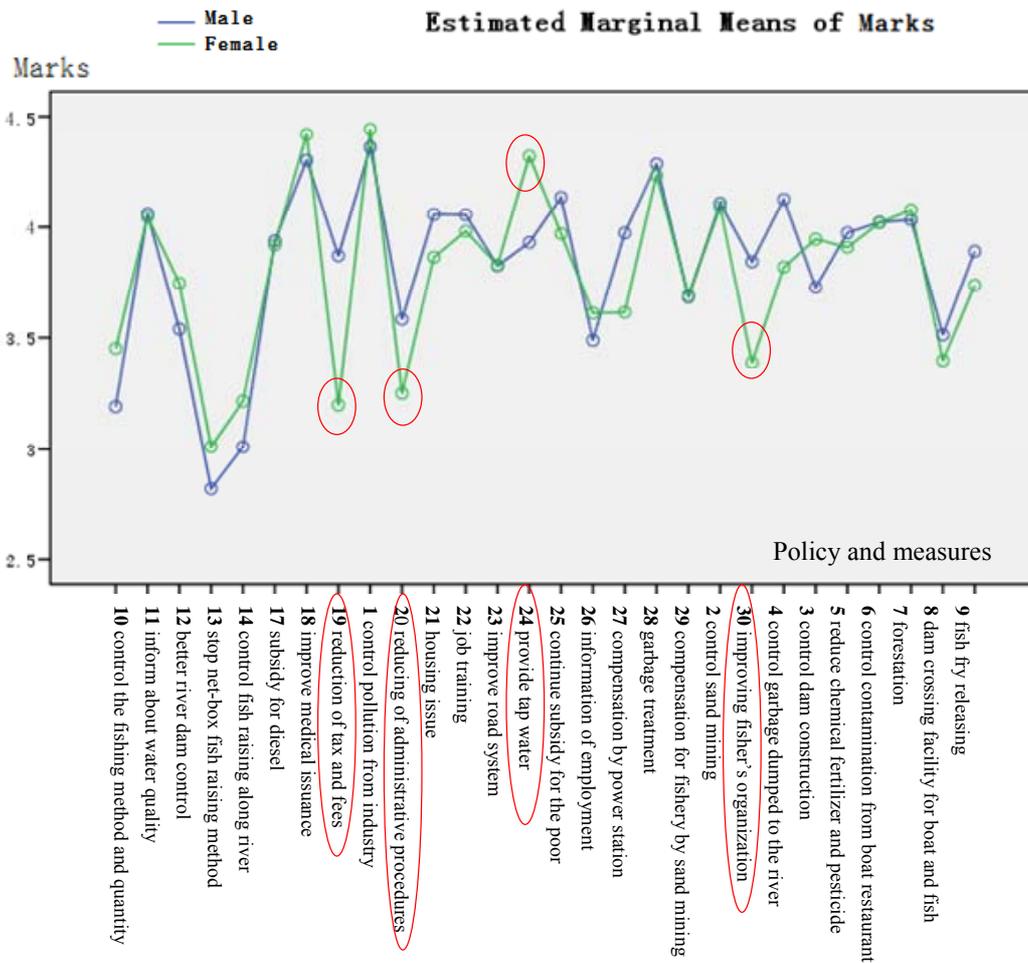


Table 6-6: The averages of importance scores from the evaluation on environmental protection policy & management measures by men and women in the fishing villages

(The most important issue=5, the least important issue =0)

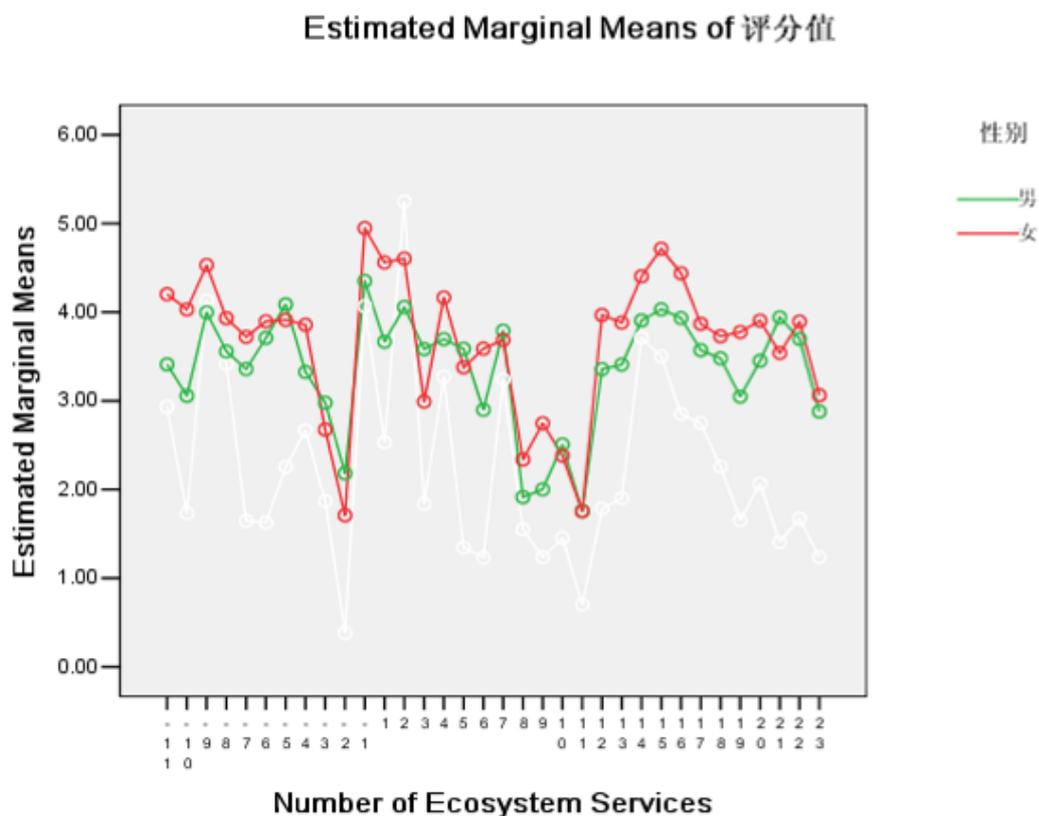
	Evaluation from female	Evaluation from male
Industrial Pollution Control	4.885	4.757
Sand Mining Control	4.731	4.514
Dams Control	4.346	4.054
Ban of direct dumping of garbage	4.269	4.541
Control of fertilizer and pesticide	4.500	4.324
Ban of direct discharge of sewage by boat restaurants	3.731	3.972
Forestation	3.500	3.324
Mandatory requirements for the building of passages for fish and boats	4.192	4.351
Artificial discharge of fish fries	4.423	4.378
Limitation on fishing tools	3.115	2.838
Monitoring and publicizing water qualityGovernment surveillance water quality and notice	4.231	3.919
Control of water reservation of dams	3.808	3.297
Ban of caged fish culture in reservoirs	2.154	1.919
Limitation of poultry farming	2.808	2.162
Oil subsidy	4.846	4.865
Medical care	4.808	4.730
Reduction of Tax and fees	3.577	4.351
Reduction of administrative procedures	3.462	3.917
Renovation and building of cheap low-rent houses	4.462	4.730
Professional training	4.115	4.000
Improvement of roads to fishing villages	4.346	4.081
Building of tap water facilities	4.462	4.189
Maintenance grant to the poorest	4.577	4.919
Providing job information	3.692	3.811
Compensation for the damages to fishermen by hydropower stations	4.385	4.811
Centralized processing of garbage	4.000	3.946
Compensation for the damages to fishermen by sand mining companies	4.615	4.730
Fishermen organization	2.923	3.000

Original resource: deal with the data by focus group on May 2010

A survey on the ecosystem services in the three villages was also conducted in the three villages and other related stakeholders. We asked them to fill a form with choice (see Table 6-7). The statistic result shows that there is no significant difference between men and women on the evaluation of different ecosystem services. However there are some differences existed between gender groups in some specific subjects as shown in Fig. 6-4. There are 25 items which women gave higher average scores than men (with red color in Table 6-6. which indicate that the ecosystem services cared by women is different from men to some extent. This may also because of different background of the women and men due to that most of the women came from farming community, so they care more ecosystem services for farming such as irrigation while men care more about

pollution which is relate to their fishing. Gender's division intra-household also has an impact on their valuation. For women do more housework than men, women may care more about the ecosystem services for daily life such as daily water use and air humidity.

Fig.6-4 The average scores on the evaluation about ecosystem services by men and women from fishers



The numbers of the ecosystem services listed in the horizontal axes are the same as t in Table 6-7

Table 6-7 Evaluation Sheet for Ecosystem Services and Costs of Beijiang River

Affiliation_____ Location_____ Date_____ No._____

Please draw a circle ○ in the cell where you think the level of importance is right. The bigger the number, the more important it is. You can add some other items at the end of the table if you think it is missed in this list.

Ecosystem services	5	4	3	2	1
1 irrigation					
2 daily water use	○				
3 industrial water supply					
4 aquatic products					
5 sand for construction					
6 transportation					
7 hydro-electricity					
8 game fishing					
9 boating					
10 tourism					
11 swimming					○
12 air humidity					
13 stable air temperature					
14 clean environment					
15 reduce flooding					
16 delete pollution					
17 reduce diseases					
18 biodiversity					
19 residential value					
20 beautiful environment					
21 spiritual home					
22 education					
23 research					
24					
Ecosystem Cost	5	4	3	2	1
-1flooding	○				
-2 draught					○
-3 transmit diseases					
-4 carrying pollutants					
-5 dike building					
-6 river bed clearance					
-7 fishing management					
-8 planting tree					
-9 river pollution control					
-10 water hyacinth					
-11 picking up river garbage					
-12					

7. LABOR, KNOWLEDGE AND AGE

7.1 YOUNG PEOPLES OTHER WORK RESPONSIBILITIES

The most significant division of labour was probably by age rather than gender. As was suggested above, fishing was primarily carried out by older adults and younger adults, who increasingly take up urban employment, play a less direct role. Nevertheless, the remaining question is the role of children in aquatic resource dependent activities. Interestingly, there were very few young people in the villages. Unlike farmers who were normally allowed two, fishers were subject to the one child policy. Furthermore, many children had moved to urban areas with their parents, leaving only the grand parents in the village as fishers. Most who remain in the village are the children of the younger families who have remained. However, in most of these cases, the father is working outside, while the wife stays with her in-laws, often also waiting for the opportunity to move on. Due to cooperation needed in fishing, it is rare that the father works outside and wife stays at home with their children. Generally, the couples may work outside together and leave their children with their grandparents. It is for this reason that it is not so popular as in farming villages for couples to work outside. Instead, in the fishing communities, most of the young people go out to find a job and leave their parents fishing at home. All the boys and girls who are still at schools said that they and their parents all hope they have a good job in the urban after they grow up no matter their age. Some of the young people who have already tried to find a job in the urban said that they are more prefer to the freedom as a fisher. Some of the young people may come back if they do not have a good job but they will go back to the urban if they have a good opportunity.

Despite this, the boys and girls who live in the community make a valuable contribution to household labour. In the past young people used to collect stones from the river to give to farmers, who used them for construction of houses. However, nowadays, they play a less direct role in aquatic resource dependent activities. Fishing was normally the domain of adults, with the participation of children more limited. Nevertheless, they do still help on some occasions, particularly during the school vacation. One teenage girl in our focus group in Lishi helped putting out the nets, while a younger girl reportedly helped her parents steer the boat. Other tasks children are involved that do not involve going out on the river in including emptying the nets after a days fishing. Some children said that they helped their parents to cut and prepare small fish for selling, and to classify all the kinds of fishes on the boat. There are clear differences between different age groups. Most of the elder children knew where their parents' fishing tools were placed and where they fish, while the younger ones knew litter about that. The elder ones could bring out most of their parents' fishing tools, such us hooks, nets and shrimp cages. Most noted that they do not enjoy fishing, as it is hard work and there are few fish. Children's understand to the "hard work" mostly may come from their parents because their parents always tell them that fishing is very hard and hope them not to be a fisher in the future any more. On the other hand, the children may understand the meaning of "hard work" from their parents' actually activity. Sometimes, when the fishers go fishing at night, they can not accompany with their children the whole night and the children may understand that fishing is a very hard work.

Figure 7-1 Children in Lishi village



Fig. 7-2 Girls cooking in Zhoutian Village



In addition to fishing related activities, young people contribute to a variety of household reproductive tasks which are essential for both fishing and non-fishing households. All the boys and girls helped their parents with housework such as washing, cooking, sweeping, cleaning, setting the table, shopping, taking in nets and fishhooks, putting everything in order and so on. Children in Lishi village said they always cook, washing cloth, washing vegetables, particularly in the summer vacation when their school work is less. One child told us that he had to wash all the clothes of his family members and to wash all the dishes after meals.

On the whole, girls do relatively more housework, while boys, especially elder boys, would do more physical jobs. Children in Lishi village told us that boys would only wash their own clothes, cooked only when they

liked, and usually were unwilling to do housework. Parents also usually gave money to boys rather than girls. The boys therefore liked to buy what they like to eat. Some girls displayed unhappiness at being made to do so much work. There was also a perception that their labour was devalued. For example, children in Zhoutian village said that parents always praised their boys when boys cooked, but not in the case of when girls cooked. Boys also do not like taking care of the younger boys or girls in their families, because they considered this as troublesome work. Boys claimed they did not know how to stop baby from crying, and they didn't like washing.

Most young people finish school. However, they do not want to be fishers. When "do you like fishing?" was raised for the children, the answers were always "no!" They didn't want fishing and even their parents told them not to earn their life by fishing. When they observe their parents, they realize what a difficult life it is, and how there are very few economic rewards. The children said that fishing was very boring and fishing was a very hard job.

They want to grow up with a good education, and find a job outside, seeing no scope in fishing. In the survey, most of the boys and girls said that they hope to be a teacher or doctor after they grow up. There are no obvious difference between the gender and age. The aspiration of most of the young people we spoke to was to move to the city, and if possible find skilled work (e.g. policeman, government job). They see the cities as where the opportunities (such as a skilled job and become a urban citizen) are, not in small villages like Lishi, Kengou and Zhoutian. Most households can not afford to send children to school beyond the age of 14-15. Beyond the nine-compulsory-education, the households have to afford all the fees for education, transportation and their daily life. However, now families really do priorities their children's education as it is one of the only ways they can get a decent job outside with higher rewards and can stay in the urban as a urban citizen. It is for this reason that they are excused from some of their work responsibilities during term time, although this is not always possible to the same degree for poorer households.

7.2 ENVIRONMENTAL KNOWLEDGE OF YOUNG PEOPLE

The understanding of children of the surrounding environment was variable. The children in Lishi village knew the surrounding environment best. They knew the location of the secondary school, primary school, health centers and other public places. In addition, they could also point out where the 4 dredging sites were located, and the locations of the pollution outlets and waste recycling stations. In Kengkou Village, children knew the location of the village, farmland and a refinery in the surrounding countryside.

Children in all villages had a common understanding of the pollution of the river. Even the youngest child could express this clearly. When we asked the question "*what is difference over the past few years about this river?*" the child said that "*the river had been very clear in the past year, but now it has become dirty*". "*The water color has changed from blue to yellow. Bubbles and a lot of garbage can be seen on the water surface*". Children in Kengkou village knew that erosion and waste water from paper mills and mines polluted waters and could kill fish. The children in Lishi which located on the upstream side of the Beijiang River could tell us that the water level of the river had become deeper and the current had become larger. They explained how garbage was not thrown into the river in the past and that they used to swim in the river. Now the water was so deep and

went so fast that some even had to wear a life jacket to swim in the river. Children also told us that they could pick water snails to sell and pick mussel to play with in the past, but now you can never find these.

The Children got their knowledge of fishing from their parents and this therefore depended upon the degree to which their parents depend upon fishing. Parents taught them how to identify the name of fish. It was surprised that many of the children living beside the river could not swim. There were some gender and age differences about the knowledge of the fish. Boys usually could tell the names of different fishes, but the girls couldn't, perhaps because it is more common for boys to help their parents with fishing. However, one boy studying and living in downtown during weekday could not tell the name of fishes during our weekend contact, although he was used to live on fishing boat when he was a very little boy.

Not all children shared the same environmental and fishing related knowledge. In Zhoutian village, children went to school located in the town and came home only during weekends. These children's knowledge of the surrounding environment was more limited which may because that the fishers do not live along the river. They just knew that there was bamboo forest and some farmland close to the river bank. They had never seen people dredging in the river although they knew there was a sand processing site in the upper part of the river. The sixth-grade child knew there was a hydropower station in the river, but he could not tell the name of it. The little boy even did not know the name of the river.

Given that both fishermen and their children expressed their pessimistic prospects for the future of fishing, when they grow up, it is likely that environmental and fishing related knowledge will decline extensively over coming years. Fishing skills will no longer passed through to the next generation and fishing as an occupation itself may disappear in Beiji River sooner or later.

8 AQUATIC RESOURCES AND NON-USE VALUES

It is important to note that a sustainable livelihood should not only offer economic security and resilience, but overall wellbeing, including access to non-material benefits. It is therefore important to explore the non-economic elements of livelihoods which are important to local people.

We asked respondents to define what 'happiness' means to them. Most of the fishermen answered that having food to eat, a house to live and money to spend, was what was needed for a happy family, suggesting that economic considerations are still considered the most important element of their livelihoods. Their happiness is in other words, based upon their level of survival and guarantee of life. This can be demonstrated by the following anecdote. It was raining heavily while we were having a discussion in Kengkou village, and the fishermen could not go out fishing. When asked about the question of happiness to a 50-year-old male fisherman, he looked out the window and answered that "*The weather. Under this kind of weather (rain), we can not go out. I am irritated, because there is no work, no money.*" His happiness and joy was tied up with weather, which has the potential to make their lives unstable and without protection.

When the interview continued, he added that "*health is happy, there is not illness, no disaster. The whole family is in peace. This is happy.*" Health was therefore considered as also important for happiness. When this topic

continued to a greater depth, their understanding of happiness went into a third level which can be considered a 'spiritual' level.

When we contacted families which already had a secure livelihood and higher income, happiness was considered to be harmony and understanding among family members. This entails for example, husbands and wives not fighting with each other, children being nice with their parents. A woman of about 50 years old, talked about her understanding of happiness as "*harmony, family members get along harmoniously and have a healthy living.*" Lishi and Zhoutian fishermen said that the happiest time was receiving a call from their children working outside. Women's understanding of happiness in particular, relied on the expectations of their children, and the hope that they would receive a better future. When we asked what was the happiest time in your lives, women were able to give a clear answer that the happiest time was in their childhood before marriage. In Lishi, a woman replied that happiness was in the stage when she was a child. During this period of life, they lived under the protection of their parents. They did not have the burden of life and did not have to worry about important issues in family livelihoods.

How therefore does fishing and the river itself impact these non-material elements of people's livelihoods? When investigating in Lishi and Zhoutian, men said that they went fishing every day and felt quite tired and there was no time to think about happiness. They had not felt 'joy' for decades, neither did they go for entertainment in big cities like Shaoguan. Some men felt that fishing was not only boring and difficult, but was harmful to their health. There are about 80% of the fishermen with rheumatism. Their clothes would usually get wet when fishing, even in the cold winter, and they could change their wet clothes only after finishing their fishing work. Men in Zhoutian hoped to leave fishing and live ashore. These views were shared by some women, and in the case of Kengkou and Lishi, they felt there were no benefits apart from fish.

These views were not however widespread, and an equal number of respondents cited non-material benefits of fishing to their overall happiness and wellbeing. For example, some men said that fishing still had some advantages over working for a company such as in a factory. Fishing activity was their own business. They could fish according to what they like. Employees in a company on the other hand, had to obey the orders from their boss. The work of fishing was not as hard as many jobs in a factory or a construction site. They felt that the lives of fishermen were relatively free. After coming back from fishing or during rainy days, they can have tea, can brag, and watch TV. Fishermen do not have a habit of gambling.

On the understanding of the river for economic security and maintaining good relations among family members and relatives, both men and women agreed that these were very important. Among 12 men and 17 women with whom we conducted our survey in Lishi, 10 men and 10 women considered that fishing was a suitable way to gain economic security and to maintain good relationship with family and friends because of more free time to contact with other. There were 6 men and 7 women who agreed that fishing activity was a way to preserve traditional culture and values of understanding. A man mentioned that they are very interested in those fishes caught in the water which they did not know. They would bring them back and discuss with each other. He said that "we do not directly put the dirty things back into the river. Dirty oil, for example, we buried it underground by digging a hole." Men in particular, both young and old, appeared to value fishing as an activity in itself,

almost as a form of recreation as well as work. One woman we met explained how her husband has a very good government job. However, when he comes home during holidays, he enjoys fishing on the river.

The cultural relationship of children to the river and fishing is more complex. Although they do not depend on the river economically, and do not want to have a life in fishing, they acknowledge the importance of the river for their parents. When asked, what would happen if the river was not there, most children in our focus group in Zhoutian agreed that it would make their lives more difficult. They said that their parents rely on the river to make money for the family, although it is very low. This is interesting, as although they do not see it having any potential for their future, they realize that the older generation depends on the river.

The children did however, appreciate the 'beauty' of the river. Most of them had experience of fishing with their parents, especially during school vacation. Most of the younger children said they liked being on boats, because they could see beautiful view and birds. There was also evidence of recreational fishing amongst children. In all three villages, children noted that they sometimes go fishing with a rod. Catch is generally low and as a group they can usually catch no more than 0.5 kg, often just giving the fish to the cat. However, they do this for fun more than anything else. As mentioned above, the children also go swimming sometimes in the river.

9 CONCLUSIONS: ISSUES TO BE ADDRESSED TO LIVELIHOOD ACTION PLANS

9.1 Issues Faced by Fishers in Beijiang River

According to the analysis above, the key issues faced by fishers are as follows:

- Declining of fish stock. Fishing stock is declining in Beijiang river due to pollution, sand mining, the construction of dams and hydropower station, which have a significant impact on fishers' livelihoods. Although some regional programs have already done by the government to improve the environment and the aquatic resources, fish stock declining is continued.
- Fishing license issues. Many fishers do not have a license for fishing, hence can not get the diesel oil subsidize. The fishers must pay 105 Yuan annual fee for the fishing license. The license will be canceled if the fishers do not pay for any reasons. The government refused to reissue the license in order to control fishing. Because of the increase of diesel price in recent years, it is very hard for those fishers who do not have the license.
- Pension issues. Most of the fishers do not have a pension which is the most worry for the fishers particularly the older generation. The fishers may have no income when they stop fishing, because they do not have any land for farming. In the rural areas, there is a new pension policy for all the farmers but fishers do not belong to the group of farmers and can not share this policy. Fishers belong to the group as residence and at present the residence in town or city pay one part for their pension and the working affiliation pay another part. But the fishing communities do not have any collective economies and can not

help the fishers to pay for the pension. The fishers have to pay all for themselves if they want to have the pension in the future. But most of the fishers do not rich enough to pay particularly the poorest fishers.

- Medical care issues. There is also a new policy for all the farmers to participate into the health insurance but the fishers can not share this policy. Only the better-off households buy the health insurance for their household members. For poor households, they have to pay all for the medical treatment and the economic situation of their livelihoods may become worse.
- Housing issues. Part of the fishers live in the house provided by the government but there are still a lot of fishers that do not have their own house and have to rent a house or live on boat. Most of the house near river bank and the houses are easy to be inundated by flooding. The government is preparing to build new houses for the fishers who are living on the boats within the urban area, but there are no plans for the fishers who live in rural areas so far.
- Compensation issues. The behavior of some stakeholders such as pollution emitters, sand mining companies, and hydropower stations have a significant impact on the ecosystem and the livelihoods of fishers but there are still no definite criterion to compensate the ecosystem and fishers' losses.
- Education issues. At present, the education of primary and junior secondary school is free and the fishers' children can also enjoy this policy. But most of the fishers still find it difficult to pay for senior secondary school. Some of the households have to borrow money from their relatives to pay for their children's higher education. Hence, many children have to find job instead of education at the age of 15-16.
- Transportation issues. It is not convenient for some fishing communities to reach out for school, health centre and market.
- Organization issues. The fishers do not have their own organization, such as Fishermen Association or Fishermen Cooperative. It is difficult to organize the fishers when they meet problems. They have very weak bargaining power whenever encounter other stakeholders.

9.2 Suggestions for LAP

The government has already done much to improve the environment and fishers' livelihoods. The establishment of natural preservation zone for forest and aquatic organisms, management of sand mining, breeding and releasing of fish fry, and monitoring of fishing activities are some of the policies and measures used to improve the environment and aquatic resource. But the implementation of these policies and measures need to be strengthened.

The local government also has some policies and measures to improve fishers' livelihoods particularly those poorest, such as subsidize for the poorest, diesel oil subsidize for the fishers own the fishing license, nine-years-compulsory-education for the children, house provided to the fishers in the urban areas, training for the fishers to help them to find a job in the urban, and some basic facilities as road and water provided by the government, which have improved the livelihoods of fishers to some extent. The government considers that the best way for the fishers is to help them migrate to the urban which is also useful to the environment. This is helpful for the

young generation and it has already happened in the fishing communities but it is not easy for the current and old generation who are engaging in fishing now. Therefore, LAP should consider different generation. To the young generation, it may be easier for them to migrate to urban. To the current and old generations, there are some basic issues should be considered. The most basic issue is to identify the identity of the fishers. In the past, the fishers were identified as city resident due to no lands owned by them. Actually, most of the fishers are living and working in the rural and engaging in fishing which is also one of the activities of agriculture. At present, there are some special policies for the farmers such as pension and health insurance but most of the fishers can not enjoy these policies because of their identity as city residents. Other policies such as for the poor also can not be enjoyed by the fisher due to the same reason. Maybe it is better to consider the fishers as a special group to secure their basic livelihoods.

Compensations from the stakeholders who are using the ecosystem are important to improve the ecosystem and the fishers' livelihoods. It is required to compensate the ecosystem and the fishers to the stakeholders such as sand mining companies and hydropower stations but the standards for compensation are not clear. If a ecological compensation fund can be built, some of the funds needed for ecosystem improvements and compensation for the fishers' loss can be resolved.

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Section 4

Highland aquatic resources and livelihoods:

Buxa, West Bengal, India.

Highland aquatic resources & livelihoods: Buxa, West Bengal, India



Report compiled for project: *Highland Aquatic Resources Conservation and Sustainable Development*

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Abbreviations

High ARCS Highland Aquatic Resources Conservation and Sustainable Development.

SGSAY Swarnjaynti Grameen Swarojgar Yojajana

FGD Focus Group Discussion

NGO Non Government Organization

WP Work Package

JFM Joint Forest Management

Gol Government of India

NRLM National Rural Livelihoods Mission

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Executive summary

This is the livelihoods report for Buxa, one of two Indian field sites for the project Highland Aquatic Resources Conservation and Sustainable Development (HighARCS). Buxa is a region of rich diversity in both cultural terms and biological endowment. It is also a region of difficult terrain, while aquatic resources are unevenly distributed geographically. It offered an interesting case study for HighARCS research. Sustainable livelihood framework suggests different types of assets and vulnerability context of people which mediate their access and control over different assets. Additionally institutions and policy determine the extent and direction of access and control over assets.

This study divided the project area into three clusters (communities) representing the geographical and ethnic diversity of the region. According to government estimates, households are predominantly Below Poverty Line(BPL). We chose a random selection of thirty respondents from each of the three clusters to participate in a survey. A questionnaire was developed and used to elicit responses from respondents. Beside the questionnaire we also used qualitative methods like Focus Group Discussion (FGD) and participant observations. The data was collected in three rounds.

Buxa region has a predominantly forest and agricultural based economy. The region has a complex history as frontier between the Indian and Bhutanese states. Once a remote frontier, the establishment of administrative centres and forestry operations under colonialism increased the population and for the first time introduced wage labour to the region. At the same time, the much of region was set aside as reserved forest. This impeded indigenous forest based livelihoods and the expansion of agriculture.

Today livelihoods are grounded in marginal agriculture and livestock raising, collection of forest produce and wage labour both for Forest Department operations and in the towns of the plains. They were in the past rich aquatic resources which people used to exploit for their livelihood. However, in recent years flooding events and climate change have undermined the habitat of aquatic species. Nevertheless, today aquatic resource use is still an important supplementary activity and involves small scale fishing, collection of drift wood and medicinal herbs from water courses, and stone collecting. Class stratification is not significant given that agricultural expansion is limited. Nevertheless, there are wealth differences, and it was found that poorer households are more dependent upon aquatic resources than their richer counterparts.

The report reviews a number of policies and institutions which address issues of livelihood security and the management of forest resources. While state level policies on paper seek to protect the interests of communities, it was found that in practice these laws put further stress on fragile livelihoods. There were also considerable tensions between the Forest Department and local communities regarding the appropriate management of natural resources.

The report also examines gender and age differences in both the contribution to household labour and use of aquatic resources. Men, women, boys and girls interact with the forest ecosystem in unique ways, giving rise to gender and age specific ecological knowledges. Of particular interest is

the fact that fishing is particularly important for young people, not only to supplement household livelihoods, but as a form of recreation.

The report offers important insights into livelihood dynamics and the policies and institutions which can both support or undermine them. It is anticipated that this will inform the development of integrated action plans to protect both biodiversity and promote sustainable livelihoods.

1 Introduction

In the context of globalisation and climate change, the link between environmental degradation and increased vulnerability of poor communities is well known. In this context however, only limited information is available concerning communities in highland areas, and even less regarding those dependent on aquatic resources and associated ecosystem services. Highland Aquatic Resources Conservation and Sustainable Development (High ARCS) is a project which seeks to better understand the patterns of resource use and livelihoods of communities who utilise highland natural resources in five sites across Vietnam, China and India, with a focus on aquatic resources. The interdisciplinary approach employed by this project seeks to encourage sustainable and wise-use of aquatic and other natural resources while safeguarding ecosystem services, biodiversity and the livelihoods of poor and vulnerable groups.

The overall research question of the project is therefore, *how can highland aquatic resources be sustainably managed and conserved while accommodating for the livelihoods of poor and food insecure communities?*

This is approached through answering a set of research questions which fall under four broad themes:

1) Biodiversity

- i) What is the existing aquatic biodiversity in the selected field sites?
- ii) How can these aquatic ecosystems be managed to secure the sustainable provision of ecosystem services and the conservation of biodiversity?

2) Livelihoods

- i) What are the dynamics of the multiple livelihood strategies in the selected field sites, how do these strategies utilise resources derived from aquatic ecosystems and what are the differences according to gender, age, ethnicity and class?
- ii) How can aquatic resource dependent livelihoods be ecologically sustainable and at the same time permit equitable local development opportunities?

3) Policies and Institutions

- i) In each selected field site, what are the existing institutions and legislations which mediate access to aquatic resources at multiple scales and levels of government?
- ii) What policies and institutional frameworks are needed to resolve conflicts between multiple stakeholders and ensure sustainable resource management whilst maximising local income generating activities?

4) Planning

- i) What is the best approach to facilitating interactive participation in assessment, decision-making and planning with respect to aquatic biodiversity, conservation and wise-use? Is this the best approach? How do we ensure participation includes individuals stratified by relations of gender, age, ethnicity and class.
- ii) Can indicators be identified that are appropriate for local communities to assess change? What are the limitations and advantages to such an approach?
- iii) How can the monitoring of aquatic ecosystems, livelihoods and institutions be established and sustained locally? Who should be responsible?

This report focuses on the second question. It analyses the livelihood strategies of highland communities in the Buxa Tiger Reserve in West Bengal, India (see Figure 1 and 2), in the context of environmental and economic change, examining the economic rewards, conflicting interests, and non-use values associated with aquatic, and other natural resource use. It seeks to explore further divergences in livelihoods and values associated with class, gender and age divisions within the selected communities. This focus stems from the fact that access to and control over multiple livelihood resources are known to vary according to entrenched social relations. For example in some parts of India, women are traditionally not encouraged to catch fish and their entry into some of the ponds is religiously and culturally prohibited. Similarly, class is known to play a significant role in mediating access to and control over resources as people belonging to high class communities enjoy stronger patronage and privileges of the state. Similarly, some ethnic groups are more dependent on one kind of resource than others but have limited permissible access. The project seeks to understand the dynamics in accessing and controlling resources. It is anticipated that this will facilitate in the provision of solutions to livelihood, conservation and sustainable development challenges.

For the purposes of the High ARCS research, five sites in total across three countries were selected for an in-depth case study. Each site shares something in common, enhancing the potential for comparative analysis, while also having unique characteristics and providing a valuable case study. The Buxa Tiger Reserve (henceforth interchangeably referred to as BUXA) in the foothills of the Bhutan Himalaya in Jalpaiguri District West Bengal, offered a number of interesting case studies to enrich the overall HighARCS research agenda. It is today a protected area and is a region of rich forest and aquatic biodiversity, with many seasonal and perennial rivers flowing down from the hills. It is home to marginalised communities, many of whom are from minority ethnic groups, together representing a cross section of the eastern Himalayan population. These communities have used aquatic resources for multiple purposes over the generations, and their presence within a National Park adds a new angle to explore. It is also a region of growing tourism development, while having a climate and topography which makes it vulnerable to natural disasters such as flooding

Three communities from within Buxa were selected for in-depth analysis. The criterion for selecting communities in HighARCS was that they were dependent on the same aquatic ecosystem such as a river basin or lake system so they were of comparative value, while still being located in different locales along the watershed to demonstrate the influence of locally specific geological, ecological, cultural and economic processes. Each community consists of a cluster of small settlements or villages. The first cluster, referred to here as the Buxa Fort cluster, consists of a series of small

communities in the hills around the ruined Buxa Fort. The second cluster, Adma, is a remote set of hamlets in the valleys to the west of the Buxa Fort cluster. The third, Jayanti, lies on the gentle alluvial slope right at the foot of the hills downstream of Buxa fort, where the Jayanti river spills out onto the plains (see Figure 3).

FIGURE 1: MAP OF WEST BENGAL

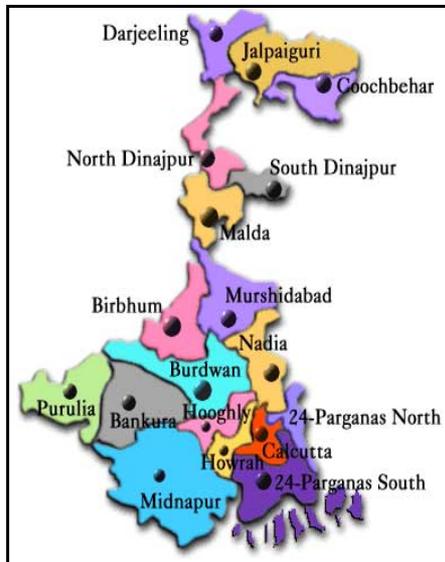


FIGURE 2: MAP OF JALPAIGURI DISTRICT

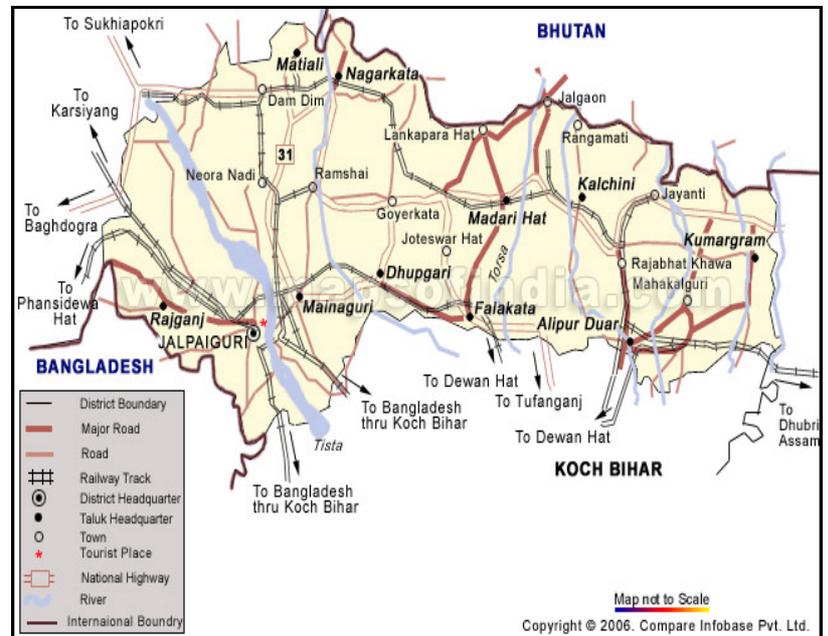
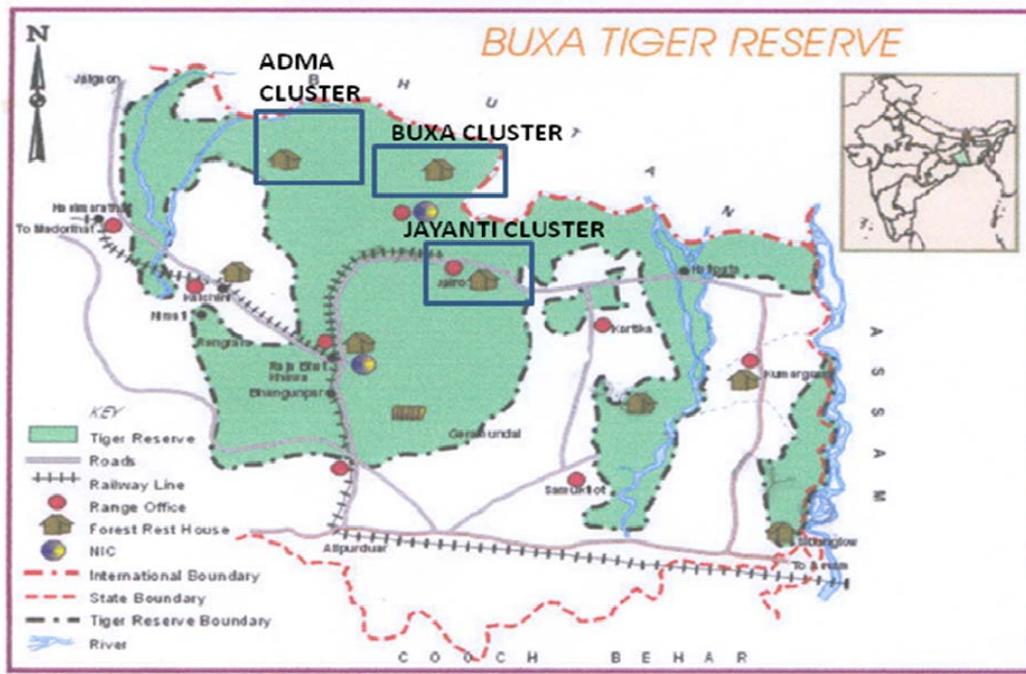


FIGURE 3: MAP OF BUXA TIGER RESERVE



2 Methods

In order to set the context of the research, the first stage entailed a situational analysis. This involved a biodiversity assessment across the major river basin where the project intended to work. This was followed by exploratory site visits, a review of secondary data, and discussions with local stakeholders. This formed the basis for the selection of communities and offered initial insights into the livelihood and conservation issues of the region. The second stage involved pursuing three integrated research themes, one examining biodiversity the other examining livelihoods, and another focusing on policies and institutions. Although these are being assessed in an integrated manner, this report is focussed upon the second trajectory, dealing with livelihood issues. A separate High ARCS biodiversity, policies and institutions reports focuses on data derived from the first and third programmes.

A combination of quantitative and qualitative techniques formed the basis for the livelihoods segment of the HighARCS research that this report focuses on, in line with the projects interdisciplinary agenda. Firstly, a detailed interview schedule was prepared. This began with a quantitative section which investigated aside from basic household information, levels of aquatic resource use such as fishing yields and income over the last week, and data on water use. Further questions were included on livelihood activities such as agricultural and livestock production and income, labouring and migration. To gain an understanding of household budgets, the survey also reviewed household expenditure for both productive and non-productive purposes, while collecting data on asset ownership and employment of labourers to better understand relative wealth. A qualitative section was also included, which was designed around a series of open ended questions organised into themes, which could be asked with some flexibility. Topics included overall livelihood strategy, environmental change, gender and age relations, understandings of relative wealth and poverty, market relations and environmental knowledge. Further sections dealt with policies for the management of aquatic resources and respondents visions and aspirations for the future. In each of the three selected cluster, 30 surveys/interviews were carried out. A random sample was drawn from the village bearing in mind that most households in the three clusters belonged to the below poverty line (BPL) category.

Secondly, in order to gain deeper insights into the issues raised in the quantitative section of the interviews, a series of qualitative focus groups were carried out. A specific objective of the focus groups was to understand the gender and age dynamics of aquatic resource use. In total the research team completed approximately 40 focus group. Out of this, an equal number (10) were carried out with women, men, girls and boys respectively. For the focus group with women and men, open ended evolving themes were used. The themes included livelihood change, the use of rivers and lakes, rules and access regimes for natural resources, market relations, understandings of wellbeing, and ecological knowledge. Gender specific questions were included to examine the intra-household division of labour, distribution of household resources, participation of women in local governance and decision making and changing status of women. The focus groups also included participatory techniques such as community resource mapping, production of historical and annual timelines, and ranking activities, whereby respondents were asked to rank livelihood activities and problems in order of importance using cards. The mapping tools was also repeated for the focus groups with young people, along with the compilation of a daily time chart of activities and ranking

activities focussing on different types of work. The research team asked questions relating to how young people use aquatic resources, their relations with siblings, the benefits they get from their contribution to family labour, education and leisure. Throughout this report, the acronym *FG* is used when referring to data collected from focus groups, with *HH interview* being used for data from household interviews.

The livelihoods assessment was based loosely upon the sustainable livelihoods framework which suggests different assets or livelihood resources – social, physical, human, financial, natural – shape livelihood options (Scoones, 2009). Access to and control over these resources would depend upon the vulnerability contexts in which people live and institutional and policy framework that govern the dynamics of access and control.

The data when collected, offered the team a broad set of quantitative and qualitative information which was organized into a meaningful pattern using coding techniques. The quantitative data set was compared with the qualitative data and triangulated for consistency and validity. The research has been ongoing, with fresh consultations with different stakeholders at periodic intervals. Changes have been noted between different rounds of data collection.

3 Livelihood strategy: A framework

3.1 History of livelihoods

To understand the context of present day livelihoods in Buxa, it is useful to review the history of the region, more information on which can be found in the HighARCS overview report (Sugden and Punch, 2011). Buxa is part of the Western Dooars, a tract of once heavily forested land at the frontier between the Bhutan Himalaya and the plains of West Bengal. Historically, the predominant population of the consisted of indigenous communities such as the Meche, Rabha and Garo on the plains and Dukpa (ethnic Bhutanese) in the hills. Over the last two centuries they were joined by Nepali speaking communities such as the Limbus and Mangar (or *Magar*) who migrated from the west. Farming was difficult in the unstable rocky soil, and the livelihoods of the forest dwelling communities were based upon shifting cultivation, hunting-gathering and fishing. Buxa was on an important trade route between Koch Behar and Bhutan, so local people also earned additional income transporting loads for traders (Chaudhary 1995; Ray, 2002).

The kings of Bhutan annexed the entire Dooars region to the south in the 1700s. This caused significant difficulties for forest dwelling communities as they were expected to offer tribute through labour service such as portering loads for government officials, as well as taxes on the use of irrigation channels, on trading and plying boats, on weaving looms and on residing in the jungle (Ray, 2002, Chaudhuri, 1995). Sadar bazaar at the centre of the field site was then known by the Bhutanese name, Chothokha.

The next major state formation was that of colonial Britain. They annexed the Dooars from Bhutan in 1846 following the Anglo-Bhutan war. Although Buxa itself remained a forested frontier with limited settled agriculture and a sparse forest dwelling population, the area around Buxa fort, which had been built originally by the Bhutanese, became a strategic outpost on the northern borders of the

colony, and many government officials were stationed there. There was also a large troop cantonment (Grunning, 2007 [1911]). It remained an important trading point, where ivory, wax, wool, musk, *endi* silk cloth, Tibetan and Central Asian wool, among other goods were imported, many on their way to the ports of Europe (Grunning, 2007 [1911]). The economy was primarily based on trade and servicing the government outpost rather than agriculture. In Adma to the west however, livelihoods were more strongly linked with shifting cultivation and herding in the forest, and there does not appear to have been a culture of outside wage labour.

The origin of Buxa reserve forest lies in the classification of land by the British into three categories: agricultural land, tea garden, and reserved forest (Bhowmik, 1988). Most of the present day Buxa region was set aside as reserved forest. This was highly significant for livelihoods as restrictions were placed on agricultural activities. These outlawed the shifting cultivation or *jhum*, which was once carried out by the indigenous Rabha and Dukpa community in more remote regions. At the same time, 'forest villages' were set up to provide a labour force for forestry operations (Grunning, 2007 [1911]). Residents were given small plots of land and plantation forest to operate, while being obliged to provide unpaid labour or *begar* to forestry operations to maintain their right to live in the forest. The third study village, Jayanti, was set up as one of these 'forest villages' and was also home to a dolomite mine and associated factories, served in the past by the narrow gauge Koch Behar state railway which is now out of use. Nepali, Bengali and adivasi labourers from the surrounding estates and agricultural land were brought in to work in the mine. What is significant is that households residing on forest land had no land ownership rights as all land was owned by the forest department, unlike their counterparts living around land classified as 'agricultural'—a situation which persists today. They therefore lacked livelihood security and could be evicted at any time.

Buxa fort fell into ruin in the post-colonial era, although the village remained a sub-divisional headquarters with a small cantonment, which itself closed in the 1970s. As the livelihoods were based primarily on labouring and the forest department's land laws limited potential agricultural expansion, the local people were particularly badly hit by the closure and the population fell considerably. Many local people moved to nearby places such as Santalabari (interview in Sadar bazaar, Oct 2010). Buxa fort had declined from a large cantonment village to a minor trade centre. Jayanti also went into decline with the closure of the dolomite mine and railway in the 1980s. It was only in Adma village which had always been heavily dependent on settled agriculture, where livelihoods followed their original pattern. In the 1980s, the Buxa region was designated as one of India's many Tiger Reserves to protect the dwindling number of Royal Bengal Tigers (Forest Conservation Act, 1980). This paved the way for even stricter policies on conservation and the use of the forest by local communities.

Over the last decade however, livelihoods have diversified. There are many more tourists visiting Buxa, and this has offered new sources of income to local people who can work as guides or porters, or can open small businesses and shops. However, it is limited in Adma as few people visit there. Seasonal migration to cities of the plains has also increased throughout the last decade. Aside from these shifts in livelihoods, there have been some social changes. The education level of the population has improved significantly, especially in Buxa cluster. People are more aware of health issues in particular. Reportedly people are more likely to visit a doctor rather than a *dhami* or

jhankri, a traditional healer, although they do still exist. People are also reportedly more aware of their rights now, and which government services and development initiatives are available.

1.2 Livelihood strategy today

Today livelihoods are quite diverse and vary considerably according to the locality. Before examining aquatic resource use it is useful to review the primary non-aquatic resource based livelihood activities in each cluster. What is apparent in all the clusters is that labouring is the primary source of cash income, although its relative importance for providing households with their food needs is highly variable.

In Buxa fort cluster, small scale agriculture and laboring are the primary livelihood activities. The types of labour are diverse, but include work in construction, work for the forest department, and work for the Panchayat through the National Rural Employment Guarantee Act (NREGA). This scheme ensures individuals 100 days work a year, or a compensation pay out for the period when job is not offered after application for registration. There is also a considerably amount of migration to urban centres of the plains such as Siliguri and Delhi. Jobs include working as machine operatives in factories or work in hotels (general notes from HH interviews, Buxa, Oct 2010). For the Dukpa community, many migrate to Bhutan where they are familiar with the language and culture. In Lepchakha for example, it was suggested that up to 90% of the local men work as labourers in Bhutan. This opportunity however, is not available for the Nepali community who are less familiar with the language and lack necessary connections. Either way, given that migrants lack Bhutanese citizenship papers, they can usually only secure menial employment (interview in Lepchakha village, Oct 2010). Agriculture is limited, given the steep terrain, damage from wild animals, and restrictions from the forest department which impede their ability to cut trees. Nevertheless, there is some maize production in most villages, and some production of cash crops such as garlic and ginger. These crops are sold to merchants in Santalabari at the foot of the hills, usually during the large Tuesday market. In addition to labouring, households raise livestock such as cows and goats in the forest, which is mostly for household use, while also collecting medicinal herbs.

Jayanti cluster has a quite different cultural composition, being home to Nepali, Adivasi Bengali and Bihari migrants who settled to work in the now abandoned dolomite mines and factory. The livelihoods however, are somewhat similar to the Buxa fort cluster. Labouring is the primary source of income, along with migration to urban centres. Agriculture is limited to a few fields of maize on the far side of the river, but this is an unstable activity. As in Buxa fort cluster, the forest department restricts any opening of new fields, while fields which are present are regularly damaged by wild elephants.

In Adma cluster livelihoods follow a slightly more traditional pattern. Shifting cultivation is less common nowadays, but the area of agricultural land is still greater than in Buxa and Jayanti. This may be because these villages are more remote and further from state control, so it was more difficult in the past for the government to restrict the size of fields. Households who are mostly from the Dukpa community, operate fixed fields of maize and millet (see Figure 4), and there is even some rice in the lower valleys. The livelihood is semi-nomadic. Most households have large herds of cattle

which they tend in the lower valleys at the foot of the plains during the monsoon when the upper forests are abundant with leaches, then moving up to the level of the villages in the Autumn. In the winter herders return to villages to tend the harvests of millet while in the early Spring they move to pastures on the high ridges on the Bhutan border (HH interview, Adma, Nov 2010). The households produce milk products to sell in Bhutan and in Santalabari market. These include cheese, butter, ghee and milk. Although some people work as labourers, there is not the same culture of out-migration that exists in the other two clusters, and much work is simply carried out locally for other villagers. This community however, displays a greater level of self-sufficiency than other villages in the Buxa region.

FIGURE 4: FIELDS OF MILLET NEAR ADMA



Other non-aquatic resource based livelihood activities present across the three villages include bee-keeping and banana and orange cultivation. Orange cultivation had once represented a significant source of income, but disease in the past had significantly reduced the yields. Work as guides for tourists is also a livelihood activity offered by some villagers during the dry season. While in Jayanti guides are employed through hotels, in Buxa cluster guiding is more sporadic and informal. In Adma there is little work in tourism due to the remoteness of the community. Livelihoods across all three clusters are highly seasonal, and a different set of activities are pursued during the rainy season, summer and winter. These seasonal variations are evident in Table 1.

TABLE 1: SEASONAL CALENDAR FOR LIVELIHOODS IN BUXA

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Paddy						√	√	√				
Maize	√	√	√									√
Ginger									√	√	√	
Kosh (Local Vegetable)						√	√	√				
Kanada (Local potato)						√	√	√				
Livestock raising	√	√	√	√	√	√	√	√	√	√	√	√
Bee keeping	√	√	√	√	√	√	√	√	√	√	√	√
Banana	√	√	√	√	√	√	√	√	√	√	√	√
Orange	√	√									√	√
Boulder Collection	√	√	√	√	√					√	√	√
Tourism	√	√	√	√	√				√	√	√	√
Fishing						√	√	√	√	√		

1.3 Relative dependence upon aquatic resources

Aquatic resources play a critical but supplementary role in rural livelihoods. Unlike the other HighArcs sites, the water in the many rivers flowing down from the hills is relatively clean, and is the primarily source of water for drinking and washing. Water is piped to some households in Buxa fort and Jayanti, although more often households are required to walk for long distances, particularly in the dry season when pipes dry up. In Lepchakha for example, they have to walk for two kilometres during this period to collect water from the river. In Adma however, there are no wells, and water must be carried from the river (field observations, Adma, Nov 2010). In Jayanti, local people use river water for irrigation also. Some have water directly supplied to them from a pipe, while for those in the forest, water must be carried to the village fields.

Fishing remains an important activity for many households in the region, although it is mostly subsistence oriented whereby it acts as a dietary supplement. Arguably the richest fish resources are in Jayanti, which is home to a large perennial river. The fishing methods here are unique. Large groups of local people go out at night, often building a dam to seal off a braided channel (see Figure 5). Once the water starts to run dry in the sealed off channel, they go in with buckets to collect the fish stranded on the river bed or in pools. The research team joined a group of fishers who managed to collect at least 20kg of fish, most of which were tiny, although there are often large species caught too. The fish are either consumed or sold locally to supplement family income. One of the

most significant use of aquatic resources however, is the collection of rocks from the river. This had previously been banned, but was permitted again in recent years, so it is a less reliable source of employment. Unlike other forms of aquatic resource use however, this can not be considered an independent subsistence livelihood activity. Instead, stone collecting is dominated by contractors from the urban areas who use the stones for construction (field observations, Jayanti, Oct-Nov 2010). Local people in this context work as wage labourers. Stone collecting is also seasonal and during the monsoon this activity can not be carried out (see Other non-aquatic resource based livelihood activities present across the three villages include bee-keeping and banana and orange cultivation. Orange cultivation had once represented a significant source of income, but disease in the past had significantly reduced the yields. Work as guides for tourists is also a livelihood activity offered by some villagers during the dry season. While in Jayanti guides are employed through hotels, in Buxa cluster guiding is more sporadic and informal. In Adma there is little work in tourism due to the remoteness of the community. Livelihoods across all three clusters are highly seasonal, and a different set of activities are pursued during the rainy season, summer and winter. These seasonal variations are evident in Table 1.

Table 1)

FIGURE 5: REMAINS OF DAM ACROSS RIVER BUILT FOR FISHING IN JAYANTI



In the hilly tract of Adma and Buxa cluster, fishing opportunities are more restricted but still important. Nevertheless, local people collect crabs, molluscs and small fish from the pools in smaller streams using hand nets, traps or even small spears. These are reportedly most abundant in the monsoon period and in the post-monsoon when streams start to dry up and aquatic species become trapped in pools (see Other non-aquatic resource based livelihood activities present across the three villages include bee-keeping and banana and orange cultivation. Orange cultivation had once represented a significant source of income, but disease in the past had significantly reduced the yields. Work as guides for tourists is also a livelihood activity offered by some villagers during the dry season. While in Jayanti guides are employed through hotels, in Buxa cluster guiding is more sporadic and informal. In Adma there is little work in tourism due to the remoteness of the community. Livelihoods across all three clusters are highly seasonal, and a different set of activities are pursued during the rainy season, summer and winter. These seasonal variations are evident in Table 1.

Table 1). Fish, crabs and molluscs are reportedly an important dietary supplement to accompany the staple of rice, particularly when vegetables are not available (General notes from hh interviews, Buxa, Oct-Nov 2010). Given the seasonality of both fishing and vegetable production, both of which are around the monsoon months, it is clear that households nutritional shortfalls are greatest during the dry season.

Other important uses of aquatic resources include the collection of plants from along the river sides for medical purposes. Some of these plants are sold on in the market while the remainder are for home use. Some livelihood activities could meanwhile, be considered 'indirectly' dependent upon aquatic resources, such as tourism. This is due to the Jayanti river being a prime beauty spot for viewing animals, and a number of guest houses and hotels have been built along the river bank to the north and south of the village. Without the river and its environs, these tourism opportunities would not be present.

2. Class (wealth group) and livelihoods

2.1 Class divisions in Buxa

Before one can gain a realistic assessment of livelihood strategy and needs in Buxa, it is necessary to uncover the patterns of stratification within the chosen communities. Only then will one be able to understand how differently situated groups are able to access a different ranges of livelihood resources. In a study on Tanzania, Birch-Thomsen et al (2001) divides livelihood strategies into three types. An 'accumulation strategy', applies to households that are commercialized with a high income who are able to reinvest their surplus to expand their asset base. A 'peasant strategy' on the other hand, entails limited market participation and subsistence orientation. Finally, a 'coping strategy',

applies to households that struggle to meet their minimum subsistence needs, with limited income and dependence upon common property resources. A similar terminology was used across the five HighARCS sites to identify wealth differences within communities, although there is variation in the conditions necessary for households to fall into these three categories (Sugden and Punch, 2011).

A central methodology of the Sustainable Livelihood Approach is to examine the different types of 'livelihood resource' or 'assets' available to households or individuals (Scoones, 1998, Moser, 1998). Scoones categorizes these livelihood resources as: *economic capital*, such as money and other assets; *human capital*, such as knowledge and education; *social capital* such as networks of mutual support; and finally *natural capital* such as land and multiple ecosystem services. A particular livelihood strategy is an outcome of the different combinations of assets that one has access to (Scoones, 1998). In this context, whether a household can be classified as 'accumulating', 'subsistence' or 'coping', depends upon the livelihood resources one has access to and the decision making strategies through which these resources are utilised.

Which livelihood resources are more important than others in driving stratification depend very much on the local context, but across the HighArcs sites (see Sugden and Punch, 2011), it was found that stratification was disproportionately driven by ownership of productive resources. This is in line with a classical Marxian analysis of class stratification which places a particular emphasis on ownership of the means of production (Marx, 1974). This includes land (natural capital), machinery and tools (economic capital) i.e. the instruments which allow *production* to take place. Ownership of the means of production tends to affect whether individuals or households are able to receive *the full product of their labour*. For example, if one does not own their own productive assets such as land and tools they may be dependent on rented assets, where any surplus is given away as rent. Similarly, they may be dependent upon menial labour for others. On the other hand, those with substantial ownership of the means of production are often able to employ outside workers and produce more than they could as a household, and even rent out excess assets such as land or machinery. This is a source of accumulation. Other 'assets' also play a critical supplementary role in determining whether or not a household can accumulate wealth, although access to these assets is sometimes connected with ownership of productive resources. For example, if one has livelihood security from their productive assets, they can invest more money in education, a form of 'human capital', that can allow household members to secure employment offering a better remuneration for their labour.

Local definitions of wealth: During the focus groups, the research team asked respondents themselves to specify the basis on which one would define whether a household was rich, medium and poor. The local definition did not conflict with the description of class stratification outlined above, and the two can be seen to supplement each other. Access to land and tools was considered by respondents as critical, as was access to other resources such as a well built house with its own toilet and bathroom. Other factors were related more generally to one's economic security, which in turn are often linked to access to the means of production and one's capacity to retain the product of their labour. Those with large savings for example, were considered rich, as were those who were able to afford good clothes. A nutritious diet was also considered important. For example, some respondents suggested that rich households were able to afford full meals 3 times a day, with meat at least twice a week, and vegetables and dhal with each meal. Medium households could only

afford meat once a week, and would perhaps have two main meals a day with vegetables and dhal. Poor households often could only eat once a day and would never eat meat, with meals often just consisting of rice and *achhar*, or pickle. They would often be directly dependent upon natural resources such as roots in the jungle for food.

As in the discussion above, education was also considered important. It was suggested that rich households could afford to send their children to boarding schools in towns outside the region such as in Kalimpong in Darjeeling district, while medium households would send their children to local schools. Poor households' children often did not go to school at all. As was suggested by respondents, if one can accumulate wealth, they can invest in the education of their household members, while conversely, households who struggle to even meet their subsistence needs not only face difficulties affording education but may depend upon children's as well as adult's labour to survive.

All households to some extent depend partially on labour, so there is by no means a 'capitalist' class of accumulating households who are employing members of a poorer labouring class. However, access to different types of labour can lead to class stratification within communities, and if one has access to skilled labour it can even be a source of accumulation. Money offered by sons or daughters with skilled employment was considered a source of wealth, although this is considered dependent upon education.

What follows in Table 2 represents the criterion through which households have been divided according to their class position based upon a combination of theoretical definitions of wealth, and local understandings.

TABLE 2: TYPICAL CHARACTERISTICS OF SELECTED CLASS CATEGORIES BUXA FIELD SITE

'Coping' or poor households	'Subsistence' or medium households	'Accumulating' or rich households
<ul style="list-style-type: none"> • Dependence on unskilled labouring • Dependence upon common property resources • Very limited ownership of means of production (e.g. kitchen garden, small amounts of livestock) • Rare consumption of meat or eggs • Low expenditure on consumer goods 	<ul style="list-style-type: none"> • No use of outside labour (with the exception of labour 'exchange') • Ownership of means of production (e.g. agricultural land, shop, machinery) to provide at least some of the households subsistence needs • Access to labour income from 	<ul style="list-style-type: none"> • Employment of outside labour • Reasonable ownership of means of production that can provide most of the households subsistence needs • Recent expansion of means of production • Access to skilled labour income

and education	outside the community <ul style="list-style-type: none"> • Meat or eggs with some meals • Moderate expenditure on consumer goods and education 	from outside the community <ul style="list-style-type: none"> • Meat or eggs with most meals • High expenditure on consumer goods and education
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Accumulating or ‘rich’ households (see Table 2): Households pursuing an *accumulation* livelihood strategy are pursuing livelihood activities which give them opportunities to increase their overall wealth. They have more secure ownership of the means of production than their poorer counterparts, allowing them to produce or earn a surplus beyond what is required for their families’ subsistence. ‘Accumulating households’ represent the smallest wealth group, with 24 households classified as such.

Opportunities for accumulation are more limited perhaps than in other parts of India because the primary means of production, land, belongs not to individual households or individuals but to the forest department. Richer farmers therefore, although often having larger holdings, have no way of expanding them. The agricultural holdings operated by households are on land belonging to the forest department, and they are only allowed to stay there as they have farmed the land for generations. According to the provisions under the Community Forest Right Act (2006) the local communities are entitled to use forest land for their livelihoods without interfering with the bio-diversity. Their access to and control over minor forest products are unrestricted. In Buxa for example there has been encouragement from the forest department to diversify local livelihoods resources, for example, by intercropping in the forest land to earn income for the community and enhance bio-diversity. This has offered households rewards for not-damaging the bio-diversity. While these provisions are not sufficient to allow households to increase their overall wealth, they do offer some households with access to their own plots a more secure livelihood. Even if households do not have substantial land holdings, ownership of livestock can be a source of wealth, with many households in Adma owning large herds of cattle.

A key source of actual wealth accumulation for such households in this context is income from better paid skilled work. Figure 6 shows that rich households earned on average Rs1500 over the last month through government employment, most of which requires skills. The relatively high income from pensions also reflects this. Although Figure 6 suggests that ordinary wage labour is still important for rich households’ income, observations in the field revealed that this often includes skilled and semi-skilled wage work, while poorer households were more likely to be engaged primarily in more menial, unskilled professions. The greater propensity for skilled employment may be a result of higher investment in education, as Figure 7 suggests. Investment in education in turn is facilitated by their greater access to productive resources and more secure livelihood which makes it easier to raise capital. More unusual results on education are evident in Table 3. Although Table 3 suggests that in Buxa cluster for that 62% of accumulating households have no education, this is most likely due to the fact that educated sons or daughters have migrated *away* from the village, and thus have not been counted by respondents as part of the household. For a similar reason, Table 3 also suggests that the percentage of households with members who have completed education

above class 10 is lower for accumulating households than their medium counterparts. Better educated sons or daughters may well be in urban centres, sending money home. Table 3 Educational characteristics of each household

Household characteristics	Wealth group	Buxa	Adma	Jayanti	Average
Number of households where no members have any education?	Poor	50%	33%	40%	41%
	Medium	50%	33%	8%	30%
	Rich	62%	22%	14%	33%
Percentage of HH with education above class 10 (years)	Poor	13%	22%	0%	11%
	Medium	10%	11%	42%	21%
	Rich	0%	0.00%	43%	14%

[Data sources: from household survey in the selected communities]

Table 4 The signs of relative wealth for ‘accumulating’ households are also evident through when one observes diet patterns.

Table 4 shows that ‘rich’ households have a more nutritious diet, and most meals are supplemented with a source of protein such as eggs or meat. This is facilitated by the fact that many richer households have larger land holdings and own more livestock. Relative prosperity is also evident when one considers expenditure on general consumption such as cultural events and house maintenance, which are above average, as Figure 7 demonstrates.

Subsistence or ‘medium’ households (see Error! Reference source not found. Table 2): ‘Medium’ households pursuing a ‘peasant’ or better termed *subsistence* strategy are engaged in livelihood activities which offer households a secure, regular, source of income or produce, but do not allow them to accumulate wealth. 30 households were classified as subsistence. Signs that a household was producing a secure subsistence but not accumulating, entailed firstly, that they had access to some land and livestock which provided them a significant share of their food needs, but they did not display signs that they were accumulating wealth through high investment in education and consumer goods.

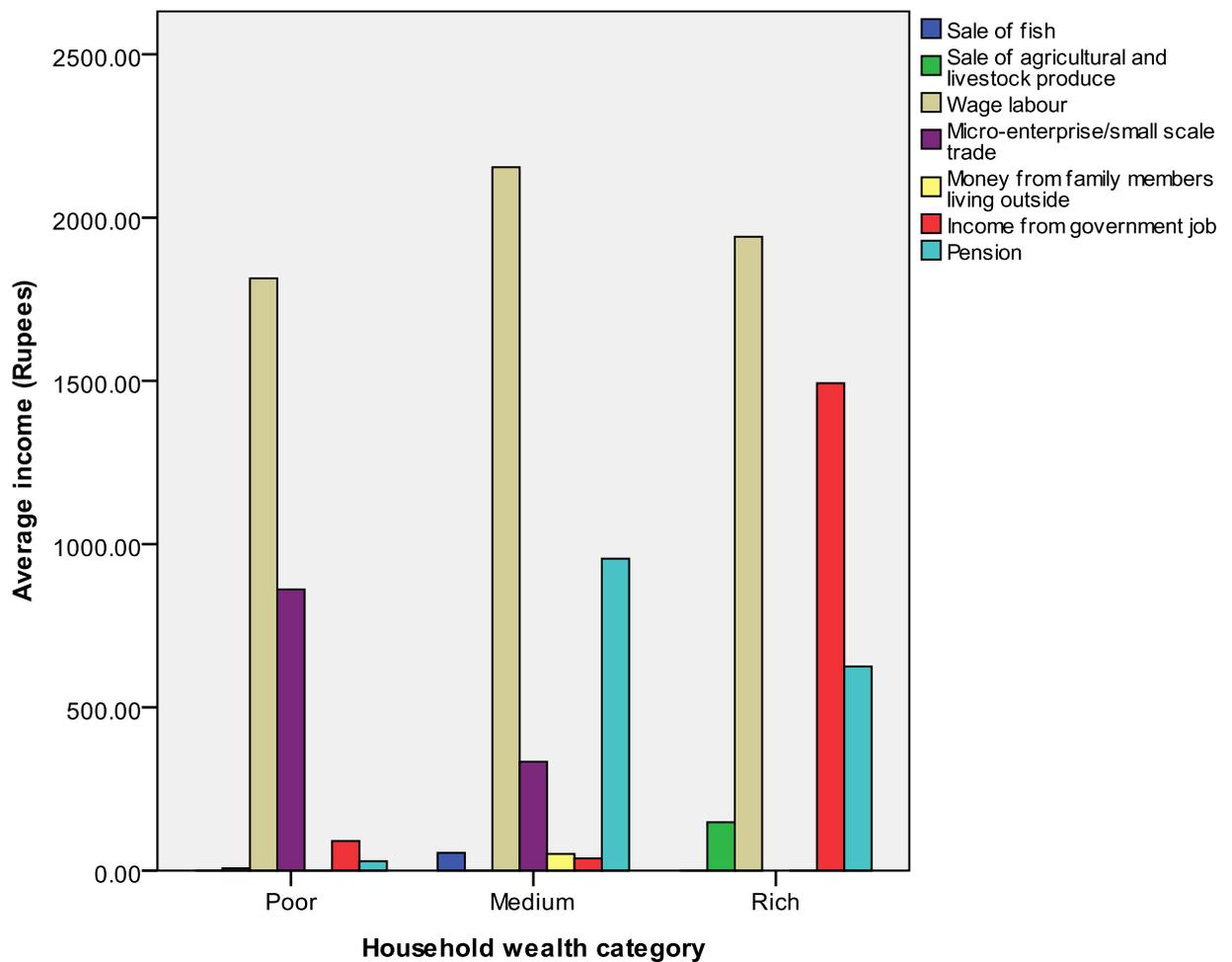
Figure 7 demonstrates how the level of day to day expenditure by medium households is considerably lower than those in the accumulating category, particularly with regards to house

maintenance and education expenses. In fact Table 3 demonstrates that across the three villages, 21% of medium households have members who have completed education beyond class 10, compared to 11% of poor households. The typical recorded diet is also more limited, and protein rich foods such as meat and eggs are not consumed on a daily basis (see Table 4).

Coping or 'poor' households (see Table 2): Households pursuing a *coping* strategy include those whose livelihood activities offer them only an insecure or irregular source of income. The range of livelihood activities available to such households is more limited, and they do not operate sufficient land to meet their subsistence needs themselves. They are therefore dependent upon others for work and vulnerability to surplus appropriation. The majority of households in the sample are coping, with 35 classified as such. Coping households mostly have very limited ownership of the means of production and are primarily dependent upon unskilled labour for their subsistence, with the exception of secondary activities such as small scale livestock raising or tending vegetable gardens, as well as small scale enterprise and trade. This is evident in Figure 6, whereby much of the average income over the last month appears to have been from laboring with micro-enterprise as an important secondary source. Out of this laboring, poor households are more likely to be engaged in lower wage and more menial work than their richer counterparts. For example, in Jayanti, the average income from labour in stone collecting from the river, a physical and difficult job was Rs956 over the last month for poor households, while it was Rs340 for medium households and Rs297 for rich households. In this context, medium and richer households had higher income from construction, a type of wage work which is more likely to include skilled and semi-skilled jobs.

The weaker economic position of 'poor' households is evident when one examines their average levels of day to day expenditure, which is much lower than their 'accumulating' and 'medium' counterparts, as Figure 7 suggests. In particular, investment in education is significantly lower. This can be also observed in Table 3, which suggests 41% of poor households have no education, and only 11% have household members who have studied beyond class 12.

FIGURE 6 ESTIMATED INCOME OVER THE LAST MONTH* IN BUXA (RUPEES)



*To enhance the reliability of data in the survey, information on agriculture was based upon the last year's income, and information on fishing was based on the last week's income, while information on labour was based upon the last month's income. Data on fishing and agriculture were adjusted in order to provide a 'monthly' estimate.

FIGURE 7: BREAK UP OF AVERAGE EXPENDITURE BY WEALTH CATEGORY OVER LAST YEAR

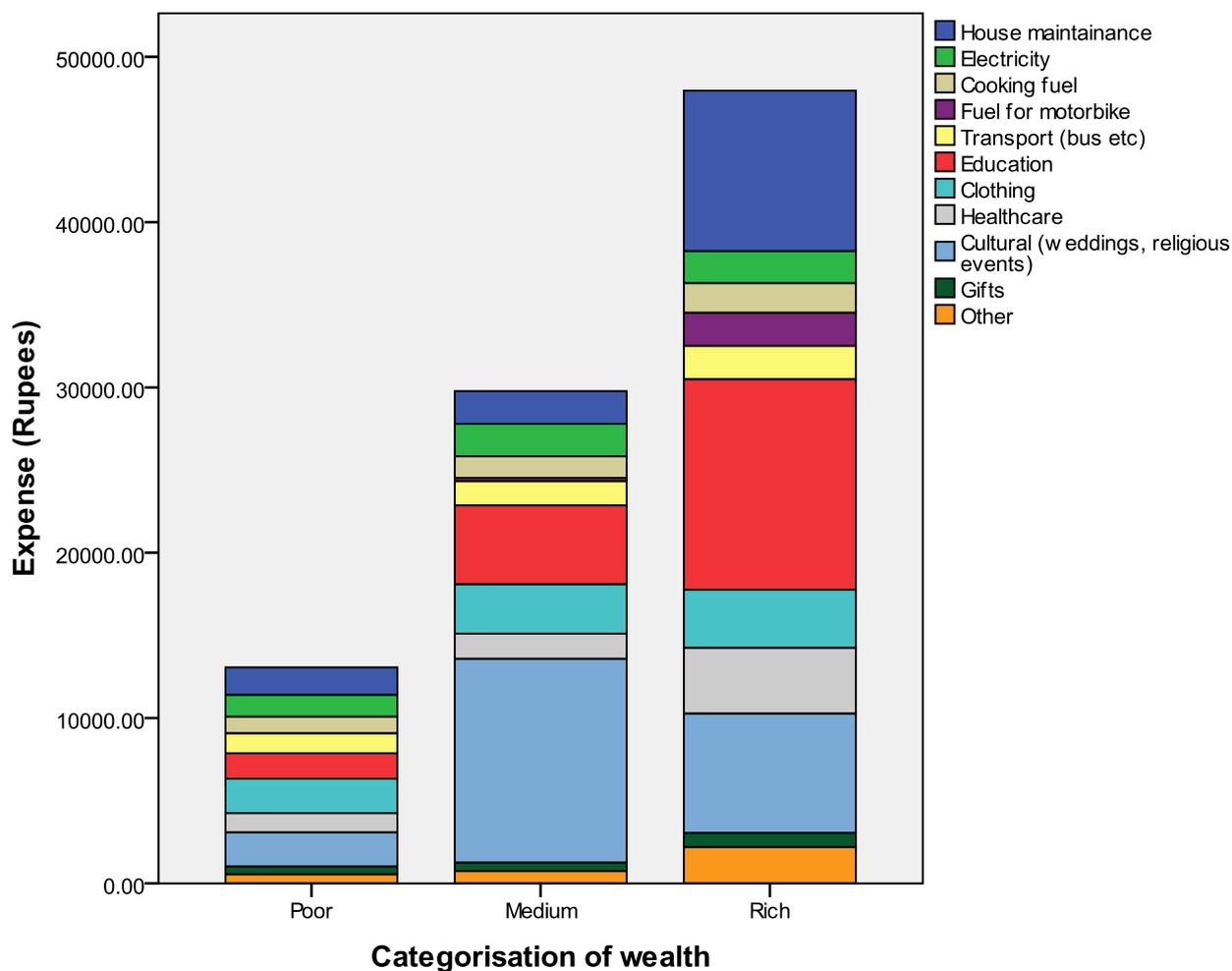


TABLE 3 EDUCATIONAL CHARACTERISTICS OF EACH HOUSEHOLD

Household characteristics	Wealth group	Buxa	Adma	Jayanti	Average
Number of households where no members have any education?	Poor	50%	33%	40%	41%
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	Medium	10%	11%	42%	21%
	Rich	0%	0.00%	43%	14%

[Data sources: from household survey in the selected communities]

TABLE 4: CONSUMPTION PATTERN IN THE THREE CLUSTERS BY WEALTH GROUP AND COMMUNITY

Meal	Wealth group	Buxa	Adma	Jainti
Breakfast	Poor	Rice/Chapatti	Rice/Chapatti	Rice/Chapatti
	Medium	Noodles	Noodeles	Rice/Chapatti
	Rich	Noodles with Egg	Noodles with Egg	Rice/Chapatti with Egg
Lunch	Poor	Rice with vegetables/Dal	Rice with vegetables/Dal	Rice with vegetables/Dal
	Medium	Rice with vegetables/Dal	Rice with vegetables/Dal	Rice with vegetables/Dal
	Rich	Rice with meat	Rice with meat	Rice with vegetables
Dinner	Poor	Rice/Chapatti with vegetables	Rice/Chapatti with vegetables	Rice/Chapatti with vegetables
	Medium	Rice/Chapatti with vegetables	Rice/Chapatti with vegetables	Rice/Chapatti with vegetables
	Rich	Rice/Chapatti with meat	Rice/Chapatti with meat	Rice/Chapatti with vegetables

2.2 Summary of class relations

Given the lack of opportunities for accumulation and the lack of capacity for households to expand their holdings, there is little class differentiation, whereby the poorer households are selling their assets to their richer counterparts. Indeed the importance of wage labour for all wealth categories highlights the limited social stratification. The only difference is that poorer households are more dependent upon lower wage and menial labour while the richer households perform more semi-skilled work while some have government jobs.

As there are few sources of accumulation, the primary 'class relations' are therefore between the forest dwelling populations and outside employers, with the few exceptions of poorer household members working for others. Few households have achieved the level of wealth that they can rent out land to poorer households.

Given that daily wages for labour across each wealth category is low, at around Rs1900 over the last month, far beyond what could independently support a family, it is clear that a significant portion of households subsistence needs in all wealth categories comes from activities *outside* the cash economy, notably through small scale subsistence agriculture, fishing and livestock herding. Unfortunately data on actual agricultural and livestock production (not including sales) prove unreliable and difficult to collect. Therefore, one element of class stratification which could not be captured statistically was the more secure subsistence richer households have from agricultural and livestock produce which is output for home consumption.

2.3 Different uses of aquatic resources by wealth group

Having established the character of class relationships in Buxa, it is now necessary to understand how they mediate access to aquatic and other natural resources. Evidence from throughout the world suggests that land-poor households pursuing 'coping' livelihood strategies are disproportionately dependent upon common property resources (CPRs), including aquatic ecosystems (Beck and Ghosh, 2000, Dey, 1997, Luttrell, 2006, Agarwal, 1998). This trend is also evident in Buxa. In fact, the importance of aquatic ecosystems for livelihoods is enhanced given the conservation restrictions on the use of forests, the other key common property resource. Harvesting from rivers through fishing plays a supplementary role for all three wealth categories, although interviews and focus groups revealed that poorer households on the whole are most dependent upon aquatic resources in all three clusters. Table 5 shows how over the last week at the time of the survey, 10 poor households had been fishing, in contrast to only 3 medium and 2 rich households. Many of them stated that they collect fish when they do not have vegetables. It is a crucial survival strategy during periods of scarcity. Fish are rarely sold, as the low income from fishing over the last week in Figure 6 suggests.

TABLE 5 AQUATIC RESOURCES HARVESTED OVER LAST WEEK BY WEALTH CATEGORY

No of households who have carried out following activities over last week	Wealth group	Buxa	Adma	Jainti
Fishing	Poor	10	2	8
	Medium	3	2	12
	Rich	2	2	7
Collection of sand from river	Poor	0	2	6
	Medium	1	2	6
	Rich	2	3	0
Collection of firewood from river	Poor	10	17	13
	Medium	5	5	8
	Rich	3	4	0
Collection of mushrooms from river sides	Poor	1	0	0
	Medium	0	0	0
	Rich	0	0	0
Collection of bamboo from river side	Poor	0	8	5
	Medium	1	0	0
	Rich	1	2	0
Collected boulders from river (as labourer)	Poor	0	0	6
	Medium	1	2	12
	Rich	1	4	4

Significant differences in levels of aquatic resource use by wealth are also apparent with regards to non-fish aquatic resources. Households were asked during the survey to list which aquatic species had been collected over the last week. Table 5 shows that more households classified as 'poor' had collected aquatic species than those classified as 'rich' or 'medium'. In particular, ten poor households had collected driftwood, in contrast to only 5 medium and 3 rich household respectively.

2.4 Class relations and access to aquatic resources

There did not appear to be unequal power relations with regards to how fishery resources are mobilised. However, stone collecting is one use of aquatic resources which is cornered primarily by capitalist or private enterprises, and local people benefit primarily as labourers. There are very clear class relations with regards to how this aquatic resource is utilized. Although it is “used” by everyone, the benefits are not equally shared, given that the profits are drained to urban centres. Contractors who own the trucks, collect the stones with the use of local labour and sell them on in Alipur Duar and other urban centres. Each truck pays Rs650 to groups of 5 labourers for each round trip on the truck. There is normally one trip a day if it is further afield, or several trips if the stones are for use in the local area. They must pay Rs350 per truck to the forest department.

3 Policies and institutions and impact on aquatic resources

3.1 National and State Level policies regarding natural resource management and allied sectors

3.1.1 Environmental protection legislation

The sustainable Livelihoods Framework underlines institutions and policies as integral components of livelihoods which mediate access to and control over resources in different contexts. The objective of this section is to discuss these policies and institutions at various levels.

In general, the environmental governance of air, water, and forests are covered under the Environment Protection Act (EPA) 1986. In 1980, the Department of Environment was established in India. Later on in 1985 it became the Ministry of Environment and Forests. The ‘environment’ encompasses water, air and land and the interrelationships which exist between these elements and human beings, other living creatures, plants, microorganisms and property. Environmental Pollutants mean any solid, liquid or gaseous substance present in such concentration as may be, or tend to be injurious to environment. The objective of the act is to provide the protection and improvement of the environment. In the EPA, article 48A specifies that the State shall protect and improve the environment. Important later acts and rules also include The Environment (Protection) Rules, 1989; The objective of Hazardous Waste (Management and Handling) Rules, 1989; The Manufacture, Use, Import, Export, and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules, 1991; and the Public Liability Insurance Act and Rules and Amendment, 1992. Relevant (in the context of High ARCS), sector specific acts include the water act, 1882; The Easement Act, 1897; The Indian Fisheries Act, 1956; The River Boards Act, 1970; The Merchant Shipping Act, 1974; and the Water (Prevention and Control of Pollution) Act, 1991.

3.1.2 The Biodiversity Act (2002)

The Biodiversity Act (2002) of the Government of India (GoI 2002) is the over arching policy framework for the promotion and conservation of biodiversity and regulation of ecosystem services. The policy framework envisages a broad base of stakeholders which includes government officials, local government, people's representatives and community.

Until recently in India, biodiversity was something held entirely in common by local communities of people. Resources and knowledge about forest or agricultural properties were freely shared. Whether it was seeds of the farm or plants of the forest, all were clearly understood to be part of the cultural, spiritual, and biological commons. The new Act undermines the community right. The Act tightened the Government control over biodiversity and in theory is careful to protect the interest of the community.

Salient provisions of the Biodiversity Act (2002) include:

- i) Conservation and sustainable use of biological diversity.
- ii) Conservation and development of areas important from the standpoint of biological diversity by declaring them as biological diversity heritage sites.
- iii) Protection and rehabilitation of threatened species.
- iv) To respect and protect knowledge of local communities related to biodiversity.
- v) Regulation of access to biological resources of the country with the purpose of securing equitable share of benefits arising out of the use of biological resources and associated knowledge relating to biological resources.
- vi) To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources.
- vii) Involvement of institution of self-government in the broad scheme of the implementation of the Act through constitution of committees.

However, a 2004 amendment to the Act further undermined both communities' dependent on biodiversity, and conservation itself. They also dilute the Biodiversity Act (2002) in letter and in spirit, weakening the inadequate provisions of the Act relating to rural community rights and entitlements. The changes emphasised conservation at any cost. Although there was apparent appreciation for the involvement of the community in practice it isolated forest dwelling peoples.

Furthermore, there is no specific provision for upland populations in the Biodiversity Act (2002), although it is now not forthright in providing opportunities for livelihoods of the marginalized in either upland or lowland communities. The Act instead entraps the poor through a number of regulatory measures. In fact the forest protection committees proposed in the Act are often overwhelmed by the official representations and the communities have to remain subservient (personal communication with the members of the committees) The communities in the upland are isolated and lack awareness on critical aspects of conservation viz-a-viz their rights and entitlements.

3.1.3 Orientation of and relationship between National and State Acts.

National Acts and Laws on Environment are usually binding at a state level. States are however free to bring in and introduce local adaptations to adjust to and address the local situation and realities. The overall framework and focus of the national provisions have yet to be conformed to.

A significant element of the Acts, both national and state, is the overwhelming control of the state. Where ever there is any mention of the local community it is notional and unilateral –the community has to participate in the management of the given resource ‘as directed’. There is therefore limited decentralisation in natural resource management decision making, despite the rhetoric of democratisation. The National Water Policy (1987) for example, clearly suggests that ‘Farmers should be progressively involved in the management of irrigation systems. The term ‘progressively’ however, is ambiguous and dilutes the focus and seriousness. The water policy further advocates integrated use of water which is based on the wise use approach. Indicators for wise use however, are left wide open.

Another important issue is lack of coherence between different Acts within and between the National and state policies. For example central and state policies on poverty alleviation should have strong focus on integrated management of aquatic resources including water which does not seem to be the case. Also the same act and its provisions cannot be applied in different contexts for example high and low lands. The environment protection laws are quite stringent against the poor who have limited rights over access to aquatic resources. Enjoying the access right is also dependent upon the interpretation and good will of the state agencies and their functionaries.

4 Policies on poverty alleviation and sustainable livelihoods

4.1 Policies and experiences with stakeholder participation in environmental planning and regulation.

This section reviews some of the policies and institutions which shape livelihoods and natural resource use in Buxa. For more information, see the HighARCS policies and institutions report (Mishra et al., 2011). Approximately 35% of Indian population is below the official poverty line (US\$ 1 a day as per World Bank’s criteria). Poverty alleviation and sustainable livelihoods is the priority of the national government. Poverty alleviation strategies include both group and individual based interventions. State governments while implementing the programs also have their own innovations. Swarnjaynti Grameen Swarojgar Yojajana (SGSY) has been one of the key programs offering multiple opportunities to the poor. Now, the Government of India has come out with the National Rural Livelihoods Mission (NRLM) to comprehensively deal with poverty issues by creating skills and opportunity for income enhancement.

As has been indicated above, the Government of India environmental protection acts are ambiguous in their commitment to stakeholders’ involvement in environmental planning. However, there are a number of separate initiatives which explicitly seek a more decentralised approach to environmental management in line with the government’s poverty alleviation goals.

The Government of India for example, has a watershed development program. This is one of the most important integrated programs combining natural resource management, skill development

and augmentation of biodiversity in rural areas. The program has a strong component of community involvement and micro-planning. India has many successful examples of watershed management in the diversified tract covering the length and breadth of the country. Watershed management is a clear example of community involvement in natural resource planning. Million of hectares of land have been rehabilitated and employment and income opportunities have been created for poor and marginalized communities.

Launched during the 1970s Joint Forest Management (JFM) is another example of community involvement in natural resources management which is aimed at protecting forest resources through community surveillance and protection. There is no clear policy however on the involvement of the community in highland aquatic resources management. They are presumably covered under the environmental protection acts of the central and state governments.

4.2 Legislation and Policy Analysis of sustainable management of aquatic resources in the Buxa study site:

4.2.1 Lack of coordination between acts, stakeholder participation, and environmental degradation

Despite the strict acts aimed at protecting biodiversity, there appears to be some areas where management regimes are weak, particularly with regards to aquatic resources. The Forest (Conservation) Act 1980 has stringent provisions but at the same time do not interfere, in any manner, or restrict the Nistar which is , recorded rights, concessions and privileges of the local people for bona fide domestic use as granted by the State Government under India Forest Act,1927 or State Forest Act/Regulations. While it is crucial to allow access to forest resources, a number of restrictions remain in place. These include the provision that right holders do not resort to felling of trees or the break up of the forest floor so as to procure stones, minerals, or take up constructions, etc The Acts state that forest produce so obtained shall not be utilized for any commercial purposes. The collection of such forest produce should be manual and should be transported through local modes or transport like bullock carts, camel carts, etc and no mechanized vehicles shall be allowed to be used in transporting such forest produce and only in exceptional cases with approval of concerned Divisional Forest Officers, tractors mounted with trolley may be used.

Appreciation of such provisions is at very minimal level of the Government forest officials, leading to avoidable conflict. Large vehicles operated by contractors continue to enter the forest to collect boulders from the Jayanti river (see Figure 8). The Forest department had previously banned the collection of boulder from the river. However, a few years ago they allowed trucks in again. Most the profits are drained to urban centres by contractors, although it was still a source of income for the local people. Currently, contractors do not need permission to collect stones from the vicinity of Jayanti, but they require clearance if they want to go deeper into the forest. Although dolomite factory has been closed the flow of dolomite continues to cause damage to the aquatic species.

There are a number of potential explanations for such unabated resource exploitation in a protected area, but a key explanation may lie in the lack of coordination between different acts. For example, resource extraction may have been justified by the National Mines and Mineral Development Act 1957 and national mining policy of 1991. The national Mines and Mineral Policy in the post reform period talks of private partnership with the hidden motive of profit. Thus aquatic species are damaged not only due to human interference but also due to incoherent policies of different departments.

FIGURE 8: STONE COLLECTING TRUCKS ASSEMBLE IN JAYANTI



The lack of provisions, specifically for forest aquatic resources, may be another reason for the unabated mining of rocks from the river bed. The west Bengal inland fishery Act (1984-section 6-8 Chapter III) takes special view of pollution of water causing damage to fish. Pollution causing damage to fish by an individual or industry is punishable under the Act. Punishments can be either financial as well as or involving imprisonment. However, this act does not appear to have been implemented in Buxa.

The limited stakeholder participation may be another reason for the unabated mining from the Jayanti river. More effective involvement of local people with ecological knowledge of the river and its ecosystem may have ensured that more effective local level regulations were developed.

4.2.2 Restrictions on the use of forest resources, stakeholder participation and conflict

Paradoxically, just as activities such as boulder collection have continued in the reserve, local people's rights to forest resources are being increasingly curtailed, despite the provisions in numerous acts. There are a number of restrictions on access to forest resources. These include:

- **Restrictions on use of wood:** Local people are allowed into the forest to collect fallen branches dry wood, and fodder but they are not allowed to cut large trees.
- **Restrictions on collection of medicinal plants:** Local people in one of the villages in the hilly tract were aware that there was a lot of money to be made out of harvesting of medicinal plants from the jungle such as *totala* and *pipla*. Many of these are found along river banks. However, they reported that the forest department does not allow this (*interview in Lepchakha, Nov 2010*)
- **Restrictions on tourism:** There were 21 households in Jayanti who had members working as guides for the many domestic tourists who visit the reserve each year. However, the Forest Department is cracking down on tourism in the reserve. Already a number of the core roads for vehicle safaris have been closed to the public.
- **Restrictions on fishing:** Technically, the local people in Jayanti reported that they were not allowed to fish. In the past, they were fined and even beaten by forest guards for fishing. However, officials reportedly turn a blind eye, and fishing is tolerated.

While these regulations still allow some use of forest resources, restrictions are becoming increasingly strict making livelihoods unviable, and for some communities, the government is seeking to relocate them entirely. Additionally the government is supposed to provide local people with 100 days of work per year through the MGNREGA scheme, but locals in both Jayanti and Buxa fort clusters stated that many had not received this work, and even then, did not get the required compensation which they were entitled to.

The local people also had little trust in the conservation agenda of the government. Despite it being a 'tiger reserve', female respondents reported in a focus group in Jayanti that they had not seen tigers in years, saying that "*we are the only tigers here*" (Nov 2010). There was a perception amongst some respondents that the state sought to pretend there were tigers, and evict people from their land with this justification, in order to continue receiving the additional funds that a 'tiger reserve' is entitled to. It was also interesting that while the government was being stringent in restricting the livelihood activities which directly involve local people, larger scale operations which involve private companies such as stone collecting are still permitted. This suggests the local people have perhaps less bargaining power with the authorities.

Local people felt entirely powerless in relation to the Forest Department with a lack of trust towards the institution and resentment of its policies. The sentiments were echoed by one respondent during a focus group in Jayanti cluster, who said "*how can they stop us, the river belongs to us, not to the forest department*" (Nov 2010). Another man reported during a focus group meeting in the hills that "*I do not like the Forest Department. This is our forest and this is our land. I need the land and I*

need the forest but I do not want the Forest Department!" (Nov 2010). This was followed by an applause from the villagers.

The limited stakeholder participation in resource management planning arguably lies behind this break down of trust. Furthermore, with more effective stakeholder planning the Forest Department could perhaps come to a mutual agreement with communities regarding how forest resources are to be managed sustainably rather than seeking their eviction, or banning activities entirely.

4.2.3 Local NGOs and community relations

There were numerous NGOs operating in each of the three villages, although the impact of development activities appeared to have been limited by the strict forest department regulations. Lack of follow up also appeared to be one problem. For example, during a focus group in Jayanti, the local women explained how they had taken training in mushroom cultivation, but they were unable to find a market for them, so the endeavour failed. Furthermore, there was a rotating credit scheme in Bhutia Busti which failed reportedly due to the borrowers not making the required repayments on time.

As with the government, there was apparently a lack of trust with local NGOs. A local woman we spoke to in Jayanti felt she had been misled and 'cheated' by NGOs in the past. Indeed, the suspicion of some respondents in Jayanti to our work reinforced this. Nevertheless, community relations are good in the three villages. There are self-help groups in most villages which were responsible for collective tasks such as repairing trails and keeping them free from undergrowth. People do this work voluntarily for the collective benefit of the community. It is not clear however, what the power relations are within these groups – for example, who dominates them and prioritizes jobs. The people in Buxa cluster appear to be very well organized. There is also a strong community spirit. For example, we observed one elder who was unwell, whereby local boys had taken turns to come and massage him.

There are rarely open conflicts apart from minor disputes. Jayanti, being the larger and more diverse community has greater potential for conflict. Some fishers stated annoyance that after building a dam to divert the channel for fishing, other villagers also come and collect the fish, even though they had done the hard work to build the dam. Nevertheless, they acknowledged that as a community they should help each other, and sometimes they would also collect fish after another group has built the dam.

There were also some local management regimes for common property resources, such as a sacred lake up a forest trail an hour north of Jayanti. This was home to huge cat fish and turtles. Due to the lake's religious significance however, people were not allowed to even touch the water, let alone catch the fish. However, it was still a source of income, as pilgrims and tourists would regularly come to visit the site, and local people could act as guides.

The good community relations suggest that there are opportunities for effective community mobilisation to preserve and manage aquatic and other natural resources while protecting vulnerable livelihoods.

5. Environmental change and aquatic resources

There have been considerable environmental changes over recent decades, more discussion of which can be found in the HighARCS ecosystem values and biodiversity report for Buxa (Roy et al., 2011). When the research team asked local people what they felt were the main changes in the community over the last 10 years, environmental changes were generally deemed most important, and in this context, changes to aquatic ecosystems were significant. There reportedly are less aquatic species in the river today than there was 10 years ago. In particular, fish stocks in the Jayanti river, and in the Katloom khola which flows into it, have declined significantly since 1993 when there were major floods. A large landslide reportedly changed the channel during this time in a way that reduced the suitable habitat for fish. There are reportedly fewer wild animals and birds when compared to before. The jungle around the villages is also less dense, perhaps due to the cutting of firewood and fodder for animals.

Furthermore, there are reportedly more severe water shortages nowadays. The pipes to the village taps are quite often dry during the winter and spring seasons. This is problematic for both agriculture and drinking water provision. For three months of the year, local people around Buxa suggested that water in the river at points flows directly down into the soil, rather continuing down its course. This makes it difficult to collect water. There used to be rice fields in Sadar Bazaar also, below the church along the dhobi khola. However, nowadays the water supply is too meagre to irrigate the plots, and rice is no longer cultivated. In Jayanti, the bed of the river has grown considerably due to the deposition of gravel. The local people felt that this made it more difficult to access clean drinking water.

Climate change had also reportedly affected the communities of Buxa. Floods are also a regular occurrence, and can cause significant changes in the river channel distribution. As early as the colonial times, the problem of flooding was acknowledged in the Buxa region (Grunning, 2007 [1911]). However, local people report that they are increasing in frequency nowadays, as are landslides.

Agricultural yields have also reportedly declined over the last decade, with the climate being reportedly hotter and more extreme compared to before. There are more storms and longer dry spells. The geography of the system has also changed with a rapid accumulation of stones in the rivers as the presence of a bridge in the Jayanti river half buried by rocks suggests. This phenomenon is a significant pointer to the rapid changes taking place in the local ecology.

6 Intra-household division of labour

6.1 Differentiation of livelihood activities (gender)

If one is to promote reconciliation between conservation and sustainable livelihoods development, it is important to not only engage with wealth differences between households, but within households themselves. This affects how individuals interact with their environments. The first and most well documented axes of differentiation is that of gender.

There was a perception that inequality between men and women had decreased, and the position of women had improved. The predominantly Buddhist Dukpa in particular was considered a relatively 'egalitarian' community when it came to gender, as opposed to the Nepali and Bengali communities who were more often Hindu or Christian. Respondents reported that within the Dukpa community between men and women, even activities such as cooking are reportedly shared (interview in Chunabhati, Dec 2010). Nevertheless, within all communities there were some tasks which were more often carried out by women and some which were more commonly the domain of men.

While women's status in the household has arguably improved with greater access to resources and education, the distribution of labour still remains unequal. Women often have a dual responsibility for reproductive tasks as well as productive tasks such as watching livestock and tending agricultural plots which are often some distance from the house. Amongst the Nepali community in Sadar bazaar for example, women bear a disproportionate responsibility for reproductive activities such as collection of water from the river when the wells are dry and collecting fodder for cattle. The other time consuming reproductive jobs they are usually responsible for include the collection of firewood and cooking.

While women's dual responsibility for both productive and reproductive tasks increase their work burden, there are also some jobs which are primarily the male domain. Fishing is primarily a male activity, and few women we met were involved in this, with the exception of Jayanti. However, it was still dominated by men. Fishing is often carried out at night in Jayanti with torches, through the process of damming the river, as described above. For this reason perhaps the research team observed more men fishing, although the team did see two women fishing. Normally a group of 10 men work to block the channel (participant observation with fishers in Jayanti, 25/10/10).

With regards to other aquatic resources, women and young girls play a disproportionate role in the collection of driftwood from the Jayanti river in line with their 'reproductive' responsibilities. This is difficult work, and involves long spells of walking out on the vast treeless gravel flats searching for wood left by the river during floods. The heat can become intense under the sun, and the loads are heavy (general observation around Jayanti, 25/10-28/10).

Wage labour, which forms an important element of livelihood strategies, is again, the domain of men and women, although labour outside the community is more often carried out by men. It is generally Dukpa men for example, who migrate to Bhutan to work as labourers, often in construction, while in other communities they migrate to urban centres of India. While women also work as labourers, this is mostly for jobs within the forest such as the maintenance of paths.

Aside from the inequality in the distribution of labour, there is by no means a fair distribution of household income. Women in Jayanti stated that they were entirely dependent on their husbands, as many do not have any personal source of income. Although women participate in some activities, this is primarily for subsistence purposes. Some women who have income laboring do retain some income for themselves, although they also have to share this with their spouses. Nevertheless, there was evidence in some instances of these relations reversing, particularly amongst the Nepali and Dukpa communities. There was an interesting perception that women were more responsible with money and were better 'accountants'. It was for example reported by women that men waste

household money drinking, buying cigarettes and gambling. Even men admitted this jokingly, and claimed to have conceded control over the finances to their wives as a result. For example, one respondent from the Nepali community joked that if he needs Rs 100 for some expense, his wife will always question him as to what it is for to make sure he doesn't waste it.

6.2 Differentiation of livelihood activities (age)

The analysis of the intra-household division of labour does not stop at gender. It is also crucial to examine the understudied differences across generations in labour responsibilities and interactions with ecosystems. In rural majority world contexts, young people make an important contribution to household livelihood strategies in both productive and reproductive tasks. However, like the labour contribution of women, it is often undervalued (Panelli et al., 2007). It is essential therefore for this research to understand the dynamics of young people's livelihood activities. This is important firstly, so as to better understand how aquatic ecosystems such as rivers are used; secondly, to uncover how these livelihood activities contribute to or undermine the wellbeing of different generational groups; and thirdly, to understand the constraints (or opportunities) within the household to strengthening particular livelihood activities (see HighARCS overview report, Sugden and Punch, 2011).

Young people in the hilly tract of Adma and Buxa appeared to play an important role in fishing activities, particularly in the collection of smaller species. The field team observed one young boy carefully catching small crabs from under rocks and trees. It is a time consuming process. The fish species the children recalled include *bhuduna*, *garela*, *jinge macha* and *gangata*. They also collect *paha*, a particular type of frog, which is eaten as medicine. Boys are generally more likely to go fishing than girls, perhaps because it is a predominantly male activity. Collection of forest produce was carried out by both boys and girls, although it was claimed that more 'physical' tasks such as cutting larger logs is more often carried out by boys (FG with children in Sadar bazaar, Oct 2010). Other than this, there was not a significant gender division of labour between boys and girls.

Children like women, appeared to play a particularly important role in reproductive activities. These include fetching water from the well or pipe, cooking, collecting firewood, cleaning the house and washing clothes (FG with children in Sadar bazaar, Oct 2010), although girls play a more important role. In this context, reproductive activities which utilise aquatic resources such as the collection of drift wood and washing of clothes are more often carried out by girls, particularly as they get older and their labour contribution begins to parallel that of their mothers. Other tasks such as collection of fodder for animals was carried out by both boys and girls (see Figure 10).

As with women, young people have limited sources of personal income. It was apparent that boys and girls after collecting aquatic produce from the river, would share the catch with their parents. This was driven in part by a sense of responsibility for their parents. One boy said that he only goes fishing when the family are short of vegetables, and require something else to supplement their diet. He did not enjoy fishing (FGD with children in Sadar bazaar, Oct 2010).

FIGURE 9: FISHING FOR CRABS NEAR BUXA FORT



FIGURE 10: CHILDREN IN CHUNABATI COLLECTING FODDER FROM FOREST



There are some opportunities however, for children to retain some of the products of their labour. Collecting wood from the river and forest is also a job they enjoy, as the children can also collect wild fruits to eat at the same time. They do not have to give everything to their parents. Furthermore, children enjoy it when they are asked to go to the shops to buy groceries, as they can keep a little of the change to buy treats for themselves (FG in Sadar Bazaar, Nov 2010).

6.3 Education, age and intergenerational change

There is evidence that in some instances, young people's involvement in livelihood activities is declining as more priority is placed by parents on their children's education. As was outlined above, access to skilled employment is a primary source of accumulation, particularly when access to land and other resources is restricted by the Forest Department. While some young people aspired to stay in the village when they were older, citing an appreciation of the natural beauty and sense of community, FGs revealed that many aspired to leave and find skilled employment outside.

Nevertheless, as the data in Figure 7 suggests, opportunities for education are more limited for poorer households. In a competitive job market there was a perception by poorer respondents that they could not afford the quality of education which would be necessary for their children to get better paid employment. In Buxa for example, wealthier households sent their children to private schools, often far from the village in neighbouring regions such as Kalimpong. Poorer households depended on the village schools which in some contexts such as Adma, were understaffed. The schools in the villages themselves are only up to class 8 which cater to the age range of 10-14, after which young people have to move outside for their studies, a disincentive for poorer households.

Either way, despite the fact that education is being prioritised by wealthier households across the five field sites, there is a perception that the chances of securing better paid employment are often limited. These sentiments were echoed in a focus group near Buxa fort, when we discussed the issue of education. One respondent suggested that working as a labourer is a better investment of one's human resources. He said, *"those who have an education are begging from those who go to Bhutan to labour and earn Rs15,000. Of course not everyone agreed, and one respondent replied "Rs15,000 may be gone, but education you will have for life. Nobody can steal it".* Evidently for some individuals, education is still valued for non-material reasons. The respondent in Buxa concurred that only a few individuals are able to get good jobs in the village, education is beneficial in the long run. As he said: *"education will make them better people".*

7 Non-use values, gender and age

A sustainable livelihood should not only offer economic security and resilience, but overall wellbeing, including access to *non-material*, or 'non-use' values (Scoones, 2009). This is important as aquatic *ecosystems* themselves can have non-economic values which are important to the lives of users. Secondly, livelihood *activities* themselves can contain non material benefits. The latter is particularly important for young people in their aquatic resource harvesting activities. Although young people's responsibility to labour is like that of women, embedded in unequal structural power

relations, they are not 'passive' actors, and can exercise some agency. The literature has shown instances where they negotiate their work so as to attach it with particular meanings and values (Dyson, 2008, Klocker, 2007, Robson et al., 2007, Punch, 2007, Punch, 2002).

While many of the other jobs they are expected to contribute to are considered by young people during focus groups as 'boring', fishing is a task which is considered as much a form of play as a form of work. Interestingly, when asked what forms of work they helped with, fishing was not listed. This may be because it was considered as much a recreational activity than a labour activity (FG with children in Sadar bazaar, 12/10). In Jayanti, the local children actually considered fishing as a 'game'. Small scale fishing was however, not prioritized by parents, who generally dictate young people's responsibilities. Nevertheless, agency is exercised when they go off without being told. They can therefore enjoy themselves, be excused from other jobs around the house, and after a day's fishing, have something to share with their family. Fishing at night by children is not allowed by many parents. However, we met some boys out on the river in Jayanti when collecting fish from the dry river bed. They had sneaked out without telling anyone! (observation around Jayanti, Oct 2010)

Children also love to bathe in the river, particularly in Jayanti. It was reported that parents often do not allow them to go, but again, children can exercise some agency and bathe in the river while collecting water for their parents. They are therefore quick to volunteer to collect water.

Aside from the non-use values of livelihood activities for young people, some aquatic resources clearly have a 'non-use' religious significance for both young and old, like the sacred *pokhari* (lake) above Jayanti.

8 Ecological knowledge, gender and age

Given the diverse ways in which men, women, boys and girls from different socio-economic groups utilise aquatic ecosystems, it is clear that a unique set of environmental knowledges exist. It is crucial that these are valued and utilised when planning the management of aquatic resources. In Buxa it appeared that ecological knowledge was acquired as children, particularly through working alongside their parents in the forests, rivers or fields of communities. Children's work was not only to increase production and ensure families achieve food security. It was an essential part of their socialisation process, endowing them with the ecological knowledge and practical skills essential for the augmenting and multiplying of their family labour. During focus groups in Buxa fort cluster for example in October 2010, young boys and girls displayed a rich knowledge of the forest ecosystem where they lived; knowledge which had been acquired through years of work with their parents collecting fodder, tending livestock and fishing.

Knowledge is also acquired from parents, and is thus intergenerational. In early times, forest dwelling communities were highly dependent upon forest produce for food. Informants from the Manger community in Sadar Bazaar explained how they used to collect roots from the jungle in the past, and have therefore accumulated a rich knowledge of how to utilise different forest products such as medicinal plants over the generations.

9 Needs and priorities

9.1 Priorities of poorest communities

The above report has demonstrated that livelihoods in Buxa are complex and diverse, with aquatic resources playing an important supplementary role, particularly given the restrictions placed by the forest department. At the end of each survey, respondents were asked to identify what they perceived were the biggest problems in their lives. These included:

- Lack of road access in Buxa.
- Water shortages, having to walk to the river during the dry season when water supplies run dry in the taps.
- In Adma, they would like a better school. They say that the teachers rarely stay in the local government school, and all the children have to go outside to study.
- Hospital and health facilities are very far.
- Lack of income, particularly in Buxa and Jayanti.
- Not being allowed to increase the cultivable area and cut grass from the forest for livestock.

There were some issues which were prioritised by young people in particular:

- The children we spoke to in Sadar bazaar were all keen for the school to increase to at least class 12 so they did not have to go far away for further studies
- The lack of road access was a priority listed by many young people in Sadar Bazaar and Adma cluster. In Chunabhatti for example, local people must walk for up to 2-3 hours to reach Santalabari.

It is important to note that wellbeing is not only about economic security. There were a number of non-economic factors which were considered important by respondents.

- Good relations with their friends and family.
- Good community relations and peace within the village

Based upon follow up discussions with community members, a provisional set of needs was identified, which will form the basis of the HighARCS Buxa action plan. Although some needs were commonly identified by each group in each community, in some contexts there is variation between different clusters and class categories in livelihood needs. These can be compared in Table 6:

TABLE 6 NEEDS ACROSS CLUSTERS AND CLASS CATEGORIES

Needs	Wealth group	Buxa	Adma	Jainti
Proper implication of MG NREGA Scheme	Poor	√	√	√
	Medium	√	√	√
	Rich			
Improve income from Animal husbandry	Poor	√	√	√
	Medium	√	√	√
	Rich	√	√	√
Improve income from Boulder and Stone Collection	Poor			√
	Medium			√
	Rich			
Enhance cooperation between local people and FD	Poor	√	√	√
	Medium	√	√	√
	Rich	√	√	√
Improve road and Transport	Poor	√	√	√
	Medium	√	√	√
	Rich	√	√	√
Strengthening of Self Help Groups	Poor	√	√	√
	Medium	√	√	√
	Rich			
Improve agricultural production	Poor	√	√	√
	Medium	√	√	√
	Rich	√	√	√
Improve fishing income	Poor	√	√	√
	Medium	√	√	√
	Rich		√	

10 Potential interventions

To facilitate the development of Action Plans, we asked local people about more specific interventions they thought could strengthen their livelihoods. These are outlined below.

- Ponds could be built to raise fish. Given the number of fish in the *Pokhari* above Jayanti, the environment could be conducive to fish raising, as some local people suggested. However, would the FD allow this? Many local people in Buxa and Adma cluster asked about the possibility of building fish ponds.
- Local people suggested that a reserve tank should be built to retain water during the dry periods, with a pump to take it to the village.
- A pump set or system for irrigation was suggested by a group from Adma and Buxa cluster. There is apparently a good water source on the Dagar khola near the fort. That water can be used for electricity as well as duck raising and fishing.
- Local people had also suggested planting trees around the water source to increase the water retention.
- Access to credit is a issue and the current government policy in favour of self-help groups(SHG) can be quite handy in facilitating a federation of SHGs.

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Annex 1: Household interview form

Statistical data

Introduction to be given by interviewer

The purpose of this survey is to collect information on how people use aquatic resources, so the findings can be used to better inform policy makers of the importance of aquatic resources in highland areas, how they may be protected, and how income generating activities can be strengthened.

1 Interviewee details

Name of respondent _____

Date _____

Gender of respondent (tick): F _____ M _____

Ethnicity of household _____

Village _____

Interviewer _____

Household code _____

Wealth category (please select) *Poor* [] *Medium* [] *Wealthy* []

2 Household head details

Name of household head	
The age of the household head?	
Information (Tel/add)	
Gender of household head?	

3 Details of house:

[To be filled in by interviewer themselves].

What are the <i>wall</i> construction materials? (please tick)	Wooden	Brick	Concrete	Earth	Bamboo	Other
What is the quality of wall construction	High quality		Medium quality		Low quality	
What are the <i>roofing</i> construction materials? (please tick)	Wooden	Tile	Metal	Thatch	Leaf	Other
How many floors? (please tick)	1 floor		2 floor		3 floor	
What is electricity supply? (please tick)	Mains electricity		Solar cell		Diesel generator	
Other comments (e.g. material goods)						

4) Household background information

4.1) Tell me about the people who normally live and eat in this household.

1) Tell me about the people who normally live and eat in this household.

What are the names of the immediate family members?	What is their relation with the hh head?	Gender	Age?	Up until what level have they studied? (please tick)				What is their main occupation?	Have any migrated in the past?
				Primary	Secondary	High school	University		
1.									
2.									
3.									
4.									
5.									
6.									

4.2) When did you build this house? _____

4.3) Was household head born in community? _____

4.4) I will quickly ask about your households' main income source over the last year?

4.4) I will quickly ask about your households' main income source over the last year?

What are your three main income sources? (please tick)		Approximately what percentage of your income comes from each source	Can you rank these activities according to their importance?
Fishing			
Fish culture			
Agriculture			
Labouring			
Migrant remittances			
Other			

5) Productive activities of household

5.1) Do you fish? (If no, go to question 5.3)

How long do you spend fishing each day? _____

What time of day do you go fishing? _____

5.2) I would like to ask you some questions about your fishing activities.

What <u>species</u> of fish and mollusc have you caught in the last <u>year</u> ?	What months did you catch each species?	What are the <u>peak</u> times of year for this species?	What is a typical daily catch during the <u>peak</u> months? (kg)	What would be a typical daily catch during the <u>low</u> months? (kg)	How much of each of these species have you caught over the last <u>week</u> ?	For each species caught in last <u>week</u> , where were they harvested?	For each species caught in last <u>week</u> , what were they used for?	For each species, how much of the <u>weekly</u> catch do you sell? (kg)	What was the price for each species you sold?	Where were they sold?	Who were they sold to?

5.3) Are there any other products you collect from the lake/river/wetland? (e.g. aquatic plants) (If no, go to question 5.4)

What has been Collected over the last <u>year</u> ? (state species if applicable)	What times of year were they collected?	What was the total quantity collected over the last <u>week</u> ? (kg)	For each product collected in last <u>week</u> , where were they harvested?	What form was each product collected? (e.g. was the whole plant/species removed, or only part)	What was each product collected in last <u>week</u> used for? (e.g. for consumption, for housing materials)	Over the last <u>week</u> , how much of each product have you sold (kg)	What was the price for each product you sold? (thousand VND per kg)

5.4) Do you culture fish? (If no, go to question 5.6)

Which fish have you cultured over the last <u>one year</u> from now?	Source of fish for culturing? (please tick)		Which system did you use to culture each species of fish? (please tick)			
	Wild caught from river/lake	Captive bred	Cage	Pen	Pond	Other

5.5) I would like to ask you some more about your recent fish culture activities

Over the last <u>week</u> , what quantity of cultured fish have been consumed? (kg)	Over the last <u>week</u> , what quantity of cultured fish have been sold?	What was the price for each species you sold over the last <u>week</u> ?

5.6) I would now like to ask some questions about your agricultural production.

What crops have you planted in the last year from now?	What was the area cultivated? (ha/m ²)	What was the yield for each harvest?		Over the last <u>week</u> , how much of each crop have you sold? (kg)	Over the last <u>year</u> , how much of each crop did you sell? (kg)	Average price per kg
		Harvest 1 (kg)	Harvest 2 (kg)			
Wet rice						
Maize						
Sweet potato						
Vegetables						
Soya bean						
Aquatic plants						
Forestry						
Other						

5.7) I will now ask some questions about the livestock you own.

Which animals / birds do you own?	How many of each species do you own?	How many have you sold over the last <u>month</u> ?		How many have you bought over the last <u>month</u> ?		How many have you used for home consumption over the last month?
		Qty.	Price	Qty.	Price	
Chicken						
Duck						
Pig						
Cattle						
Buffalo						
Goat						
Other						

5.8) Does anyone in your household operate a non-farm or fish related business? (If no go to question 5.9)

What is the business?	Approximately how much do you earn in a typical week?	Approximately how many months a year does this business operate?

5.9) I would like to ask you about your water use. For each of the following purposes, what is the water source?

Purpose	Water source				
	Tap or well in household	Tap or well in village	River or stream (specify where along the river water is collected)	Canal (specify where along the canal water is collected)	Lake (specify where in the lake water is collected)
Drinking					
Washing clothes					
Bathing					
Irrigation of rice fields					
Irrigation of upland fields (e.g. maize, cassava)					
Irrigation of kitchen gardens					
Other					

6) Household inputs and expenses

6.1) I would now like to ask you about the inputs over the last year from now for fishing, agriculture and livestock?

Input		How much of each input have you used over the last year from now? (e.g. kg / no. of items)	Typically how much would you pay for these inputs? (in <i>local currency</i>)
Category	Input item		
Fishing inputs			
Fish culture inputs			
Agriculture / Livestock inputs			
Other aquatic resource dependent activity			

6.2) I would like to ask about any other expenses over the last year for fishing, agriculture and livestock

Expense item	Expense
Maintenance of fishing equipment (e.g. repairing nets)	
Maintenance of farm equipment (e.g. repairs to machinery)	
Tax on agricultural / aquatic activities	
Other	

6.3) Approximate non-food household expenses over last year from now

Expense	Amount (local currency)	Who bears expense		
		Men	Women	Both
House maintenance				
Electricity				
Fuel for cooking				
Fuel for motorbike				
Transport (bus etc)				
Education				
Clothes				
Health/medical				
Transport				
Cultural/religious				
Family events (e.g. wedding)				
Gifts				
Other				

7) Asset ownership

7.1) Now lets talk about the land only your household owns or rents at present (not community land).

How much land do you operate and what type of land is it?	How much is both <u>owned and cultivated</u> by the household (appropriate local unit of measurement)	How much is owned by household but is <u>rented to others</u>			How much is <u>owned by others</u> but rented by household		
		Amount	Payment	Who is rented to?	Amount	Payment	Who is rented from?
Irrigated land (e.g. for rice)							
Rain-fed (e.g. for maize)							
Kitchen garden							
Fish pond							
Forest plantation							
Uncultivated forest/scrub							
Land for house							

7.2) Now lets move on to other economic resources you own

Which of the following items do you own?		What is both <u>owned and used</u> by the household (state quantity)	What is owned by household and <u>rented to others?</u>		What is <u>owned by others</u> but is rented by the household?	
			Quantity	What is the rental payment?	Amount	What Is the rental payment?
Fishing / Fish culture apparatus	Boat (state size)					
	Boat motor					
	Fish nets (state types)					
	Fish cages					

Agricultural assets	Irrigation pump					
	Tractor					
	Thresher					
	Husker					
	Other					

7.3) I would like to ask you about property which has been acquired in the last 10 years?

Asset	How much of each form of property has been <u>bought</u> in the last 10 years?	When were they bought?	Who was the seller?	How much of each form of property has been <u>given to household as gift or inheritance</u> in the last 10 years?	Who was the giver?	When was it received?
Land						
Agricultural machinery						
Boat (state size)						
Boat motor						
Other assets						

7.4) I would like to ask you about property which has been lost over the last 10 years?

Asset	How much of each form of property has been <u>sold</u> in the last 10 years?	When were they sold?	Who was the buyer?	How much of each form of property has been <u>given away by household</u> in the last 10 years?	Who was the recipient?	When was it given?
Land						
Agricultural machinery						
Boat (state size)						
Other assets						

7.5) Let us talk briefly about other goods you own at present.

Which of these goods do you own?	How many?	How many years have you owned these goods?
TV set		
Fridge		
Motorbike		
Bike		
Other		

8) Labour relations and income

8.1) Think again of your household members (those who normally eat and sleep here). Did any members of this household work for others (e.g. other households, businesses, the government) during last month, if no go to question 8.2.

What kind of work did your family members do?		How many days in the last month has each household member worked on these tasks? What was the wage (or was it unpaid), and approximately how many months a year do they work?					
		1 (state name)	2 (state name)	3 (state name)	4 (state name)	5 (state name)	6 (state name)
Work for other household in <i>fishing</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work on other household's <i>farm</i>	No of days in last month						
	Wage paid						
	No of months per year						
Work on <i>construction/road maintenance</i>	No of days in last month						
	Wage paid						

	No of months per year						
Work in factories	No of days in last month						
	Wage paid						
	No of months per year						
Other work	No of days in last month						
	Wage paid						
	No of months per year						

8.2) Did any people from outside the household work for your household over the last week: If no, go to *question 8.3*.

Production system	How many workers from outside household were employed over the last week?		How many days did they work over the last week?		What is the daily wage for paid workers? (<i>local currency/day</i>)
	Paid	Unpaid (as exchange)	Paid	Unpaid (as exchange)	
Fishing					
Fish culture					
Livestock					
Agriculture/ Aquatic plants					
Other					

8.3) Do you have any family members who once lived in this house, but are now living outside the community?

Name of family members who are living away from the village right now?	Where do they live?	Why did they move away?	How long have they been away?	How many times did they visit in last year and how long for?		When they return, do they bring any goods back apart from money?	How much money have they given the family in the last year?
				No of visits	Length of stay		

8.4) What are the benefits of household members working outside, as opposed to working within the community?

8.5) What other sources of income does your household have?

Income source	Approximate income in last year from now
Subsidies	
Pension	
Any other sources we have not yet considered?	

Qualitative section

NOTE: It is essential to complete the entire quantitative section of the form for the 30 households in each community. The qualitative section is however, more flexible. While we would endeavor to cover all sections and questions, respondent fatigue or time constraints may mean this is not possible. Some issues are also covered in the focus groups, so if one is short of time or the rapport with a particular respondent is weak, the interviewee can focus on a particular section of the form. The section of focus can be chosen according to: (i) the relevance to the household being interviewed, e.g. it will not be important to speak about agriculture to a household that engages primarily in fishing; (ii) The level of data already collected on a particular topic e.g. if there is little data on certain issues from the interviews and focus groups already completed in a given community, one may choose to focus on related questions for the household interview.

1) Livelihood strategy

1.1) How have your income generating and food producing activities changed over the past 10 years?

1.2) Do you feel your family was poorer or wealthier during your grandfather/grandmother's time

2) Environmental change

2.1) Think about the river/lake 10 years ago and beyond. How has it changed today?

Have certain parts of the river/lake changed more than others?

2.2) Think back 10 years ago and beyond, are there *more* or *less* fish than are present today?

...What types of fish have *declined* in numbers in the last 10 years (note species names)?

...What do you think are the causes of the decline?

...How have you adjusted your livelihood practice to cope with the decline in fish catch and fish types?

...What types of fish have *increased* in numbers in the last 10 years (state species names)?

... what do you think are the causes of this increase?

2.3) Think about fishing today. Are there any areas of the river/lake you do not fish?

Why?

2.4) Are there any times of year you do not fish?

Why?

2.5) How do the fish populations change over the seasons, in terms of species, quantity and size?

2.6) Do you know why they change?

2.7 Have there been any sudden environmental or economic changes which have put pressure on your income generating and food producing activities over the last 10 years? How did you respond?

2.8) What would you lose if the lake / river was no longer present?

3) Class relations and livelihood change

3.1) Over the past 10 years and beyond, have you invested in more fishing /fish culture equipment and boats than was previously owned?

... If not, what constrains you from investing?

Have the fishing gears you use changed? If so, how have they changed and why?

3.2) What do you think needs to change for you to increase your catch and achieve a better income from fishing or fish culture?

3.3) Is fishing or fish culture viewed as a good way to increase one's wealth? *[or other aquatic resource dependent activity]*

... Would you like your children to be involved in fishing or fish culture? Why?

3.4) Are there any income generating activities you would like to engage in but are unable to? What are the constraints?

3.5) Have you increased agricultural production in the last 10 years?

... If not, what do you think needs to change for you to increase production for the market and achieve a better income from agriculture? What prevents you from increasing production?

3.6) How easy is it to increase your ownership of land?

4) Market relations, credit and class

4.1) How do you decide which species to sell and which not to sell?

4.2) Do you ever sell fish to traders or middlemen? (If no, go to question 4.4)

...When selling fish to traders and middlemen, how do you decide which particular trader to sell to?

...If the price is poor, can you easily move to sell to a different trader?

...How many traders do you normally sell to?

...Do you have a strong relationship with one particular trader (for example, one who gives you a particularly good price)?

4.3) Are you satisfied with the price you receive for your fish? If not, what prevents you from achieving a more favorable price?

4.4) Does anyone in your household borrow money?

... What for?

... How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Knowledge

5.1) How did you learn to catch/culture fish?

5.2) When did you learn to catch/culture fish?

5.3) Do you know the names of all the fish? How did you learn?

5.4) What are the main information sources which contribute to your knowledge of fishing and agriculture?

5.5) Have you taken any training over the last 10 years in either agriculture or fishing/fish culture?

6) Social networks, politics and non-economic structures

6.1) How are your relations with other people in the village?

6.2) Are you a member of any community organizations?

... If yes, what is your role? ... What benefits does it bring you?

... If no, why? Are there any constraints preventing you from becoming a member

6.3) Out of all the community organizations, which are the most helpful in improving economic security?

... Why are these organisations helpful?

... And which are the least helpful?

... Why are these organisations not helpful?

6.4) Are you a member of a political party?

... If yes, what benefits does it bring?

6.5) Do you receive any form of assistance from government or local institutions to improve your livelihood practices? What kind of assistance?

6.6) Think of your close friends or relatives that you meet regularly?

... What kinds of things do you do together?

... Can you get help from each other (e.g. financial, or sharing of information)?

... Which kind of obligations do you have towards each other?

... Are there any social groups in the village which you are excluded from?

6.7) Do different families in the village have set fishing areas?

7) Policies and institutions governing natural resource use

7.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high?

7.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

... Is there a different rule making process for both the village and for the district government?

... Who makes these rules?

... What influence do you have over the rule making process?

... If influence is limited, what prevents you from influencing the rule making process?

... How are rules policed? What are the penalties for breaking them?

... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?

7.3) Who else uses the lake/river resources apart from people in this commune?

7.4) Are there any difficulties and disagreements as many people are using the water resources?

8) Concluding questions

8.1) What are the biggest problems facing your household?

8.2) What are the biggest problems facing the river / lake?

8.3) What would you like to change in your life in the future?

8.4) What would you like your children to be doing in the future?

8.5) Do you have any other comments on the issues we have discussed above?

8.6) And finally, do you have any questions for us?

8.7) Can we revisit you in next 4 months? Yes/No

...If yes: when should I visit : evening/morning/afternoon....

Thank you very much for your time. Good luck with your crop and see you soon!

Annex 2: Focus group schedules for men and women

Instructions for interviewee

SAMPLING FOR FOCUS GROUP: There should be a minimum of 40 Focus Groups completed in each site. The format should be as follows: 10 with men; 10 with women; 10 with boys; and 10 with girls, across the three villages. Within these subgroups we could hold discussions with different livelihood groups, or in the case of boys/girls, with younger children and teenagers. We would also like to include some extra focus groups with additional stakeholders of interest (for example farmers living upstream who use aquatic resources indirectly; market traders who buy or sell aquatic produce). These additional focus groups will be used to compliment household interviews and the gender/age focus groups, to fill in gaps and to better understand the needs of all stakeholders.

CONDUCTING THE INTERVIEW:

- Divide roles within the group. One team member should take notes and one should concentrate on asking the questions and interacting. If a third team member is present, then they may observe social interactions within the group (e.g. who is dominating, who is coming/going, what is the mood of participants, who is not participating).
- These questions should only be a rough guide, and the interviewers should be flexible, according to the direction of the discussion. Some questions may have already been answered.
- The same essential questions will be asked for both women and men, but there should be flexibility to add new questions if interesting issues arise in the process of fieldwork.

Materials required

- 3 large sheets of paper
- 5 large pens (different colours)
- 30 beans
- 15 blank cards

1) Livelihood strategy and intra-household relations

1.1) What is your main income source?

[PRA Tool 1] Livelihood activity ranking:

1. Ask participants to brainstorm all of the livelihood activities they participate in. Write as 'spider' diagram with box for each activity
2. Rank these livelihood activities in order of importance
3. Give out 30 beans, or any other small objects (e.g. Pebbles)
4. Ask respondent to distribute them in the boxes to indicate the level importance of each activity.

1.2) Look at the livelihood activities from the ranking which were ranked as most important.

...For these activities, who controls how the income or product is used?

... Are there any livelihood activities where you control the income?

1.3) Out of the most important livelihood activities discussed above, what is the income or product used for?

1.4) What were your main livelihood activities 10 years ago?

...How have your livelihoods changed?

...Are there any new livelihood activities which were not present 10 years ago?

1.5) [For China and Vietnam] How did your income and food security situation change since the decollectivisation of agriculture? Is it more or less secure?

1.6) [PRA Tool 2]: Livelihood problems and benefits.

1. Openly ask group to list what they feel are the major problems they have faced over the last 10 years with earning money and producing food.
2. Write each problem on a card and assign them a picture or symbol. Put each card in one of three piles, listed 'big problems', 'small problems' and 'minor difficulties'.
3. Create a chart and ask respondents to list benefits and problems of each strategy. For example:

Problems	Benefits

1.7) How has your ability to produce food and earn money improved in the last 10 years? Why?

2) Fishing questions and environmental change

2.1) What species do you collect from the river / lake?

... Where do you collect these from?

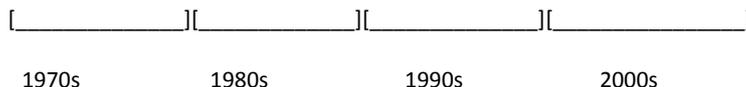
... What technologies do you use?

... How long have you been involved in these activities?

... How did you learn how to do them?*[if not already answered above]*

2.2 [PRA tool 3: Historical Timeline]

1. On a large sheet of paper draw a line for the last 30 years, for example:



2. Along the timeline, ask participants to note down major events which had affected their income generating and food producing activities (e.g. natural disasters, building of a dam, agricultural decollectivisation)
3. Ask participants how they were affected by these events and how they coped.
4. Ask participants whether any events are increasing or decreasing in frequency? (especially natural disasters)
5. Ask participants to indicate which years the harvest of river and lake resources were good and which were poor.

2.3) Ask participants what they feel the major problems are with river lake resources today.

... What are the solutions?

2.4) How has the importance of fishing changed compared to 10 years ago? Is it regarded as a good way to improve one's economic security?

... What are the barriers for people who want to improve their income from fishing or fish raising?

... How has the price for fish changed over time? Has it been different for different species?

... Is it easier to reach the market now when compared to 10 years ago?

2.5) Do you know how the river / lake has changed since your grandparents time?

2.6) [PRA tool 4: Seasonal calendar]

3) Rules and access

3.1) Are there any income generating activities which require special permission or a licence?

... For these activities, who grants permission or licence?

... What are the costs involved, both official and unofficial?

... Are there any income generating activities you would like to do, but can not because these costs are too high?

3.2) Are there any rules which determine where fish (and other aquatic produce) can be collected and the quantities?

... Is there a different rule making process for both the village and for the district government?

... Are there conflicts as a result of these differences?

... Who makes these rules?

... What influence do you have over the rule making process?

... If influence is limited, what prevents you from influencing the rule making process?

... How are rules policed? What are the penalties for breaking them?

... How have rules changed over the last 5 – 10 years? Do you know why these changes have taken place?

... Do you know how the rules have changed since your grandparents time?

3.3) Do rules and regulations mean that some social groups have permanent rights to use the river/lake resources while others are excluded?

3.4) Are there any difficulties when different users use water or catch fish from the same river/lake?

3.5) Have people from outside been using the river/lake resources of your community?

... If so, what effect have they had on the resource (abundance, distribution and ease of harvest)

3.6) Which of you in the group are members of community organizations? Please note in table.

Community organisation	Number of people

3.7) Out of all the community organizations, which are the most helpful in improving economic security?

... Why are these organisations helpful?

... And which are the least helpful?

... Why are these organisations not helpful?

... Are there people in the village who are disadvantaged by these organizations? Why?

4) Markets

4.1) Where do you sell your fish (or other aquatic products)?

4.2) How is the price set for fish?

4.3) When selling fish, how do you decide which trader to sell to?

4.4) If the price is poor, can you easily move to sell to a different trader?

4.5) Do you have a strong relationship with a particular trader?

4.6) Are you satisfied with the price you receive? If not, what prevents you from achieving a more favorable price?

4.7) How has access to credit changed over the last 10 years?

... Is it easier than before to get loans?

... Has access to credit improved your economic situation?

... Are there any constraints to accessing credit?

5) Status of women

5.1) How has the status of women changed in this village over the last 10 years?

... Are there more women headed households than before?

... Are there activities women do now that they did not perform before?

... Are there any livelihood activities women are not permitted to do?

... Are there any livelihood activities women only can do?

6) Knowledge

6.1) How did you learn to catch/raise fish?

6.2) When did you learn to catch/raise fish?

6.3) How did you learn the names of all the fish?

6.4) What is your main source of agricultural and fishing related knowledge? How did you learn?

6.5) Have you taken any training over the last 10 years in either agriculture or fishing/fish raising?

6.6) Do you discuss any of the following issues with neighbors and friends

... Agricultural and fishing techniques with neighbors and friends?

... Environmental issues such as the best fishing areas?

... The market situation, such as prices for produce

6.7) If you needed legal advice, would you know where to go?

7) Division of labour

7.1) Tell me about who does what in your household. What are the men's tasks, what are the women's tasks, what are the boys tasks and what are the girls tasks? See table below if necessary.

Activity		Who does what?			
		Men	Women	Boys	Girls
Fishing					
Repairing nets					
Sowing crops					
Transplanting rice					
Ploughing fields					
Weeding					
Harvesting					
Tending kitchen garden					
Travelling to market to <i>buy</i> produce					
Travelling to market to <i>sell</i> produce					
Cleaning					
Cooking					
Maintaining house					
Collecting firewood					
Looking after babies					
Cleaning house					
Washing clothes					
Other					

8) Wellbeing and non-use values

NOTE: Much of this will be gathered informally through participant observation, and will emerge throughout the discussion in interviews. However, there are some questions below which can maybe stimulate debate.

8.1) What does happiness [appropriate local term] mean to you?

8.2) What do you think is necessary to live a good life?

8.3) When do you feel really happy with your lives?

8.4) What else would you like to improve in your lives apart from improved economic security?

8.5) [PRA tool 5: Wellbeing]

1. Draw the following table:

Measure of wellbeing	Ranking
Economic security	
Protection of traditional culture and values	
Maintenance of good relations with family and friends	
Maintenance of good health	

2. Give respondents 30 beans. Ask them to place beans next to each measure to state how important they consider them.

9 Concluding questions

9.1) What are your dreams for the future?

9.2) How would you like to be in the next 5-10 years?

9.3) Do you have any other comments on the issues we have discussed above?

9.4) And finally, do you have any questions for us?

Annex 3: Focus Group Schedules for Boys and Girls

Instructions for interviewee

CONDUCTING THE INTERVIEW:

Materials required

- 2 large sheets of paper
- 5 large pens (different colours)
- 15 blank cards
- 30 beans

1 *Young peoples contribution to work*

1.1 [PRA Tool 2] *Job ranking:*

1. *Ask children to think of all the jobs they carry out, ask them to write them out on the sheet*
2. *Put each job on a card*
3. *Ask them which jobs they feel are most important. Ask them to place the cards into three piles, 'most important', 'quite important' and 'not so important' for the family.*
4. *Ask them why these jobs are important*
5. *Ask them to rank which activities they 'most enjoy', and which they 'least enjoy'.*
6. *Ask them why they like/dislike particular activities.*

2) *Young peoples use of aquatic resources*

2.2) We would now like you to think about your work in the river and lake.

a) do you participate in any fishing activities?

b) do you use the river for any other purposes?

2.3) How has the river/lake changed over the last few years? *Already asked*

2.4) Do you know the names of the different fish? How did you learn? *Already asked*

2.5) Do you know where the best sites are for fishing? How did you learn?

2.6) If the lake/river is no longer there, what would you miss/lose? *Already asked*

This could also be asked as- Would you be sad if the river/lake disappeared? Why?

3) Work and relations with other household members

3.1) Think of the work you help your family with. Who tells you which jobs to do? *Already asked*

3.2) Do any of you have brothers or sisters who help you with these jobs? *Already asked*

4) Benefits of work

4.1) When you work, do you get the chance to retain the product or income for yourself? *Already asked*

... do you have any control over how the product or income is used?

4.2) when you earn some money, what do you like to spend it on?

5) Education and leisure

5.1) Do you like school? *Already asked*

5.2) Why / Why not?

5.3) Do you think you will study until University/High School/Secondary School? *Already asked*

...Why / why not?

5.4) What would you like to be doing 10 years from now? What are your dreams for the future? *Already asked*

5.6) What would your parents like you to be doing 10 years from now?

5.7) [PRA tool 3: Activity Chart]

Provide the group with a large sheet of paper with a chart for the day, for example:

Time	Activity
Morning	
Afternoon	
Evening	

Provide the group with pens and ask them to list on the chart, the activities they do in a day from when they wake up to when they sleep.

6) Concluding questions

6.1) What do you think are the biggest problems in your lives? *Already asked*

6.2) What do you think the solutions are?

6.3) Is there anything else you would like to tell us about?

6.4) Do you have any questions for us?

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Section 5

Highland aquatic resources conservation and sustainable development:

livelihood report, Uttarakhand Site, India.

Highland Aquatic Resources Conservation and Sustainable Development

LIVELIHOOD REPORT UTTARAKHAND SITE, INDIA



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EXECUTIVE SUMMARY

The study of Highland Aquatic Resources Conservation and Sustainable Development (HighARCS) is concerned with aquatic resources in highland areas and how these provide livelihood opportunities for the people living in these regions. This report, based upon the HighARCS field site in Uttarakhand, India, is based upon a review of the available literature, interviews and studies of the livelihoods and sustainable development issues in communities who utilize highland aquatic resources and associated ecosystem services. It was done through visits to the three sites including Nainital town with its large lake, as well as Pandeygaon village near Bhimtal lake and Chanoti village near Naukuchiatal lake. A large number of people belonging to different wealth, gender and age groups are dependent on the aquatic resources provided by the lakes. It is of extreme concern that the biodiversity of these areas are well conserved so that the natural resources can be maintained and at the same time provide sustainable development for the people who are dependent on them.

The lakes constitute an important source of livelihood for different stakeholders for multiple purposes. In the initial stage of the study, the different livelihood strategies of the people and their dependence on aquatic resources were identified. Apart from activities like fishing, boating, agriculture which are directly dependent on the lakes there are also other important means of earning livelihood. The magnificent beauty of the lakes and the surrounding hilly region attracts tourists from different places of India as well from outside India to come and visit. This makes tourism a major source of livelihood earning for the people. Various other livelihood activities of the people include shops around the lakes, restaurants, travel agents, local site seeing services, tourist guide work, photographers, and rickshaw pullers who all are dependent on tourists. However, a large segment of people also work as labourers on other peoples land or as fish labourers who are hired by the Pant Nagar University to catch fish. However, there is a huge fluctuation in the earnings of the people who are pursuing these activities. This is because tourism is a seasonal activity. Their earning depends on the arrival of the tourists during peak seasons and during the off seasons they have to pursue other types of livelihood activity. The lake is also an important site of recreation for the local people. This study also highlights the seasonal fluctuations in the livelihood activities of the people residing there.

The different households in the three field sites have been classified on the basis of their wealth into three categories – accumulating, subsistence and coping. It was found that the limited numbers of accumulating households are earning income from different types of businesses and are directly dependent on the tourism economy, which itself is associated with the lakes. They are therefore indirectly dependent upon aquatic resources. On the other hand, some of the subsistence households and most of the coping households are dependent on the lakes directly through irrigated agriculture, boating and fish labour, and indirectly through labouring in the tourism economy surrounding the lakes. They are more dependent on aquatic resources for their

livelihood than their richer counterparts. There is no clear evidence of unequal economic power relationships between these wealth groups, although some richer households rent out boats or land to poorer neighbours. Most households are engaged in multiple activities and not just one livelihood option, and most families also possess some land which they cultivate to produce vegetables for household consumption. They may at times rent land for sharecropping or work as labourers. Market relations are also very limited because most of the agricultural produce is consumed by the households and whatever fishes are caught are so limited in number that there is no scope of selling them in the market. As there is seasonality to lake related livelihoods in the region, there are seasonal migrations of people. During summer, people from surrounding areas seasonally migrate from Nepal, Uttar Pradesh, Bihar and other areas to Nainital for their livelihoods. This provides them ample opportunity to work and earn. However, during winter, there are fewer tourists and so the people of this region need to look for alternative sources of livelihood. This often leads to out-migration of people to different places in and around Nainital and even beyond in search for different livelihood opportunities.

Almost all people, from school and college teachers to agricultural workers and even small school going boys and girls are aware of the importance of the environment and the need to protect and conserve the biodiversity. Focus group studies also focused on the perception of the people regarding environmental degradation and the possible reasons for these conditions. Indiscriminate cutting of trees, soil erosion, pollution, throwing garbage and plastic packets in the lake are some of the problems identified by the people as the causes of environmental degradation.

Different national macro-economic policies are pursued for the management of the natural resources. Actions that have been undertaken by local bodies and non governmental organizations to preserve the lake have also been evaluated. Moreover, in the focus group study, the specific role played by women and young people in utilizing the aquatic resources has also been explored. In terms of gender relations, the roles played by men and women in carrying out livelihood activities are different. Women generally do not participate in fishing and boating, but run shops, restaurants and also perform household activities like cleaning utensils, and washing clothes. With respect to age, young boys and girls generally concentrate on studies and only after coming home from school they help their parents in either fetching drinking water from taps or in household work. Few have significant involvement in the lakeside economy.

The ecosystem can be visualized as providing various services or benefits which are obtained by the people. These are provisioning, regulating, supporting and cultural services. The people in these areas are concerned with the preservation of the lakes. They are aware about the problems of the environment and also the importance of the lakes in their lives. Necessary action plans therefore have to be developed so that the environment and the aquatic resources can be

protected and preserved from destruction, and at the same time the livelihood of those who are dependent on these resources can continue.

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1. INTRODUCTION

1.1 Background

HighARCS aims to develop an understanding of the importance of aquatic resources in highland areas of Asia. It is principally focused on the highland aquatic resources and their functionality, management, exploitation, in particular aquatic biodiversity and conservation issues at five sites in Asia that is, Guangdong, China; Uttarakhand and West Bengal, India and northern and central Vietnam. The main factors that will be assessed will include biodiversity and associated ecosystem services, including provisioning, regulating, supporting and cultural services. Provisioning services are the products obtained from the ecosystem, such as food and water. Regulating services are the benefits obtained from the regulation of ecosystem processes, such as flood and disease control. Supporting services are ecosystem services that are necessary for the production of all other ecosystem services such as biomass production, production of atmospheric oxygen and all those services that maintain the conditions for life on earth. Cultural services are the non-material benefits that people obtain from ecosystems through spiritual enrichment, cognitive development, recreation, aesthetic experience and cultural benefits. The Millennium Ecosystem Assessment is an international meeting by over 1000 of the world's leading biological scientists that analyses the state of the Earth's ecosystems and provides summaries and guidelines for decision-makers. It reaches the conclusion that human activity is having a significant and escalating impact on the biodiversity of world ecosystems and thus reducing both their elasticity and biocapacity. It refers to the natural systems as "life-support system" and providing essential ecosystem services. This assessment measures twenty four ecosystem services and concludes that only four have shown improvement over the last 50 years, fifteen services are in serious decline, and five are in a stable state overall, but under threat in some parts of the world. (MEA, 2002).

HighARCS also aims to facilitate the interactive participation of stakeholders in formulating and implementing Integrated Action Plans (IAPs) addressing conservation, livelihood and policy concerns and opportunities with the support and co-operation of local communities. Other major areas that are considered include the role of highland aquatic resources in providing freshwater, food, biochemical and genetic materials, also regulating climate, hydrological flows, water purification, erosion, natural hazard regulation as well as supporting sediment retention, soil formation and nutrient cycling and contributing to cultural life including spiritual and inspirational, recreational, aesthetic and educational values. Details on the livelihood strategies of households dependent on ecosystem services derived from highland aquatic resources, especially the poor, food-insecure and vulnerable people, are assessed within a sustainable

livelihoods framework and opportunities to enhance such livelihoods are explored. Institutional features which are assessed include local as well as national policy and legislation. Also another objective of HighARCS is to communicate best practices which will be aimed at conserving biodiversity and sustaining ecosystem services to potential users, to promote wise use and enhance policy information. In this report, a focus has been given to the Uttarakhand field site in India.

The term Highland aquatic resource is used here to refer to both physical and living aquatic resources in the upland areas. Uplands are defined here in a geological context as land that is at a higher elevation than the alluvial plain or stream terrace. In contrast to the lowland areas, in the highland areas people have fewer livelihood options. This is because in the highlands people are constrained by a number of factors for pursuing livelihoods. Highland aquatic resources and associated ecosystem services provide great benefits to people, but improper development and overexploitation of these resources has had a serious negative impact on biodiversity, supply of ecosystem services, and also on the livelihoods, in particular of poor and vulnerable groups. Increase in population and construction in the catchment areas of the lakes are common in Nainital as well as in Bhimtal. In the catchment of Lake Naukuchiatal, population growth was historically low but now the number of households in the surrounding villages has increased. The large human population combined with livestock has increased the demand for water and production of waste and pollutants in the catchment area. It also enhanced the demand of land for agriculture in Bhimtal and Naukuchiatal and also forest which is used for firewood. Studies that have been undertaken and the information which is available on the aquatic resources and associated ecosystem services in the highland areas are however extremely limited.

This study is focused mainly on the Nainital lake system in Nainital district of Uttarakhand, India. The three lakes of Nainital, Bhimtal and Naukuchiatal are the most important water bodies in Uttarakhand (Figure 1, 2 and 3).

These water bodies are also polluted due to urbanization and tourism activities. Discharge of untreated waste water, disposal of solid waste and silt deposition are the major factors that cause pollution of the lakes. While in the past, this area was known to be plentiful in aquatic resources, there is little information on the present situation. No in-depth and comprehensive study has been conducted to understand the present status of biodiversity in the lake system and linkages with the livelihood strategies of the local people. This is the main reason why a study which focuses on the aquatic resources and the livelihood of the people in Uttarakhand has been undertaken.

The role of aquatic resources, whether appropriated for agriculture, fisheries, boating by poor and food-insecure households is not well understood, and because of the necessity to conserve the highland aquatic resources, there is an urgent requirement to develop new and enhanced knowledge about the potentially conflicting demands of maintaining the aquatic resources as well as sustaining the livelihoods of the people.

1.2 Study Sites

The HighARCS survey began on the 17th of April 2010 in the three primary field sites, namely, Chanoti village near Naukuchiatal, Pandeygaon village near Bhimtal and Nainital proper (the area covering nearly 0.5 km radius surrounding the Nainital Lake) (see Figure 1, 2 and 3). Thirty households from each village were interviewed and targeted focus groups conducted. These included fishermen, boatmen, rickshaw pullers, school children and all those whose livelihoods are in some way related to and dependent on the lakes in this region. Informal interviews were also carried out in villages nearby to each of these sites such as Siloti, Sanguri, Karkotak, Shongaon, Pangot and Pali.

Figure 1: Location of Uttarakhand

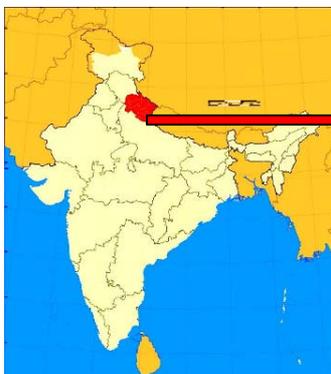


Figure 2: Location of Nainital

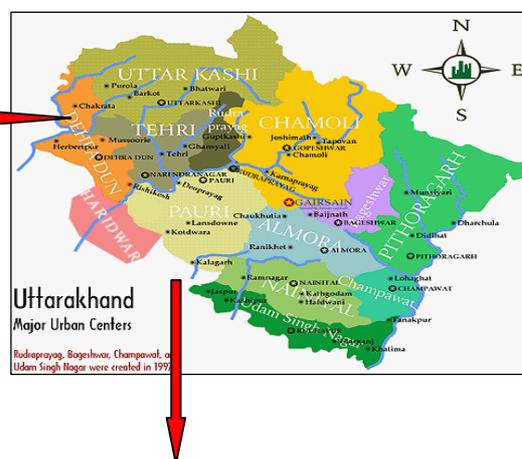
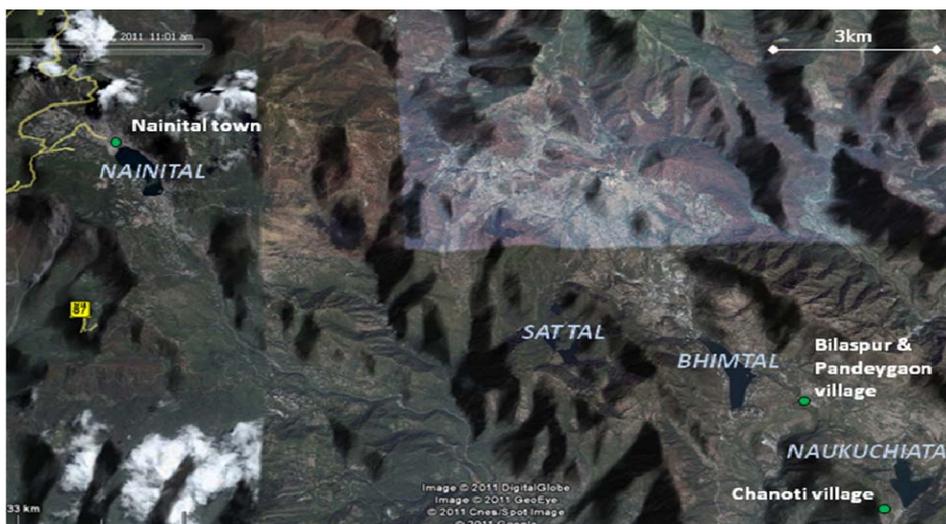


Figure 3: Map of the Nainital lake region (Source Google earth)



Nainital Lake is the most important water body in Nainital in terms of both environment and tourist attraction (see Figure 4). It is also a recipient of storm water from several large

catchments. The Nainital hills are unstable and many landslides have caused a huge amount of damage in the past. The pollution of the lakes can be attributed to urbanization and tourism activities. As a famous tourist place and the lakes being the centre of attraction of the tourists the livelihood of the local people mostly depends on these lakes, either directly or indirectly. Pandeygaon village was selected as it is the closest village to Bhimtal Lake and most of the people living there are engaged in agriculture and depend on the irrigated water of the lake for this, and they also collect water from the canal for different household purposes. Chanoti village was selected as it is the closest village to Naukuchiatal Lake and most of the people living there are engaged in Boating and tourism related livelihoods. Nainital proper area is the heart of the city and livelihood of most of the people directly or indirectly depends on the Nainital Lake.

Figure 4: A view of the Nainital Lake



The main source of water into the lakes is the surface runoff through open natural channels and springs. In the settlements around the lakes, the people live in small hamlets at some distance from each other. The lakes serve both filtered (for drinking purpose) and non-filtered water demands of these settlements. Most of the people in these areas utilize the lakes in some ways for their livelihoods. Discussions and interviews with community people revealed that the tourism economy is the most important feature for the lake community. In all settlements around the three lakes of Bhimtal, Naukuchiatal and Nainital, the livelihood of people to a great extent is dependent on tourism especially those owning boats, shops, hotels and those working in the nearby tourist resort. Some of the residents also seek employment in far off settlements as

labourers and some are engaged in government service and private jobs. More or less the entire local community depends on tourism for their livelihood, directly or indirectly.

This report focuses on the livelihoods of local people who depend directly and indirectly on aquatic resources, with the intention of facilitating development of Integrated Action Plans (IAPs) for the benefit of the community, other concerned stakeholder groups and conservation of aquatic resources and biodiversity. The report addresses the following key questions:

1. What are the present conditions of livelihood resources that are possessed by the people in these regions?
2. How have these strategies evolved and transformed over the generations?
3. With these available resources, what are the strategies that are pursued by these households?
4. How are these households utilizing aquatic resources in pursuing these strategies?
5. What are the institutional policies and approaches by local and national organizations that facilitate or impede access to particular livelihood resources and shape particular livelihood strategies?
6. What are the institutional policies undertaken for the conservation of these aquatic resources?

The broad objective of the study is to find reasons for the deterioration of the lakes, ways in which they can be conserved and sustainably utilized while protecting the livelihoods of stakeholders.

2. METHODOLOGY

2.1 Justification of methods - 'methodology'

Methodology may be defined as the rationale and philosophical assumptions that underlie a particular study. Research methodology is a way to systematically solve a set of research problems. In an actual research context, it encompasses the various steps that are adopted by the researcher in studying the research problem along with the logic behind them. It may be a description of process, or may be expanded to include a philosophically coherent collection of theories, concepts or ideas as they relate to a particular discipline or field of inquiry in the context of a particular research. Methodology is actually implemented in the research process by the use of a set of methods, techniques and tools. For example, a tool of quantitative research process is structured close ended questionnaire.

The main purpose of the HighARCS research is to understand and interpret the perceptions of the people on their livelihood problems, particularly with regard to the use of the aquatic resources. The data that will be collected will then be generalized on the larger population who

are dependent on the aquatic resources for their livelihood. Informed explanations will be then provided along with the possible course of action.

The research process consists of a series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. Firstly, the problem has to be defined in the context of the research. The main area of study of HighARCS is regarding the conservation of the biodiversity of highland aquatic resources and at the same time promoting sustainable livelihoods for local people. It requires finding out the reasons for the deterioration of the lakes, the different livelihood opportunities of the people and the livelihood strategies of the stakeholders. Accordingly, it involves a detailed review of literature relating to the various concepts and theories to gain a theoretical understanding of the problem. A research design has to be prepared for effectively carrying out the research. On the basis of extensive field surveys, data has to be gathered. The data collected will then be analysed and the main findings will be stated in the form of a final report.

Quantitative research is the systematic empirical inquiry of numerical properties and phenomena and their relationships. Quantitative data includes information dealing with numbers and anything that is measurable. In this study, data has been collected on the basis of questionnaires which have both open ended and close ended questions. The closed ended questions were used as a quantitative research tool to gather standardized statistical data. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

Quantitative research methods are distinguished from qualitative research methods. Qualitative research entails the observation, analysis and interpretation of data for the purpose of discovering underlying meanings and patterns of relationships. Researchers in this tradition aim to gather an in-depth understanding of human behavior and the processes that govern such behavior. It attempts to understand the processes behind a particular behavior and it requires a deeper understanding from a smaller and more focused sample, rather than a large sample. Research tools include open ended interviews and focus groups, emails, notes, feedback forms, photos, and video.

Qualitative research also implies non-numerical or 'words based' data collection techniques. In this type of research, the role of the researcher receives critical attention. Qualitative approaches have the advantage of allowing for more diversity in responses as well as the capacity to adapt to new developments or issues during the research process itself. They mainly seek to understand and interpret the meanings of situations or events from the perspectives of the people involved and as understood by them. Focus group studies, in-depth interviews, content analysis, ethnography, evaluation and semiotics are among the many formal approaches that are used. As

are observations, face to face informal discussions, and interviews. Qualitative research also involves the analysis of unstructured material such as field notes, or experience sharing.

An important element of the qualitative approach taken in this study was the case study method, whereby data is collected from a small number of participants through methods such as participant-observation, in-depth interviews, and longitudinal studies. The case study approach provides the opportunity to ask sharp and accurate questions and to capture diversity of behaviour, although the conclusions drawn may be specific to the particular case being studied and might not be generalisable. It is however beneficial as it allows the study of typical cases (Yin, 1984).

Focus Group (FG) interviews represent an important example of case study techniques used for this research. They are an essential participatory tool as they ensure that the different sections of the society are adequately represented. Furthermore, the group environment is often more relaxed than that of individual interviews (Punch, 2002, 2009). In the context of close-knit communities for HighArcs, the fact that group members knew each other well facilitated this. Another benefit of focus groups is that new ideas are often triggered off when individual participants hear the contributions of other group members. This facilitates a more dynamic and 'spontaneous' flow of information than may be possible in individual interviews (Lewis, 1992; Punch, 2002; Valentine, 1999).

Focus group interviews organized according to the gender of participants were therefore conducted in order to capture women and men's perspectives on the different aspects of their livelihoods. Efforts were made to ensure that within these groups there is diversity and difference of occupations. A set of focus groups was also carried out with young boys and girls because these groups also contribute substantially to livelihoods while also utilizing natural resources. The aim of the focus groups in sum was to gain an understanding of different perspectives on the biodiversity of the lakes, its importance to their lives, its problems as well as suggested solutions.

2.2 Methods utilised in this study¹

2.2.2 Choosing the study region

To carry out this research the state of Uttarakhand has been selected as it is widely regarded as rich in aquatic biodiversity. Nainital region has been selected for its tourist importance. Known for its pleasant climate and scenic beauty, the town is a popular destination in the northern tourist

¹ The multiple stages of the research are displayed in Table 1

circuit. Reasons for visits are educational tours, official tours and holidays. These reasons are influenced by one common feature that is the natural environment.

2.2.3 Selection of communities

Nainital, Bhimtal, Naukuchiatal lakes are the three most important water bodies in Uttarakhand in terms of both their environmental importance and as tourist attractions. No detailed analysis has yet been conducted to evaluate the present situation of biodiversity in the lake system and linkages with the livelihood measures of the local people. As a famous tourist place and the lakes being the centre of attraction for the tourists, the livelihood of the local people mostly depends on these lakes, directly or indirectly. The three selected communities i.e., Pandeygaon village situated near Bhimtal lake, Chanoti village situated near Naukuchiatal lake, and the Nainital proper (the area covering nearly 0.5 km radius surrounding the Nainital Lake).

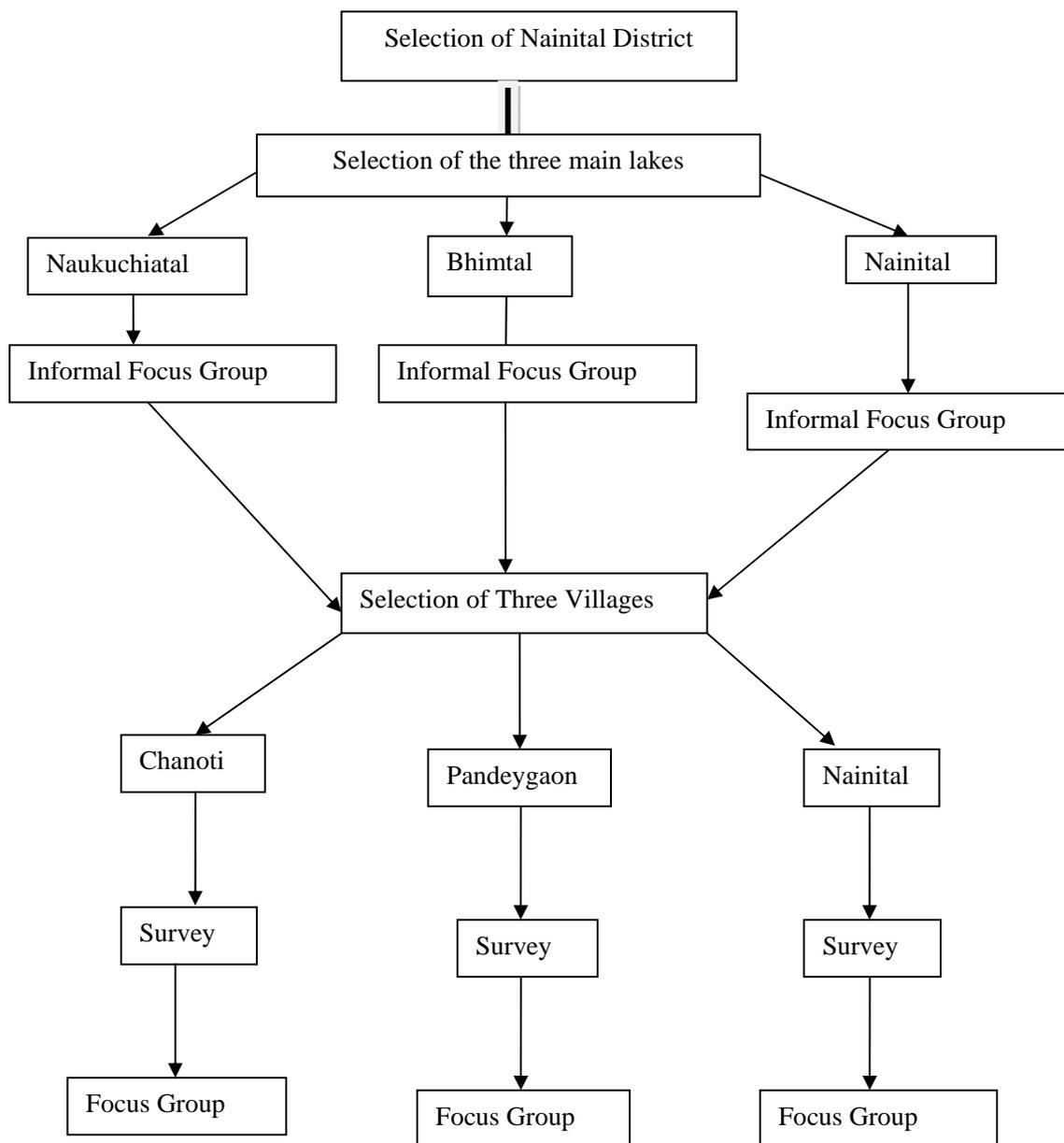
Initially, a pilot study was done in order to understand the feasibility of the process. This was done in the month of January 2010. Certain questions which were asked prior to the formal interview and provided guidance for the subsequent discussion were not part of the structured process. These were required to give the research team having an overall idea regarding the site and sample selection criteria. Also open ended questions were used to understand the perspective of the people to collect information from those who are dependent on the highland aquatic resources.

Following this, informal focus groups were carried out around these three lakes. A general discussion was conducted with people around Naukuchiatal Lake who are engaged in different activities like boating, restaurant and shops and other activities in and around the lakes. Then from a more detailed discussion and focus group study it was known that most of the boatmen or restaurant owners in and around Naukuchiatal Lake are from Chanoti village. In this way, Chanoti village was selected and then the household survey was done with the people in that village. Chanoti village is also the closest village to Naukuchiatal Lake and most of the people living there are engaged in boating and tourism.

Near Bhimtal Lake, from the general discussion with the local people and from the Irrigation Department of Bhimtal, it became known that the lake water is channelized through canals to the nearby villages. One such village near the lower side of the Bhimtal Lake is Pandeygaon where the lake water having passed through a canal reaches the village. People living in the part of the village receiving this water were selected for inclusion in the study and are referred to subsequently as the Bilaspur community. Pandeygaon village was selected as it is the closest village to Bhimtal Lake and most of the people living there are engaged in agriculture and depend on the irrigated water of the lake for this, and they also collect water from the canal for different household purposes.

The area known widely as Nainital proper was selected as it is the heart of the city and livelihood most the residents directly or indirectly depends on the Nainital Lake. This lake is surrounded by a single town so it was not possible to select specific villages. The people in Nainital therefore are in some way dependent on the lake as a resource. They were identified as ‘community of resource users’. The boatmen depend on boating in the lake as their means to earn income. The large numbers of shops in and around the Nainital Lake attracts large number of tourists. All these groups were taken into account for collecting information as well as for conducting Focus Groups.

Figure 5: Process of Research



2.2.1 Data collection techniques

After the information had been gathered from the Focus Group studies regarding the people and their occupations as well as the problems they encounter, a detailed household level survey was developed. In this way, data was collected by moving from a general and broad overview of the livelihood strategies and aquatic resources to a more detailed and particular understanding. Survey research is one of the most important measurement tools in applied social research. Survey can include both simple feedback to certain questions and an intensive in-depth interview on a one-to-one basis.

A detailed questionnaire was used to provide a structured approach to jointly collating information on livelihood activities and resource use. There were, however, certain open ended qualitative questions which dealt with more complex issues rather than obtaining frequencies and distributions of data. This qualitative data which has been collected is important in understanding the level of people's dependence on the lakes in these areas, and also their social networks and relationships.

Observation is another method of qualitative data collection which was used in this study. The researcher becomes a participant or non participant in the culture or context being studied and then collects the data. In this study of HighARCS, the researcher had to be a participant in the research process and then by being a 'member' of the community could observe the whole scenario. This would provide a deep insight into the subject being studied. Much of the data in this study has been collected by being a 'member' of the community through regular visits and observing activities in a very informal way. For example, by visiting the, spending activities of the people and use of aquatic resources in a typical day could be observed. Non-participant observation was also used. For example, the researchers collected information on the number of boats plying at different times on a per hour basis.

Following the completion of the survey, further focus groups were carried out to gain richer qualitative insights into livelihoods. Efforts were made to have separate groups for men, women, boys and girls, to gain gender and age specific perspectives (see Figure 6 and Figure 7).

In sum, both quantitative methods of closed ended questionnaire techniques and qualitative methods of observation, case studies, and open ended questions have been deployed in the research process. Therefore, this study has mobilized a mixed method approach. This kind of integration, of qualitative with quantitative methods, is also referred to sometimes as *multi-strategy* research.

Figure 6: Focus Group with Women near Naukuchiatal



Figure 7: Women from focus group



2.2.4 Population Frame Used

The elementary units or the group or cluster of such units may form the basis of sampling process in which case they are called as sampling units. A list containing all such sampling units is known as sampling frame. Thus, sampling frame consists of a list of items from which the sample is to be drawn. (Kothari, 1985). The HighARCS study is being conducted in the state of Uttarakhand with a total population of 8.48 million according to 2001 census. Nainital had a total population of 38,630 people of which there were 20,976 males and 17,654 females, respectively. In Pandeygaon, the total population was 1,281 out of which 657 were male and 624 were females. In the village of Chanoti near Naukuchiatal the total population was only 193 with 95 males and 98 females. The total number of households in Nainital, Pandeygaon and Chanoti were 8358, 243 and 36, respectively. This represents the sampling 'population'. A population is a complete set of individuals and objects having certain measurable units about which information is desired. Samples are selected from a population. A sample is a part or subset of a population. The population in this project is considered to be the total number of households in Chanoti and Bilaspur village and the total population in Nainital proper. It is given in the table below.

Table 1: Shows the total number of households and population in the three sites of Nainital, Pandeygaon and Chanoti.

Name	Household	Male	Female	Total
Nainital (MB)	8358	20976	17654	38630
Bhimtal (NP)	1283	3183	2691	5874
Chanoti	36	95	98	193
Pandeygaon	243	657	624	1281

Source: Census of India, 2001

2.2.5 Sampling Method for each of the three villages

Any research requires that a sample of population be formed because otherwise it would be too expensive both in terms of time and money to ask questions to each and every individual of the desired population. A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). Thus a sample of has to be selected which should be as representative as possible of the whole population. Inferential statistics is used to make inferences from our data to more general conditions, and descriptive statistics is used simply to describe the data in a convenient, usable and understandable form. In

the HighARCS study of, data which has been collected from a limited numbers of households has been used to infer situations which are common to other similar types of households.

There are broadly two main types of sampling 1) Probability sampling and 2) Non Probability sampling. Simple random sampling and probability sampling was done for Chanaoti village and for Pandeygaon village whereby the whole population of the village was our 'sampling frame'. For Nainital, however, a purposive or judgemental form of non-probability sampling was adopted whereby samples were selected from particular livelihoods on the basis of the purpose of the research. This is because Nainital is an urban area and it is more difficult to identify respondents who are dependent on the lake from communities.

2.2.6 Data Analysis

In most social research data analysis involves three major steps, which were also followed in this project:

- i) Cleaning and organizing the data for analysis (Data Preparation)
- ii) Describing the data (Descriptive Statistics)
- iii) Testing Hypotheses and Models (Inferential Statistics)

Data Preparation involves checking or logging the data, checking it for accuracy; entering the data into the computer; transforming the data; and developing and documenting a database structure that integrates the various measures. The data that has been collected has been tabulated in various ways so that a comprehensive visual portrayal of the situation is available.

2.3 Ethics in Research

Ethics in research is a very important issue in contemporary times. A number of steps were taken throughout the research to ensure ethical conduct. The principle of voluntary participation was followed, and the team ensured that people would not and should not be coercively forced in the research process. Closely related is the principle of informed consent. This means efforts were made to ensure the research participants were fully informed about the procedures involved in the research process and the risks associated with it. After being fully aware of the purpose of the study, the participants were obliged to give their informed consent to participate. Reducing potential harm for participants is a key ethical concern, and enduring confidentiality is one way to address this. Confidentiality means ensuring that participants are guaranteed that the information they give will not be disclosed to anyone who is not directly related to the study. Also the principle of anonymity implies that the researcher's identity will not be disclosed.

2.4 Limitations of Research

This is mainly a participatory research in which involvement of both the research team as well as the local people is important but it was difficult to convince the local people sometimes. Also since the questionnaires were very long and extensive it led to a sort of interviewee fatigue. There was some difficulty in explaining the meaning of the research. Moreover, it was difficult to gain access to some respondents such as tourists or some seasonal workers such as bell-boys working in hotel because this group is transient and changes often. Sometimes it becomes difficult to gain access to the villagers due to lack of some key informants or gatekeepers, who would act as the key link between the researchers and the local people.

3. REVIEW OF LITERATURE

3.1 Ecological Conditions and its impact on livelihood

This section outlines some of the key theoretical and technical concepts used throughout this report. It is first necessary to briefly discuss to important role of water in the ecology and economy of Uttarakhand. Water is the primary natural resource which is required for the sustenance of life on Earth. Although the stock of water on this earth is quite high but only a small fraction consists of fresh water which is suitable for human consumption. Uttarakhand formerly a part of Uttar Pradesh was formed on November 9th, 2000 as the 27th state of the Indian Union. It is a beautiful and enchanting region of Northern India. Ganga, Yamuna and other rivers originate from the Himalayan Region of Garhwal. Glaciers in Uttarakhand attract many tourists. While some glaciers are considered holy and sacred by Hindus, other are visited for their serene beauty.

Figure 8: Rivers and Lakes of Uttarakhand



Water is significant for the larger ecological system. Understanding the importance and scarcity attached to the fresh water, it has to be treated as an essential need for sustaining and maintaining all life forms. In view of increasing scarcity and the vital importance of water for human and animal life for maintaining ecological balance and for economic and developmental activities of all kinds, the planning and management of water resource in an optimal, economical and equitable basis is a matter of the utmost urgency. Community needs should be taken into account for water resources development and management. The National Water Policy will be successful depending entirely on evolving and maintaining a national consensus and commitment to the principles and objectives of the policy. To achieve the desired objectives, State Water Policies backed with an operational action plan need to be formulated in a time bound manner. National Water Policy need to be revised periodically as and when need arises. [(Water Policy Issues of India (Activity No. WW138714/DDE0014311)]

Ecological or environmental problems are mainly the result of biotic pressure on the earth. The landscape of Kumaon was once covered with vibrant forests. That is however, now cleared to a large extent for agriculture and various other purposes. The decline in the forest cover has led to a problematic situation for those people especially women who have to walk 10-12kms per day to collect a head load of firewood or leaf fodder. The carrying capacity of the natural resources will ultimately impact the future of tourism because the tourism industry is dependent on the quality of the environment. Tourists are mainly attracted to places of attractive natural scenic beauty. When that is destroyed that will create an effect on other factors as well. Local people have the largest risk if the environment is affected and they will be the victim as they have the maximum involvement in tourism. They should be the custodians of natural environment otherwise there will be an unequal growth as happened in the Nainital region. In Nainital, the tourism boom has resulted in growth of a large number of hotels and resorts and a large number of illegal constructions. This has resulted in further deterioration of the ecosystem. The famous and beautiful lake has been highly contaminated and the very existence of it is threatened. It is further suggested by the author that in order to save fuel pressure cookers and cooking gas should be provided so that pressure on the trees are reduced as well as time is saved in collecting firewood. (R.K. Dar and V.S. Singh, 1991)

According to an official statistics, published in a book, (M.S.S. Rawat, 1993) 17% of Uttar Pradesh is forest. However, not all districts on the plains have forest. Uttarakhand on the other hand is supposed to have 67% forest cover. However, only 37.5% of the area is forested. Moreover, the forest area under the control of Uttar Pradesh Forest Dept. has declined by almost 5% in the period 1964-65 to 1979-80 despite regular programmes of planting. The people in the hills are in need for forest products to increase their incomes. The forests provide land for grazing and people cut fodder for their animals and fuel for cooking and heating during the chilled winter. Wood is also necessary for making timber and to make ploughs. In the later phase of the economic development project, socially accepted people in the community were identified so that they can be involved in the project and they can handle the project effectively. Presently, a few community developers such as The Central Himalayan Environment Association (CHEA) and Central Himalayan Rural Action Group (CHIRAG) [both are Non Governmental Organizations in Uttarakhand] are also adopting such an approach. Some socially acceptable people were identified for local management with external support from different agencies and forest department. However, the involvement was largely informal. The villagers trusted the community and supported them in their work. They considered it to be their responsibility to support in this work.

Nainital Lake is a eutrophic water body and plays a significant role in the socio-economic development of the region. To address the problem of eutrophication, the restoration of the lake has been started. It is being done by applying several measures including eco-technologies such

as catchment area improvement, bio-manipulation and hypolimnetic aeration. (Notes from Lake Development Authority, Nainital)

3.2 Concept of Class

Another key concept which is used when understanding how communities use the water resources of the Nainital region is that of class. Social classes are economic or cultural arrangements of groups of people in society and are crucial to understand if one is to understand both livelihood strategies, and how people interact with their environments. Class is an essential object of analysis in the social sciences. It is often discussed in terms of 'social stratification'. Stratification can for example, comprise of a number of layers, such as upper class, middle class, and lower class.

Class distinctions are intricately tied to power relations, between powerful and the powerless groups. Social classes who possess great deal of power are usually viewed as "the elites" or ruling classes within their own societies, although there is considerable complexity in the relation between classes. Various theories propose that social classes with greater power attempt to maintain their own ranking above the lower classes in the hierarchy to the detriment of society overall.

In Marxist theory, two basic class divisions in capitalist societies are based on the fundamental economic structure of production, that is, the proletariat and the bourgeoisie. The capitalists own the means of production, but this effectively includes the proletariat as they are only able to sell their own labour power. In pre-capitalist peasant economies such as in many rural regions of India, these relations are often more complex, as small peasants own their own means of production, but are often exploited through other mechanisms such as rent, low agricultural prices or debt (Bhaduri, 1977; Deere & de-Janvry, 1979). Nevertheless, capitalist development continues and in many regions there is an ongoing process of differentiation which has been continuing for some decades, whereby smaller peasants lose their land and enter the proletariat and a richer agrarian bourgeoisie emerges with ownership of the means of production (Byres, 1981; Niazi, 2004).

Max Weber however, critiqued Marxian historical materialism (or economic determinism), positing that stratification is not based purely on economic inequalities, but on other status and power differentials. Social class pertaining broadly to material wealth may be distinguished from status class based on honour, prestige, religious affiliation, and so on. Marxist theorists such as Ralf Dahrendorf have noted the tendency toward an enlarged middle class in modern Western societies, particularly in relation to the necessity of an educated work force in technological economies.

3.3 Gender-specific division of labour

When exploring how communities make use of aquatic ecosystems, it is important to not only understand class relations, but gender differences within households. Due to processes of social change, role-sharing and working conditions of men and women do not remain static, but are continually being redefined. As a result of a progressive disintegration in existing family structures, changes are also taking place concerning gender division of labour, often at the expense of women. The tendency is for women, besides their traditional household tasks - such as the time-consuming and strenuous tasks of fetching of water and firewood, to be more and more bound up in the sort of work for which men were formerly responsible.

How work is divided and organized by gender within the family is closely related to the size of the family and to the availability of, as well as the amount of work needing to be done in, women's own separate fields. The disintegration of the extended family and the transition to the nuclear family often results in a shortage of work capacity within the family, so that woman's help in all aspects of field work is needed more. If the women have fields of their own, the men expect them, as a rule, to cultivate them alone or with the help of their children, although helping in the men's fields generally takes priority over this. The changes in family structure that have been outlined are accompanied by reduced willingness and capacity on the part of the men to act supportively.

3.4 Migration

A key issue to understand in the Nainital context is migration, given that it has been a central element of livelihoods in the region for many decades. Migration is the movement of people from one geographical location to another for the purpose of taking up permanent or semi-permanent residence, within or across a national boundary. An example of "semi-permanent residence" would be the seasonal movements of migrant farm laborers. People can either choose to move ("voluntary migration") or be forced to move ("involuntary migration"). Migration occurs at a variety of scales: inter-continental (between continents), intra-continental (between countries on a given continent), and inter-regional (within countries). One of the most significant migration patterns has been rural to urban migration—the movement of people from the countryside to cities in search of opportunities.

Due to the hilly terrain of the region there is not much possibility of quantifiable growth in the secondary sector of the economy of Nainital. Migration of workers to this town, seeking jobs in the secondary sector have few possibilities since the opportunities are less or none. On the other hand, it is evidently the tertiary sector which seems to be the engine of economic growth in the town. Most of the activities under the tertiary sector, which is the main constituent of the

economic base of the town, are related to small trade and enterprises, hotel business, transport and other such other activities. Nainital is the destination of thousands of tourists particularly in the summer months. There is tremendous growth potential in the area of tertiary sector activities. The High Court of the State, a university, several other State and Central government offices and institutions are located in this town. These institutions enhance the importance of Nainital but contribute only marginally to its economy. On the other hand tourism has its impact on the tertiary sector of the economy of the town. (Lee, E.S., 1966)

Traditionally, Nainital attracts large tourists in the summer even when much is yet to be done to improve and develop its tourist infrastructure. To attract 'high end' tourists including foreign tourists, who have the capacity to pay, higher order facilities need to be created for comfortable accommodation, high altitude recreational activities including 'adventure tourism' etc. As the tourism sector grows further, more employment opportunities will be created as a result of expansion of the aforesaid activities and enterprises. State Government also endeavours to make it a Global Tourist Destination.

4. MAIN FINDINGS

4.1 Overall livelihood strategy

'Livelihood' is most widely defined as the 'ways and means of making a living'. According to the works of Robert Chambers and Gordon Conway, livelihood comprises the capabilities, assets (including both material and social resource) as well as the activities which are required for a means of living (Carney, 1998: 4). Ellis (2000) suggests a definition of livelihood as 'the activities, the assets, and the access that jointly determine the living gained by an individual or household'. The concept of needs is particularly important in this context. Needs are things that are necessary for the survival of human beings.

Human needs can be material, physiological, emotional, and social. The basic needs (that is, the need for food, energy, shelter, medicine, cash, and also savings for future) are some of the fundamental needs of household for which people residing in highland areas must pursue diverse livelihood activities. Since in highland areas, the opportunities for pursuing livelihood strategies are comparatively limited as compared to the lowland areas, individuals have to depend mainly on the natural resources. In this highland region, aquatic resources become an important resource for livelihoods and for the fulfilment of individual needs.

The livelihood strategies and mechanisms through which people have met their basic needs have however evolved considerably over the generations. Kumaon region, within which Nainital is located, was annexed by the British colonialists in 1815. Following the arrival of the British, a number of hill resorts were developed by the colonialists across the region, including Almora

and Nainital itself, considerably changing local livelihood patterns. Although the Kumaon hills had an agricultural based economy, there were no houses or fields in the Nainital valley at all. According to colonial reports from 1842, and the lake was only visited by people from neighbouring villages once a year for a festival to honour the goddess Naini (Atkinson, 1973 [1882]). The name Nainital is derived from the name of the Goddess Naini. A temple to that goddess was built on the north of the lake (see Figure 10). It was first recommended as the site of a hill station by a British officer Mr P. Barron in 1841 in 1841 (Rawat & Shah, 2007). In 1842 the colonialists began granting lands for buildings, whereby people could settle on the payment of ground rent. Planners set aside sites for public buildings, housing, a bazaar and a church, and the first buildings had appeared by 1846. Wealthy local traders were offered land to set up businesses, while there was a significant migration of people from neighbouring agricultural communities to take up work in the many new enterprises (Rawat & Shah, 2007). The population of Nainital was 10,054 (2957 females) as of September 1880, though it was significantly lower in the dry season (Atkinson, 1973 [1882]). According to records in the Himalayan Gazetteer, at the time of colonization, the lake water was bluish-green and suitable for drinking purposes. The surrounding woods were reportedly rich with oak, ash, maple Siberian crab, cypress. (Atkinson, 1973 [1882]).

According to local tradition, the nearby lake of Bhimtal was created by the legendary Pandava Bhim with his mace. It is believed that the Pandavas sojourned in Uttarakhand and during their perambulations they happened to pass through this region. On finding no water to quench their thirst Bhim hit the ground with his mace, owing to which water started gushing out and created lakes in the region. When the Chand dynasty was ruling in Kumaon, it is believed that Baz Bahadur constructed a temple here on the shores of the lake. A temple still exists there but its antiquity cannot be traced. However Baz Bahadur did rule Kumaon and the lake region came under the Chhakatha Pargana of his kingdom.

The gazetteer from the colonial period reported that the water was suitable for drinking purposes as there is little pollution from the surface. The Bhimtal area, as with Nainital itself, was sparsely populated after the British annexation, with only one traveller's bungalow next to the temple. Bhimtal Lake was subsequently raised by 30ft by a dam built by the British so that it could be used for irrigation in the *bhabar* lands at foot of the hills in the lowlands in dry season (see From an interview with a local person (*Boatman with farm, Chanoti, Naukuchiatal, 11th March, 2011*); it was known that since the economic liberalization of the 1990s and the emergence of a wealthy class in urban centers such as Delhi and Lucknow there has been an increase in the number of tourists, probably because more people can afford to take extended vacations. While Nainital has been a popular tourist spot for over 100 years, it was only in the last 20-25 years when the tourism potential of the other lakes such as Bhimtal and Naukuchiatal was discovered, and hotels and other tourism services began to appear along the shore of each lake.

Figure 9). Attempts were made to build an embankment in Naukuchiatal at the outlet like in Bhimtal, but this was found to be of little use as the water escaped through underground channels. Most of the cultivated land in this region was below Bhimtal on the way to Naukuchiatal, and there had previously been a government owned tea plantation there as well (Atkinson, 1973 [1882]). Therefore, while livelihoods around the new Nainital town were diverse and based upon labour and trade from the beginning, the livelihoods in the vicinity of the other two lakes were primarily agricultural. Bhimtal was also a sight of a fishing centre for British officers, representing an early aquatic based economic activity. The lake was bluish-green to clear during this period. In Naukuchiatal Lake, water was also described as a rich bluish-green colour as of 1882 and is 'pure and wholesome' (Atkinson, 1973 [1882]). The surrounding hills were reportedly richly forested and are home to *kakar*, *gural*, pheasants and wood pigeons. In the post colonial period, Nainital continued to develop as a tourist town, and the population continued to grow with migration from other parts of India expanding the labour force. A generation ago, the livelihoods in these sites were much more based upon agriculture. Now they are far more diverse. The lake water during summers is released for Haldwani for both agriculture and Irrigation purpose (see From an interview with a local person (*Boatman with farm, Chanoti, Naukuchiatal, 11th March, 2011*); it was known that since the economic liberalization of the 1990s and the emergence of a wealthy class in urban centers such as Delhi and Lucknow there has been an increase in the number of tourists, probably because more people can afford to take extended vacations. While Nainital has been a popular tourist spot for over 100 years, it was only in the last 20-25 years when the tourism potential of the other lakes such as Bhimtal and Naukuchiatal was discovered, and hotels and other tourism services began to appear along the shore of each lake.

Figure 9).

Tourism opportunities provided by the lake have increased substantially over the last decade with growing numbers of visitors. Tourism is today the largest service industry in India, with a contribution of 6.23% to the national GDP and 8.78% of the total employment in India. India experiences more than 5 million annual foreign tourist arrivals and 562 million domestic tourist visits². The Ministry of Tourism is the most important agency for the development and promotion of tourism in India. Around 60,000 people permanently reside in the catchment area of Nainital Lake today. The population density in the catchment is 12,766 person/km². About 5,00,000 (Lakh) tourists approximately visit the town every year³. Tourism has greatly contributed to the socio-economic condition of the region. Due to an increase in the permanent and floating population, developmental activities have expanded largely in the catchment areas. The pattern of land use especially, forest cover has been reduced in the last few years due to an increase in the rate of urbanization and other activities. The number of houses has also doubled in the last 30 years.

From an interview with a local person (*Boatman with farm, Chanoti, Naukuchiatal, 11th March, 2011*); it was known that since the economic liberalization of the 1990s and the emergence of a wealthy class in urban centers such as Delhi and Lucknow there has been an increase in the number of tourists, probably because more people can afford to take extended vacations. While Nainital has been a popular tourist spot for over 100 years, it was only in the last 20-25 years when the tourism potential of the other lakes such as Bhimtal and Naukuchiatal was discovered, and hotels and other tourism services began to appear along the shore of each lake.

² Incredible India, Tourism Statistics at a glance, 2008 (www.incredibleindia.org/Tourism_Statistics2008-pdf.), 10th April, 2011)

³ Changes in the water quality of Nainital Lake as a consequence of application of Ecotechnologies, Thesis submitted for the Ph.D degree in Zoology to Kumaun University, Nainital by Ragini Gupta, 2008

Figure 9: Satellite image of extent of water use from Bhimtal Lake Canal



Figure 10: Naini devi temple today:



4.2 The role of the lakes in shaping livelihoods

Today, the tourism economy of the lake region is one of the primary factors differentiating livelihoods here from some of the more remote villages, where livelihoods are far more agriculture based. The Nainital hills experience a humid and subtropical climate. The area is pleasant in summers, attracting visitors from the plains. The average summer temperatures range from 20°C–30°C. The climate in winter is cool, with the valley receiving moderate to heavy snowfall (200-600 mm) and temperatures sometimes drop below freezing. The people from the plains therefore also come up to enjoy snowfall. The average annual rainfall is approximately 248 cm. Persistent clouds and fog in the rainy season is a peculiarity of the valley. Also because of the presence of five big lakes that are, Nainital, Bhimtal, Naukuchiatal, Sattal and Khurpatal, Nainital district is also called the lake district of Kumaon. All this attracts people to come to visit this beautiful place. Since tourism enhancement is a major objective of the Government of Uttarakhand, it is of utmost importance that the present quality of the lake water is conserved. The lakes of Bhimtal and Naukuchiatal are part of the lake circuit tours organized from Nainital. However, unlike Nainital, people here come mainly for a day excursion and visit before returning to Nainital. For this reason, the tourism economy surrounding the Naukuchiatal and Bhimtal is less compared to Nainital.

The following sections present a summary of different activities that people pursue to ensure a livelihood. The basic needs livelihood. The basic needs of food, shelter are universal for all individuals but the means of acquiring them vary from acquiring them vary from one area, place, situation, household to others and many other factors. Livelihood strategies Livelihood strategies which are pursued by the people in the highland areas are subsistence agricultural activities, grazing agricultural activities, grazing animals, and greater utilization of natural resources. In contrast, people in the lowland people in the lowland areas have more livelihood options as it is not limited by the rugged nature of the hills and other of the hills and other resources (see

Table 2).

Table 2: Summary of predominant livelihood strategies of people surveyed

Serial No.	Livelihood strategy
1)	Boatman/Boating
2)	Car Rent
3)	Car Driving, taxi driving, car repairing
4)	Horticulture, Florist
5)	Ornament Seller, poster seller, cloth seller, small business, tailor
6)	Tea shops, own restaurant, resort and resort manager
7)	Cobbler
8)	Construction men, mason
9)	Labour/ Worker at a shop, shopkeeper, working in a hotel
10)	Rickshaw Puller
11)	Service at boat house club, service in BSNL, pump maintenance work, service in irrigation department
12)	Horse riding
13)	Private Bus Duty
14)	Property dealer
15)	Photography
16)	Fish Culture
17)	Fishing
18)	Agriculture
19)	Teacher
20)	Students
21)	Telephone booth and phone repairing
22)	Army
23)	Livestock and cattle grazing
24)	University clerk, type men in college, college staff, clerical staff in hospital, school store in charge

Source: Field interview data

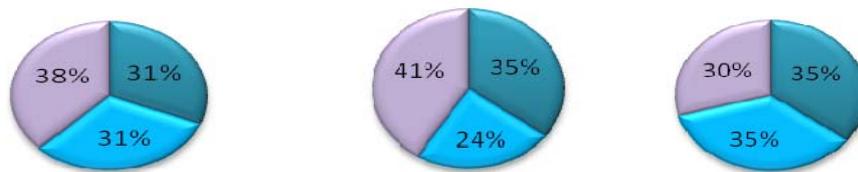
4.3 Differing levels of aquatic resource dependence

4.3.1 Three levels of dependence

Today, livelihood activities in the Nainital region are diverse, and with regards to aquatic resource use, they can be characterized into three types, *directly* dependent on aquatic resources, *indirectly* dependent, and *not* dependent. Activities which are directly dependent on aquatic resources include fishing, fish culture, farming, boating, labour (fish and agriculture), household

works. Activities which are indirectly dependent on the lakes include businesses, rental of car and car driving, photography. Activities which are not dependent are rickshaw driving, construction labour, teaching, army, and work in services. Figure 11 shows that around two thirds of the livelihood activities in each community are dependent on the lakes either directly or indirectly.

Figure 11 Graphical Representation of these livelihoods and their dependence on aquatic resources in Nainital, Bhimtal and Naukuchiatal



Nainital

Bhimtal

Naukuchiatal

Direct Dependence on Lake	
Indirect Dependence on Lake	
Not Dependent on Lake	

4.3.2 Direct aquatic dependent activities:

Agriculture: Agriculture is the traditional occupation of the communities in this part of Kumaon, and one of the original uses of the aquatic resources from the lake was irrigation. Lake water is channeled through a canal which is used for irrigation (see Figure 12 and Figure 13). In the lower part of Bhimtal that is in the Bilaspur village agriculture is done as irrigation water. Agriculture remains important for livelihoods, although it is decreasing and is not evident in Nainital. From the graphs in Figure 15, it can be said that the amount of farmland is least in Nainital. Only 17% of the households have farmland as it is mainly an urban area. In Nainital the amount of land for cultivation is very limited as the lands are mainly sold at high prices for construction purposes. In Bilaspur, which is the lower part of the Pandeygaon village, there is 87% of farmland. The lake water is also channelised to this lower part of the Bhimtal lake area and so agriculture is also possible there. In Naukuchiatal also there is 80% of farmland and so agriculture is done by most of the households. As a whole in HighARCS study sites in Uttarakhand it can be said that there presents 61% of households possess farmlands out of the 90 households which has been sampled and interviewed.

Figure 12: Bhimtal Dam which releases water for agricultural and other purposes



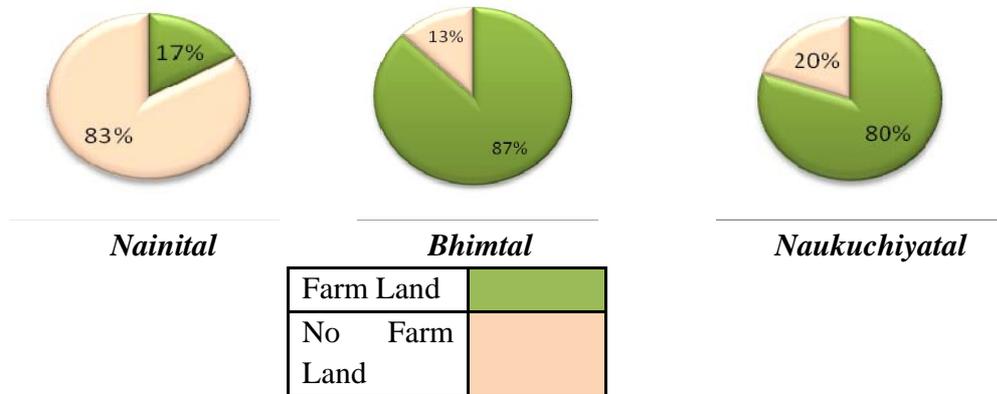
Figure 13: Canal below Bhimtal Dam



Figure 14: Terrace Farming in Jangaliagaon, Bhimtal



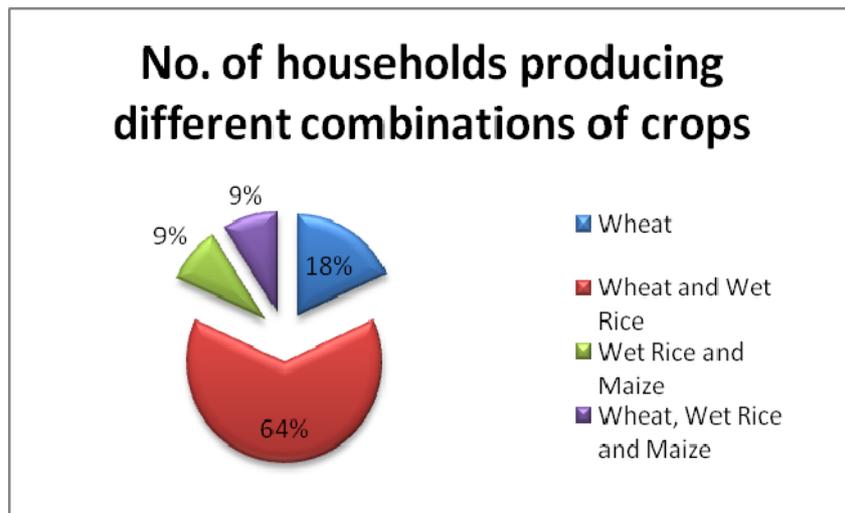
Figure 15: Percentage of farmlands possessed by the households which have been interviewed in Nainital, Bhimtal and Naukuchiatal:



Water for irrigation is provided by the Irrigation Department of Bhimtal to the farmers of Chanoti and Pandeygaon after being drawn from the lake. Water supply of Nainital is operated and maintained by Uttarakhand Jal Sansthan (UJS). These local governing bodies mentioned above are have the authority to collect water taxes and water charges for the respective villages. The primary crop in the selected study villages of Bhimtal and Naukuchiatal is wheat, which is combined with wet rice for 64% of households in Bhimtal (see Figure 16) and combined with maize for 54% of households in Naukuchiatal (see Figure 17). Only 4% of households in Naukuchiatal cultivate wet rice because the selected village Chanoti, is too high to benefit from the irrigation water from Bhimtal lake.

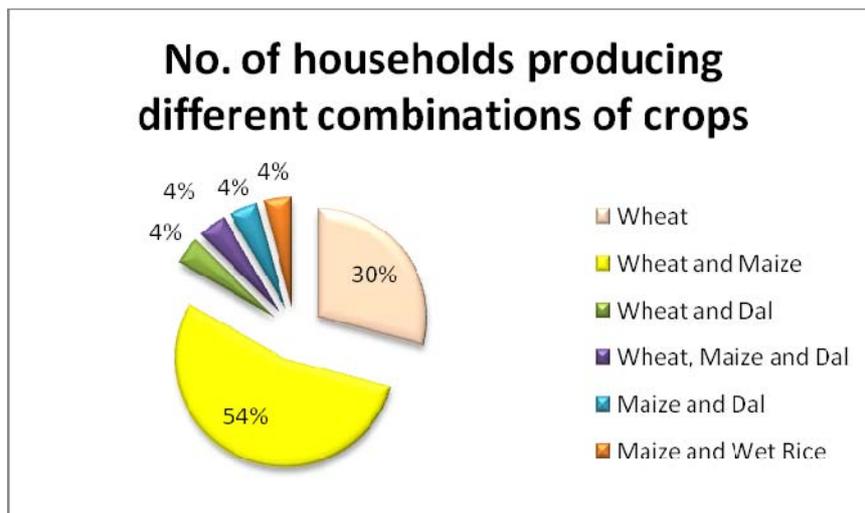
Although agriculture remains important for many livelihoods, today a far more diverse set of livelihood activities depend on the lake's resources. Activities such as fishing and boating are directly dependent on the lakes. However, both these activities are highly variable and seasonal and both are kept limited and restricted by the fisheries and irrigation departments. These are discussed below.

Figure 16: No. of households producing different combination of crops in Bhimtal



Source: Field survey

Figure 17: No. of households producing different combination of crops in Naukuchiatal



Source: Field survey

Boating: Boating for tourists is an important occupation of the people surrounding the lakes in all three sites (see Figure 18 and Figure 20). A large proportion of boatmen do not own boats, they hire the boats from the boat owners and at the end of the day they remit a fraction of their earnings to the boat owners.

In Nainital lake there is a total of 332 boats, out of which 10 boats are of National Cadet Corps (NCC) and these boats do not take tourists for trips. Also, the Boat House Club has 10 sail boats. Previously, these boats were solely for the use of the members. At present, these sail boats are also used by the public at the rate of Rs 250. And the boatmen from the boat house club they get a monthly salary of Rs 4000 per month which is paid by the Boat House Club. Also there are 222 rowing boats and 70 paddle boats. Some have their own rowing boats, some hire boats of others.

A license fee of Rs 1000 is paid every year to Nainital Nagar Palika Parishad (NNPP). NNPP has limited the number of boats in the lake and each boat has a specific number assigned by NNPP. Every year, in March, the license for the boat, together with a separate boating license, has to be renewed by purchasing a form which costs Rs 10. If any boat owner wants to sell his license then anyone else can buy that. In that case, a sum of Rs 5000 is to be paid for Affidavit to NNPP and the license has to be renewed by the new owner by paying usual Rs 1000 every year. The price of boating license at present is Rs 350,000. This is because the issue of license is limited but the demand for license is higher as boating is a profitable activity. During peak seasons it can earn a lot of income to the owner as well as the boatmen.

Those who have their own rowing boats they get Rs 145 to Rs 160 per trip. In every trip, the customers pay Rs 160 and the boat driver gets Rs 85 and the owner gets Rs 60 for a full round of the lake and Rs 10 is required to be paid to the NNPP for Life Jacket and Rs 5 to the Union Office. Those who are driving the boats, they must have a valid boating license. For a half round boating, the boat driver gets Rs 60 and Rs 35 is given to the boat owner and NNPP gets Rs 10 and the union gets Rs 5. However, unlike, Bhimtal and Naukuchiatal, in Nainital boats do not ply serially. Here, the boatmen are required to find customers themselves for boating. So they try to get hold of customers from the roads for boating.

*A change could be observed in the number of boating licenses issued during the period of 2006-07 to 2010-2011 (see 07 to 2010-2011 (see **Figure 22** and **Figure 23** for Bhimtal and Naukuchiatal). However, although there an increase in the number of boats has occurred in all the places from 2006-07 to 2010-2011,*

Figure 24 shows that the number of boatmen licenses has not increased commensurately (with the exception of Sat Tal which is not included in the study). A possible explanation for this trend is that more boats are being purchased by the richer 'accumulating' class of people. In fact, from the interview it was found that the numbers of households with more than 1 boat is increasing. Boating must be a profitable business for those groups of households who can afford to purchase

additional boats. They probably are employing labourers to carry out the boating on their behalf. This means that their options as well as earnings from boating are increasing. (See Table 11, 12, 13 in Annexure for more details)

Figure 18: Boating in Nainital



Figure 19: Boatman in Nainital

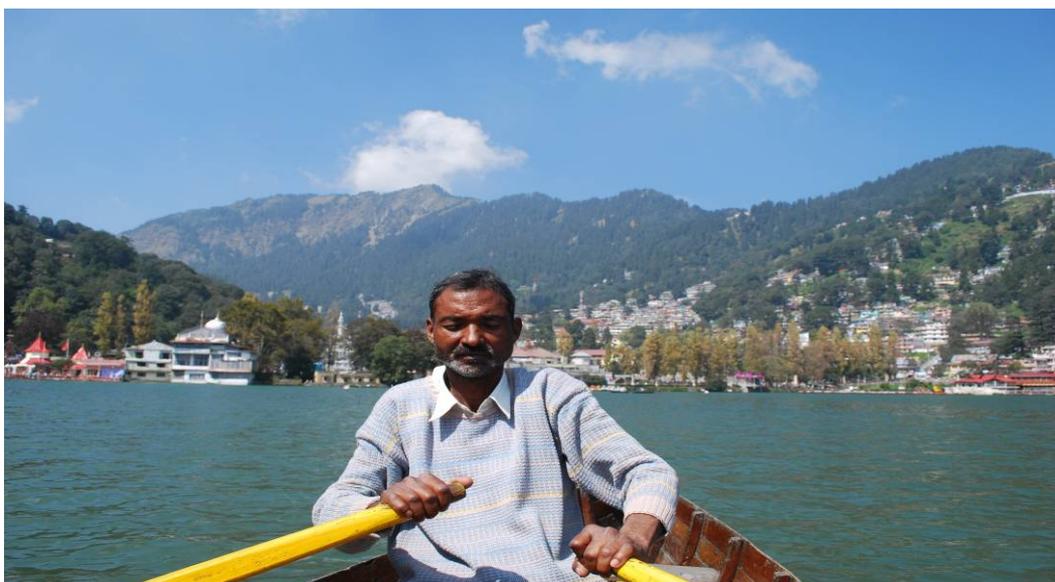


Figure 20: Boating in Bhimtal



Figure 21: Boating in Naukuchiatal



Figure 22: Graphical Representation of the change in boating licenses in Bhimtal

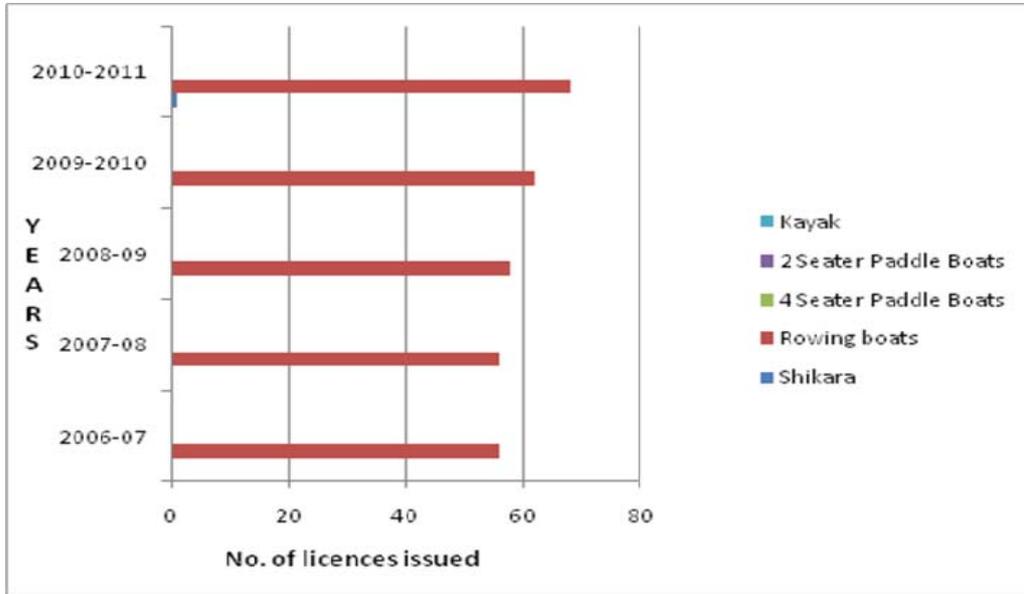


Figure 23: Graphical Representation of the change in boating licenses in Naukuchiatal

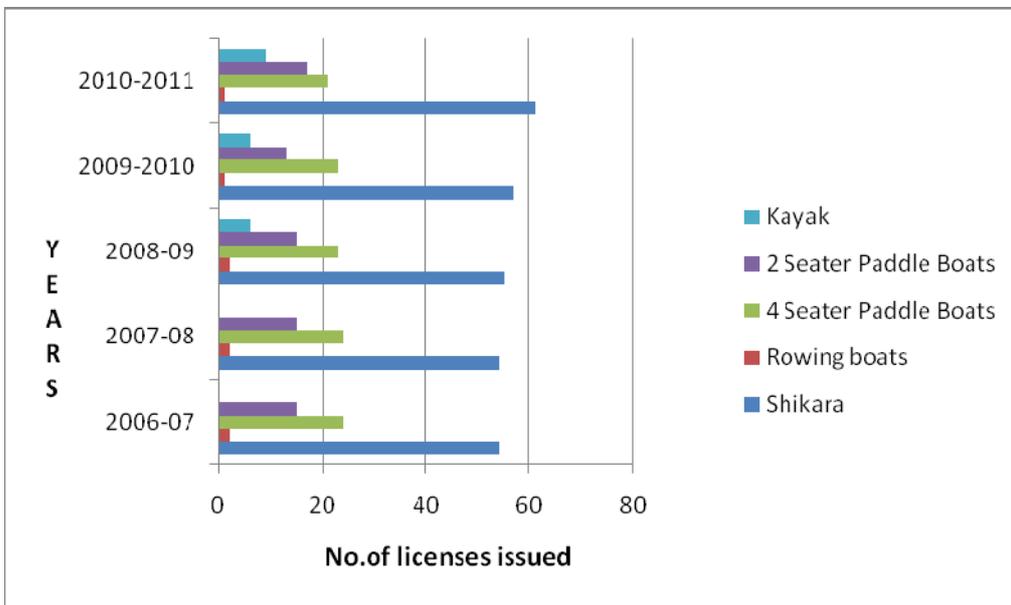
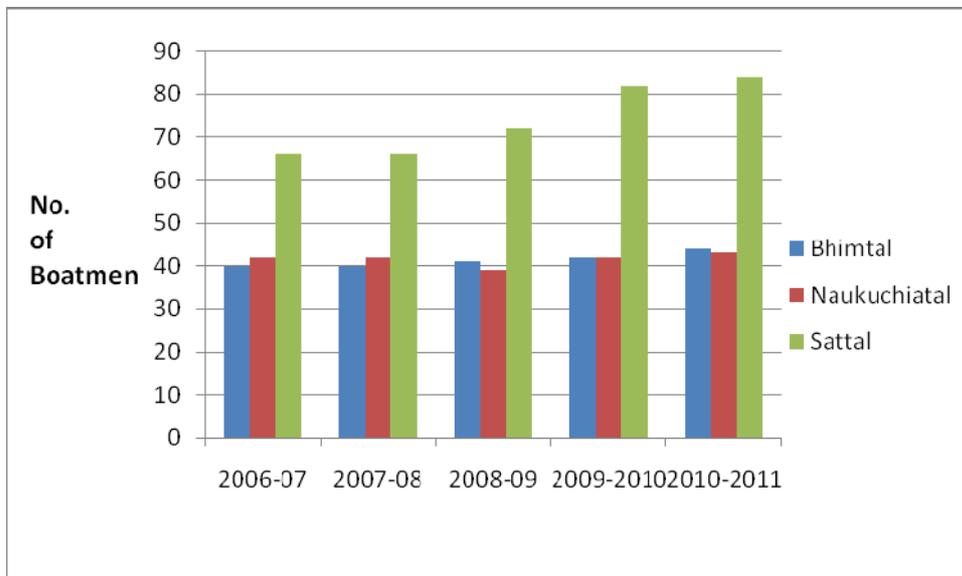


Figure 24: Graphical Representation of the licenses given to the boatmen in Bhimtal, Naukuchiatal, Sattal over a period from 2006-07 to 2010-2011.



Boating rates in conventional rowing boats ranges from Rs. 110/- to Rs. 160/- in peak season from one end of the lake to the other. Paddling boats are available on an hourly rate from Rs. 100/- to Rs. 110/- depending on type of paddle boat and tourist rush. The irrigation department of Bhimtal provides the boating licenses to the boatmen of Pandeygaon and Chanaoti villages whereas boatmen of Nainital get their license from Nainital Nagar Palika Parishad (NNPP).

Fishing: The aquatic regions of Uttarakhand State are bestowed with valuable indigenous fishes. They hold large population of both indigenous and exotic cultivable and non-cultivable fish species. The fishes found in the lake are generally Indian major carp, Mahseer, hill trout and mirror carp (*Cyprinus carpio*), which breed several times during one spawning season from May to September. The presence of such diverse range of aquatic fauna makes fishing another occupation which is pursued by some people, particularly those who already have a boating license (see boxed text 1).

A fishing license is also necessary, and this is acquired through the Department of Irrigation. Fishing is prohibited in Nainital Lake on an account of maintaining the biodiversity of the lake, and in Bhimtal and Naukuchiatal, there is a limit as to how many fish can actually be caught. The license fee for fishing is Rs 25 per day for 4 kg per person. From the boatmen of Bhimtal, it was learnt that from April to October, they get good amount of fish. During summers, when water for irrigation is released, the lake water is reduced to 20 to 25 feet. Water from Bhimtal Lake is released when the local people place demands to the Department of Irrigation that they require water for agriculture. At that time, during May and June, a good amount of fishes are

available. However, during December to February people generally do not catch fishes. In winter, fishes reach the bottom of the lake so they are rarely found. The lakes can be divided into three layers, Epylimnion, Thermo cline and Hypolimnion. According to the Fisheries Department, Bhimtal, if fishes are caught everyday, then there is an expense of Rs 25 for fishing license and Rs 50 for feeding the fish bait so there is a risk that fishers might not catch anything during winter. This is because during winter fishes reach the lower level of the lakes that is the Hypolimnion so fewer fish can be found. During peak seasons, sometimes tourists also come to catch fishes.

Fish culture was not common, although this activity was pursued by one household where the pond was leased via tender from the Fisheries Department for fish culture. The fishes cultured by this household include rohu, mrigal, grass carp, Catla and silver carp (interview of household head in Nainital, 01.05.2010).

Some fish are also caught from the lakes by the Department of Fisheries for stocking purposes. In Nainital, where fishing is banned to the general public, the Nagar Palika determines the species of fish to be collected on the basis of recommendation of the Pant Nagar University. Pant Nagar University collects the fishes from the lakes when they grow large in number, and instead replace them with fish eggs for culture. Local people or ‘fish labourers’ are employed to catch fish on their behalf. There is a close monitoring in and around the lake and steps are taken to maintain the biodiversity of the lakes. The fisheries department and Nainital Nagar Palika make rules on the quantities and species of fish which can be collected. The department of fisheries also has a cage culture scheme in Bhimtal lake. Fish labourers are employed to catch fish, and the sales revenue is given in Table 3.

Table 3: Fish Production of Fisheries Department

	2007-08	2008-09	2009-2010
Bhimtal	403kgs 800gm	1047kg 400gm	117kg 100gm
Sattal	195kg 700gm	61kg 300gm	152kg 400gm
Naukuchiatal	-	-	-

Boxed text 1: Fishing as a livelihood strategy

From an interview with a few boatmen cum fishermen named Saidul Hasan, Subhash Chand in Naukuchiatal it was learnt that from April to October good quantity of fishes are caught. During summer, when the water of the lake goes down to 6.096 to 7.62 meters due to release of irrigation water at that time, good amount of fishes could be caught. Subhash Chand caught a mahseer fish which weighed 28kg and it was sold at Rs 180 per kg. Saidul Hasan caught a maximum of 15kg of mahaseer. It is said that in this lake there are 2 male and female mahaseer fishes of 100 kg each and its length is that of a boat. There is also rohu species of 4-5kgs to 20kgs weight, katla fishes weighs 10kg to 40/45kgs in this Bhimtal Lake.

4.3.3 Indirect Dependence on the Lakes:

Tourists come to these places in large number being attracted by the beauty of the lakes and the mountains. Those individuals who are dependent on the tourists for their livelihood are in a way indirectly dependent on the lakes. Hotels, resort, restaurants are constructed to cater to the demands of the tourists. Huge number of people earns their livelihoods from these activities.

Also other type of small businesses such as ornament sellers, poster selling, photography, cloth or garment selling, and small shops have developed around the lakes and are important income generating activities for the people (Figure 25 and Figure 26). Horse riding was present on Bhimtal lakeside, although it is now strictly prohibited inside Nainital town.

Small scale enterprises such as cobblers stalls which benefit from the lakeside crowds benefit some of the poorest communities in the town. 31% of the people in Nainital are indirectly dependent on the lake through businesses. 24% in Bhimtal are indirectly dependent in Bhimtal and 35% are indirectly dependent in Naukuchiatal.

Figure 25: Local People selling goods in Nainital



Figure 26: Cobbler in Nainital



Figure 27: Tourists posing in traditional attire for photographers



4.3.4 Not dependent on the lakes:

There are some activities which do not depend upon the lake's aquatic resources. Activities like rickshaw pulling, car repairing, private bus duty, construction workers, teachers, labourers, students, different types of services are not dependent on the aquatic resources for their livelihood. These are outlined below:

Labourers: During the off seasons that is, when the inflow of tourists are less, people take up various jobs as labourers to supplement their income. They work as construction workers on road, hotels etc or as rickshaw pullers (see Figure 28). They also have employment as workers in restaurants and hotels and stalls.

Although laboring is strictly speaking not aquatic resource dependent, agricultural labour which is common during busy harvest periods is partially dependent upon the continued supply of irrigation water from the lake. Furthermore, as mentioned above, the Department of Fisheries along with Pant Nagar University at times employs fish labourers to work on their fish breeding schemes. Even labour activities such as construction are still dependent upon the tourism economy which is after all based upon the lakes and their ecosystems.

Figure 28: Rickshaw pulling in Nainital



Service: People are also working in the service sector which provides job opportunities to them. There are many government offices such as BSNL (Bharat Sanchar Nigam limited), Department of Fisheries, Lake Development Authority (LDA) and others. Also some people work in service in hotels, boat house. Some of the individuals are also clerks, teachers, and clerical and technical works in schools and college. Also some men have enlisted in the armed forces, notably the army and have migrated to other places for this work.

Education as livelihood activity: With the rise in the numbers of students and parents becoming more and more interested in educating the children, there has been a growth of the profession of teachers giving private tuitions. The parents are more eager to send their children for private tuitions because that will give their children an edge over others. This indicates an increase in the importance of education and also a new livelihood option for the educated people.

4.3.5 Widespread dependence on aquatic resources

The overall finding suggest that most households have some dependence upon aquatic resources, either directly or incirectly. 38% of the people surveyed were not dependent on lakes in Nainital, 41% of the people in Bhimtal were not dependent on the lake and only 30% of the people in Naukuchiatal were not dependent on the lake. These people are engaged in different other occupations such as teachers, students and so on.

4.4 Seasonality of Livelihood

Seasonal variation can be a major difficulty for a sustainable rural livelihood. This is because people in the semi-urban and rural areas are not always well prepared to cope with any seasonal variations. This is an extremely important factor because climate change severely disrupts established seasonal patterns and livelihoods.

As discussed above, fishing is done mostly from March to October (see Table 5). This is mainly because of change in the temperature in the Epylimnion and Thermolimnion layers in the lake and so fishes are rarely found during November to February due to change in the temperature of the lake water. So the fishermen do not catch fish during winter.

From March to June, and October to November, boating is done very high as it is the peak tourists season (see Table 5). However, in the other months, boatmen look for other types of employment as labourers or in their agricultural land. From March to June and October to November, income from boating is very high in all the three field sites. From the boatmen of Naukuchiatal, it was learnt that from the middle of April to middle of July and October and November 2nd week also there is peak season. That time they boat for minimum 3 times a day. During peak seasons they earn on an average Rs 20,000 to 25,000 per month approximately. However, this amount also varies from year to year according to the situation. As per the field report of September 2010, the numbers of tourists in Nainital were less because of Common Wealth Games in Delhi which attracted more people. More or less for 6 months they earn well, rest of the 6 months they have moderate income of Rs 3,000 to 4,000 per month.

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For the people in Uttarakhand, incomes from tourist activity are the most important source of earning livelihood. March to June and September to October is the peak season for income from different activities related to tourism. This is because of the geographical location of Nainital that it is colder than the rest of the hilly area of Kumaon region. During the monsoon season, it receives heavy rainfall. The neighbouring areas of Almora and Ranikhet are comparatively warmer than Nainital. The monthly maximum and minimum temperatures in the town range

between 28⁰C and 7⁰C. The rainy season arrives earlier than in the plains and continues up to the end of September. The heaviest rainfall is observed on the outer slopes of the hills. Average annual rainfall in Nainital is 2583 mm. Maximum rainfall occurs normally in the months of July and August which accounts for nearly 50% of the total of annual rainfall. During winter, very low temperatures are encountered because of rainfall. So during the months of the rainy season, tourists flow is less comparatively and also people generally do not prefer to go for boating. Again during the winter months, due to very low temperature, tourists flow is less. Because this region is basically a tourist dependent region, people here are affected due to seasonal changes.

Table 4: Number of Tourists Arriving in Nainital and its surrounding areas in the last 4 years

Types of Tourists	2004	2005	2006	2007
Indians	478,133	510,959	554,527	580,079
Foreigners	6,277	6,789	7,533	9,437
Total	484,410	517,748	562,060	589,516

[Source: Amar Ujala, A leading Newspaper of Uttarakhand, 3 May, 2008]

The number of tourists over time has increased (see Table 4), especially in the summer months as travelers seek relief from the scorching heat of the plains. This is because during the summer season the temperature in the plains rises between 30-45 degree Celsius. Summer vacations are also given in most of the schools during this time and so more people try to visit the hills during this time. This leads to a seasonal increase in the income of the people and more people migrate during this time for occupation. The increasing numbers of tourists visiting during a very small window each year, puts additional pressure on the environment as well as on the highland aquatic resources. Nainital Nagar Palika Parishad (NNPP) informed that they have implemented a number of measures to handle this tourist rush for these 3 seasons. They have additional police force throughout the tourist regions as well as monitoring boats which ply in the lakes to keep them clean. (*Interview in NNPP dated 30.05.2011*).

On enquiring a bell boy from an hotel (dated: 28.05.2011) it was known that he has come to work in the hotel from Ranikhet for 2 months to work in the hotel and rest of the time he stays in his hometown. On the contrary, during the off seasons the tourist flow is less so their income becomes less during the rest of the months. Also people used to visit these places for its natural beauty and snowfall but because of global warming there has not occurred snowfall in the last two years. So it can affect the livelihood of the people. And because of this fluctuation in the earnings of the people many of the households have changed from one kind of livelihood activities to another with seasonal change in income. So from March to October, people are engaged in wide ranging activities like boating, fishing, labour, agriculture, horticulture, livestock etc. Boating mainly operates in the months of February-March to October. Everyday, they get more or less 2-3 trips.

Table 5: Seasonal activity chart

MONTHS/ ACTIVITIES	J	F	M	A	M	J	J	A	S	O	N	D
Boating			High	High	High	High				High	High	
Fishing			Medium	High	High	High	High	Medium	Medium	Medium		
Agriculture	High	High	High	Medium	Medium	Medium	High			High	High	High
Business			High	High	High	High	Medium	Medium	Medium	High	High	
Labour	High	Medium	Medium	High	High	High				Medium	Medium	High

Source: Field Survey

High	High
Medium	Medium
Low	Low

Seasonal charts produced are interesting to study, and provide a deep insight into the different activities and times of the year when they are done most frequently. A seasonal chart showing different activities and months is given in Table 5. Here, the different colours indicate the seasonal importance of different activities. Red indicates high levels of activity; yellow indicates medium levels of activity and white indicates low levels of activity.

4.5 Ongoing changes in livelihoods

4.5.1 Urbanization

A very important question concerns the carrying capacity of the natural resource base which will ultimately arbitrate the destiny of tourism, which is the most important industry in Kumaon. The quality of the environment is absolutely indispensable for tourism. Tourists are attracted to the areas of natural scenic beauty. If this natural beauty is destroyed, then tourism will also be affected. Local people who are variously dependent on tourism have the largest stake in the environment and they must be the main custodians of the natural environment otherwise there will be a complete natural loss. However, owing to the recent boom in tourism (see Table 4), a large number of new hotels are mushrooming in Nainital and illegal constructions are also occurring in huge number. Because of this the ecosystem has been further degraded. Thus, the beautiful lakes have become disturbed and the livelihood as well as the natural environment has been endangered.

In Nainital, one respondent felt that many of the business opportunities were taken up by people from the urban areas of the plains. Few local people own the larger shops, and they are mostly

are engaged in smaller enterprises such as small stalls and shops. There have however been indirect benefits which are obtained from tourism around all three lakes such as improved public services and infrastructure. There has also been electricity and drinking water supply in a village which is near to the Naukuchiatal area for the last 15 years. This could be attributed as a cause to the growth of tourism economy.

4.5.2 Agricultural changes

It is also evident that agriculture is becoming less important around Bhimtal and Naukuchiatal not only due to new employment opportunities, but because of the rising price for land. It is increasingly popular for wealthy people from lowland cities such as Delhi and Lucknow to build holiday villas on the hillside above the lakes (see Figure 29 and Figure 30). There is also a huge demand from potential hoteliers to constructing more and more hotel and guesthouse complexes. The influx of outsiders buying land to built second homes has occurred particularly over the last 15 years. A form of suburbanization has occurred in this region. Suburbanization occurs when the city grows in the fringes of the main city. It is one of the reasons of the increase in the urban sprawl. Because of an increase in the number of tourists flow in the main city of Nainital which has become a totally urban area, there has also been considerable development of the areas surrounding Nainital such as Bhimtal and Naukuchiatal which have become secondary tourist sites. In the areas surrounding Bhimtal Lake the process of urbanization has already begun. This area is now under the Nagar Palika Parishad not under the Panchayat anymore. In this way, in the process of urbanization is also spreading to the surrounding areas. A contributory factor is the restriction which has been imposed in Nainital on any further construction. Because of this, more and more lands are being acquired in the surrounding areas for increasing expansion. The price of land has also been increasing.

Local people can earn considerable sums of money from their land, and combine it with alternative sources of income in the service sector and in government jobs. Many households have chosen to sell off their land to outsiders in exchange of large sum of money. The exchange rate for one *nali* (0.05 Acre) of land is around Rs 4,00,000, while by the roadside it can rise to as much as Rs 600,000. Advantages of selling off land are increasing as compared to potential future gains associated with retaining it. Location plays a significant role in determining how much a farmer can receive for selling their land and whether they will retain their land for productive purposes or not.

However, it is worth noting that the further one gets from Nainital, the more agricultural livelihoods become. In Pali village which is 12km from Nainital, livelihoods here have not changed significantly as compared with past decades, and are primarily based upon agriculture (maize, peas, wheat) on rain-fed terraced fields and livestock raising. The main commercial activity is the sale of milk to the local dairy. The residents of this village and many other

surrounding settlements have not benefited from the tourism economy of the lakeside communities. Some household members worked in Nainital, some in the plain areas and in cities, while others work as casual labourers around the village, mainly in road and house construction. The land price here was around 1.5 lakh per 0.05 Acre only. However, barely 2km away in Pangot, land was a staggering 12-15 lakh per 0.05 Acre. Pangot is on the main pitched road from Nainital and is on the ridge, with fine mountain views nearby. It is a popular site for bird watching. Most buildings in the village are now second homes being built by outsiders and hotels. In this way, the tourism economy has developed partially and only in some clusters.

Although agriculture is declining in importance, horticulture and floriculture are becoming more significant; offering additional earning opportunities. However, on their own the income generated may not be considered significant. Unlike cereal production, altitudinal differences offer hill farmers some competitive advantages in vegetable and flower production. Although this is profitable, it requires a heavy investment of labour. This is mostly a household business, although some employ few outside workers.

Figure 29: Luxury homes near Bhimtal



Figure 30: Construction Work in Silhoti



However, a very important phenomenon which was noticed in the field sites was that medical facilities were barely present in Bhimtal and Naukuchiatal. In Bhimtal, a few medical shops could be seen although there were no hospitals or nursing homes. In Naukuchiatal, the situation was even worse, where no medical shops could even be found. In case of any emergency, the local people have to be taken either to Nainital or to Haldwani both of which are nearly 30 kms far. This can make the situation worse for the patient.

4.5.2 In-migration and out migration

In Nainital there is huge in-migration of people from surrounding areas for earning livelihood as the opportunity to earn is much more here compared to other places. People from Bilaspur, Pandeygaon and Chanaoti also migrate to Nainital and other places. In all the lake regions however, there has been a significant migration of workers from outside the state, primarily from Nepal, to work as labourers in different construction sites.

It was found that on average the sampled families are residing in the town for about 16 years. Only 4 percent of families have moved to the town within the last 5 years. Of all the households 2.8 percent migrated from another town and 1.4 percent came from rural area. In Nainital, poor families have on average resided there for 20 years or more (see Table 6).

There is significantly more out-migration from Nainital to other places as compared to before, although there has been a long history of working in urban centers of the plains amongst the people of Kumaon. The levels of out-migration appear to depend on the type of job. Out-migration is primarily for skilled work however there is also out migration for labour.

Table 6: Migration to Nainital over the last 5 years

Migration*	Income Groups					
	All	Below poverty line	Poor	Lower-Middle	Upper-Middle	High
% of HH moved to Nainital in last 5 years	4.2	0	0	10	5.9	0
% of HH moved from another town	2.8	0	0	5	5.9	0
% of HH moved from a rural area	1.4	0	0	5	0	0
Not specified	95.8	100	100	90	94.1	100

*Data show households in percentage

Source: Census data-Nainital, 2005

Nevertheless, despite the active out-migration there are a large number of seasonal migrants, particularly from Nepal, although the numbers are difficult to estimate as there are no records. They are generally involved in occupations such as taxi driving, as tourist guides, construction labourers, and cooks. There is also a ranking of jobs among these labourers. A job as a labour is considered to be a one or two star job, taxi driving is a three star job and being a cook in a restaurant is considered to be a high ranking job.

Migrants can be said on one level to 'benefit' indirectly from the lake resources. They are able to take up employment as construction labourers as many new houses and guest houses are being built around the lakes. There are also a few migrants in Nainital, who drive the boats. However, for most, the wages are very low and the work is menial. They are often not even given a proper place to live by their employers. They mostly live in open shelters, where they cook and sleep. Some however used to stay in the house of the landowners and their food was also included in their wages. It was also observed that there is some sort of difference between the local as well as migrant labourers. The migrant workers were engaged in the mostly menial jobs.

There is also an aspiration to have occupational mobility among the migrants. Migrants who have slightly better socio-economic standing at their native place and are comparatively educated then they are more likely to find a better place in their paid jobs and employment in the Nainital region. However, poorer households tend to be employed as unskilled labourers in menial jobs. From an interview with Nepali labourers it was found that many of them have migrated when the dry season in agriculture prevailed in Nepal. They however benefitted from the tourism economy

although in an indirect way. This is because they were primarily engaged in the construction of guest houses and hotels that were being built around the lakes. There are a few migrants in Nainital who operate boats.

4.6 Class (wealth group) and livelihoods

4.6.1 Class divisions

There are differences within households in terms of their power relations and possession of livelihood resources. There is also differences between households regarding the ways in which they utilize aquatic resources, their degree of dependence on aquatic resources, the benefits which are acquired from these resources as well as the differences of wealth within the communities. The sustainable livelihood framework asserts that one's livelihood security is dependent upon their access to different forms of capital. These include natural capital (which includes aquatic ecosystems); human capital (e.g. education, labour power); social capital (e.g. networks of support); financial capital (e.g. credit and savings) and physical capital (e.g. machinery) (Scoones, 2009). Class divisions within the communities therefore vary according to the livelihood resources which are possessed by the households and also by their access to common property resources within a community. These include for example wetlands such as the Nainital lakes.

In a study from Tanzania, Birch-Thomsen et al (2001) divides livelihood strategies into three types. An 'accumulation strategy', applies to households that are commercialized with a high income and reinvestment of profits to expand their asset base. A 'peasant or subsistence strategy' on the other hand, entails subsistence orientation with limited participation in the market. Finally, a 'coping strategy', applies to households that struggle to meet their minimum subsistence needs, with limited income and dependence upon common property resources.

Classical Marxian tradition emphasizes on the ownership of a critical livelihood resource, that is, the Means of Production. This includes forms of 'natural capital' such as land, and 'physical capital' such as boats or machinery. Ownership of these assets which allow *production* to take place are vital, as they determine whether the individual is able to retain the full product of their labour. In order to accumulate wealth, a person needs to produce and retain a surplus value beyond ones minimum subsistence needs. However, this capacity to retain the surplus will be curbed if the means of production are not owned. For example, if one does not own their productive assets such as land and tools they may be dependent on rented assets. Access to productive resources can therefore play an important role in determining one's class position. For example in rural contexts, those with limited land are obliged to labour for others for menial pay, or 'rent' land – a situation whereby the surplus is appropriated by the property owner. The

owner of the means of production in this context uses their rent or the low wage labour they employ as a source of accumulation.

4.6.2 Local definitions of wealth:

Focus groups were carried out at the beginning of the research to assess the wealth differences in communities and define the characteristics of a ‘poor’, ‘medium’ and ‘rich’ or ‘accumulating’ household. As in the definition above, wealth in these areas is also defined by local people in terms of the possession of productive assets, or what was described above as the ‘means of production’. These assets include ownership of some businesses, boating equipment, or sometimes sizeable holdings of agricultural land. Other factors which were raised and are indirectly associated with access to productive assets included access to skilled or government employment, good social relationships with other members of the community and access to common property resources such as lakes, forests etc.

When asked what it was necessary to be defined as ‘rich’, agricultural land was raised, but this was not the most important, particularly in Nainital. This is probably because arable farming in a highland region offer far more limited opportunities for accumulation. Also in the Nainital area there is no cultivable land or any land for agriculture. Because of poor irrigation and water availability and urbanization, only a small number of people are pursuing agricultural activities. Instead, local people cited ownership of a business, or even a skilled government job or private sector or business employment as equally important.

Households defined as ‘poor’, were invariably those described as ‘labouring’ households, who had little land and were dependent on others to survive. Most of these households did have small plots of land and livestock, but these holdings were insufficient to provide households’ their subsistence needs. In other words, although land is not necessary for accumulation of wealth, it was necessary for subsistence purposes, and those who did not have sufficient land would be working mostly as labourers.

There were some labouring relations between households due to the differences in wealth. Some poorer local farmers would work as labourers for wealthier farmers with greater land holdings. However, as the local labouring class is quite small, many labourers actually come from other regions, such as from UP, Bihar and even from Nepal. The majority of households are however self-sufficient, that is, neither buying nor selling labour.

Table 7: Class categorisation in the Uttarakhand field site

‘Accumulating’ or rich households	‘Subsistence’ or medium households	‘Coping’ or poor households
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<ul style="list-style-type: none"> • Ownership of business, large amount of land, boats • Employment of outside labour • Rental of property (boats, lands) to others • Secured income from skilled employment, access to government jobs and private jobs 	<ul style="list-style-type: none"> • Minimum to no use of outside labour (except labour for ‘exchange’) • No renting out land • Ownership of means of production (e.g. agricultural land, small shop, few machinery) to provide at least some of the households subsistence needs 	<ul style="list-style-type: none"> • Dependence on labour primarily: <ul style="list-style-type: none"> ▪ Unskilled labour ▪ Rented property • Utilization of Common property resources • Limited ownership of means of production (e.g. small landholdings, small amounts of livestock)
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Source: Field interview data analysis

Below the primary characteristics of each wealth category is outlined. There are of course differences between villages. In Nainital for example, people mostly do not possess any agricultural land as assets but have their own small or medium sized businesses. Only a few have some amount of land in their native place. Those who pursue boating however, often have boats of their own and some households have farm animals like cattle, sheep which are used as means for earning their livelihood. However, in the other two sites of Chanoti and Pandeygaon, people possess varying amount of agricultural land and some have their own boats as well, as well as livestock.

4.6.3 Class divisions identified in study communities

Rich or ‘accumulating’ household

Households belonging to this group comprise of 10% of the survey in Nainital and Bhimtal and 27% in Naukuchiatal (see Figure 31). Most of the accumulating households own businesses of different types, of which car businesses were found to be most common in these areas. These rich households have taken loans to purchase car. In two households we found that they pay car loan of Rs 5000 per month. One of these rich households has three cars all of which are used for business purposes. This certainly differentiates them from the other less wealthy households. Other business include a garment’s shop. Also these households possess large amount of land, approximately around 60 to 100 Nali per household. They also employ labourers in agriculture and boating.

Other assets such as boats are also owned by some of the rich households. They employ labourers to row their boats by the lake side. Occasionally fishing is done by these households to supplement their income. However, both fishing and boating are seasonal activities and so they are partially dependent on it, while fishing often has a leisure aspect. The rich households also

possess large number of luxury goods. Apart from the most basic TV and mobile phones, these households also have bikes, air conditioners, and refrigerators.

Many people are in different government jobs and services and have a steady source of income. This assured source of income is an important factor for this group of people who belong in the accumulating category.

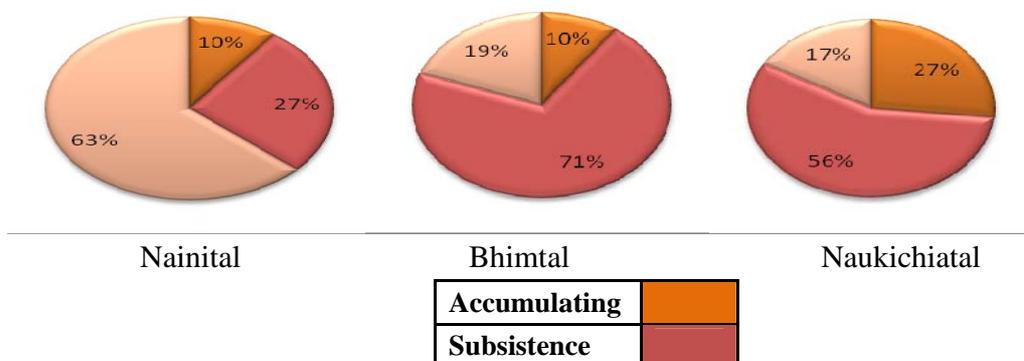
Medium households

People belonging to this category comprise of 27% of surveyed households in Nainital, 71% of households in Bhimtal and 56% of households in Naukuchiatal (see Figure 31). They generally possess some amount of land which is cultivated mainly for their own consumption to meet their subsistence needs. They generally cultivate this land on their own and with the help of family labour. Along with agriculture most families are engaged in other activities to earn income. Assets such as boats or boating equipments are possessed by a few families. Some fishes which are caught are also sold by them. A few households have family members who are engaged in different types of services, such as in the army or as lower grade staff in colleges or offices. Consumer goods possessed mainly include TVs and mobiles.

Poor households

Surveyed households belonging to the ‘poor’ category comprise of 63% of households in Nainital, 19% of households in Bhimtal and 17% households in Naukuchiatal (see Figure 31). The poor households have an extremely limited means of earning livelihood. They possess very little land for cultivation which is cultivated by themselves and also few livestock. They mainly works as labourers on others farms or in fishing or as boating labourers or construction labourers. They have no market participation as they do not produce any surplus from their agricultural land, and there is very limited luxury goods. Common property resources such as forest lands are also used by these households for various purposes. Those who belong to the Scheduled Caste category and have Below Poverty line (B.P.L) card usually belongs to the ‘poor’ category.

Figure 31: Graphical Representation of the different households in Nainital, Bhimtal and Naukuchiatal

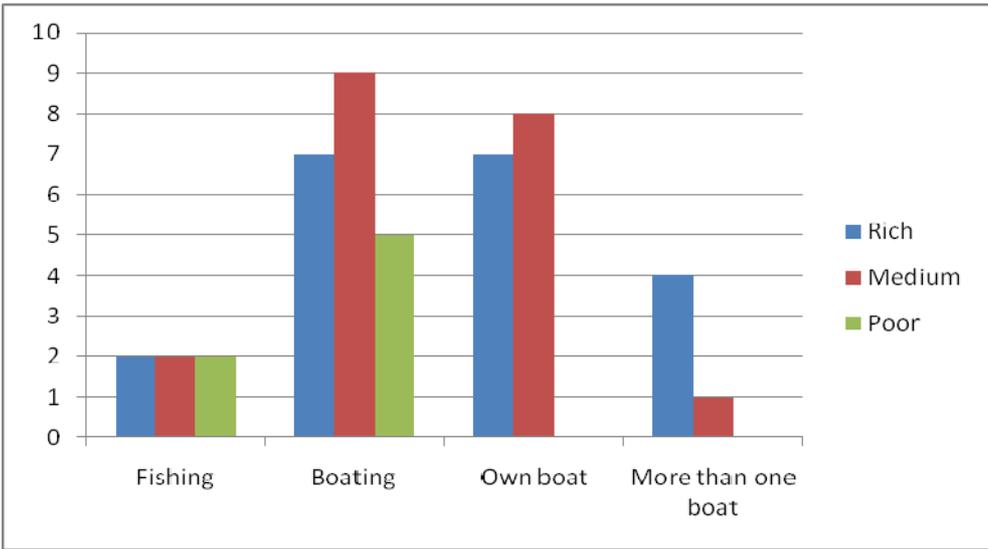


Poor

4.6.4 Class wealth groups and aquatic resources

Rich households mainly pursue different types of business like car business, garment shop etc which are totally dependent on the tourists. These tourists are the main source of their earning through business. These tourists come mainly for the lakes beauty. So this group of accumulating households may not be using aquatic resources in a direct way but indirectly the lake constitutes the main source of their income. However, some of these households also possess boats and fishing equipments. So for boating and fishing they are dependent on the lakes, although this is only a supplementary livelihood activity. Also cultivation of the large amount of lands that they possess they requires irrigation water which comes mainly from the lake which is then channeled through the canals.

Figure 32: Graphical Representation of fishing and boating by different class categories in Nainital, Bhimtal and Naukuchiatal



Most of the rich households who are involved in boating have their own boats or even own more than one boat. They therefore use the lake more as an accumulation strategy rather than it being something on which they are dependent (see Figure 32). Others belonging to the accumulating category are not wealthier because of boating and fishing but due to other livelihood activities – mostly different types of businesses. They cannot therefore be considered to be totally ‘dependent’ on the lake.

The subsistence and the coping households on the other hand are mainly dependent on labour services and agriculture as well as boating. The subsistence households possess boats but only one subsistence household has more than 1 boat (see Figure 32). The coping households however, do not possess any boating assets, and work mostly as boat and fish labourers. Sometimes they exchange labour services within household in an informal way. For example, someone may help on their neighbour’s farm and then that person may also help on some other day on their farm. In this way they often exchange labour services among themselves. But it may not be an equal but a very informal exchange. They have to diversify their economic activities to maintain their livelihood.

It is important to note that the coping and medium households are in fact more directly dependent on aquatic resources because their work as labourers in fishing and boating activities constitutes their main source of income whereas for the accumulating households it is mainly supplementing their incomes.

4.6.5 Economic power relations between different groups and changes to these relationships

As people pursue a diversity of different occupations, there is no absolute dependence of poorer households on the richer households in the selected field sites. Nevertheless, there were a number of situations whereby the poorer households are dependent on the accumulating households for various services. At times for example, the richer household may employ labourers for certain works such as for agriculture or for boating labour. Also the poorer households work mainly as construction workers and in the hotel, resort or road construction sites.

Despite these ties of dependence, there is only limited evidence of differentiation, whereby economic power relations or class relations are increasing between the sampled households. Most of the land which was possessed by households was not ‘purchased’ or acquired by an accumulating class but was inherited by them.

With regard to boating, there are clearly unequal class relations in instances where poorer households rent boats from their richer counterparts. For most medium and rich households however, the boat owner himself drives the boat so class relations are less evident. It is only

during the peak seasons that they employ labourers for boating. The Boating rates in conventional rowing boats are Rs. 160/- for a full trip from one end of lake to another end and Rs 110/- for a half trip. Paddling boats are available on an hourly rate from Rs. 100/- to Rs. 110/- depending on type of paddle boat. From Rs 160 earning, Rs 10 is given for life jackets and Rs 5 to the Union and from what is left, Rs 85 must be given to the owners and the rest of the money is retained as the wage of the labourer. Also in Bhimtal and Naukuchiatal Lakes, there is a numbering system for the boats. The boatmen can take any boat which is available and he gets the money from the counter, while the rest of the money goes to the owner. So there is no such class relation between the owner and the boatmen. In Nainital, there is no serial number system however, and anyone can take as many passengers for a ride as is possible.

The phenomena of rising land prices mentioned above, points to a new set of unequal class relations which are emerging. Since areas surrounding the Nainital Lake have been totally filled up with buildings, outsiders and businessmen now prefer to purchase lands at a high rate in other areas. Farmers also prefer to sell their lands at these hiked prices rather than farming on this land which fetches them a lower income. The seed price and lack of irrigational facilities further discourages these farmers.

Near Naukuchiatal Lake, a resort has been made by acquiring land from the villagers at the rate of approximately Rs 70,000 per 0.02 ha approx. However, with the development of the resort the land price has risen further. It is now close to Rs 3,000,000 per 0.02 ha (*Interview in Chanoti village, 11th March, 2011*). Given that there is no land for expansion or further construction in the Nainital region, investors are now looking for expansion in the surrounding areas such as in Bhimtal and in Naukuchiatal. Land prices are therefore soaring higher in these places now compared to what it was 10-15 years ago. There is a constant flow of migratory businessmen who are utilizing these lands for business purpose, resulting in steady urbanization and loss of the natural beauty of these hilly regions.

However, how much is this development in the real estate actually benefitting the people who are residing there? In one way, because of this real estate development a few local people are getting employment in the new resorts. However, they are generally stuck in low paid jobs because they are not adequately skilled to take up the higher paid jobs. It is people who are qualified and are trained in more urban colleges who have the skills matched with the requirements who are actually getting these jobs. So the local people are losing in both ways. People in these areas are utilizing this money received from their land to invest in other livelihood activities such as small businesses. However, they are often alienated from their means of production when new opportunities fail to materialize following their investment. They are effectively losing their main asset, land. Some of such households are obliged to turn to menial wage labour to survive.

However, real estate is booming and will further flourish in the days to come, causing further rises in land prices. The investors will be earning more money by selling the lands in the future

as compared to the money which the villagers who were the real owners have received. In this way, real estate development may apparently seem to benefit the livelihood of the local people but ultimately it is not bringing about any change in the livelihoods of these people. Local people are remaining in the same situation as they were before.

4.7 Market relations

The degree to which aquatic dependent activities are market oriented is highly variable. Fishing for example, is not commercialised. The fishes caught in the lakes are very limited. In fact there is a restriction on fishing in Nainital and Naukuchiatal. In all the sites there is limit on the amount of fishing that can be done, that is, 4 kg per persons per day. Since the fishes caught per day is so low the question of going to market does not arise. Whatever fish are caught with the intention of selling is sold at the lake-side. The fisheries department prevents over fishing. According to the Fisheries Department, during peak season, there is regular monitoring by the officers of the department. However, no cases of illegal fishing are reported in any sites.

In Haldwani there are fish as well as vegetables markets. The richer households are engaged in different types of businesses like garment shop so they have a market for these goods where. Also there is the local Bhutia Market in Nainital, and small markets around the lakeside in each of the three study communities. Since a large number of tourists visits these places throughout the year, the market for different goods is significant. Tourists frequently flock to these markets to purchase various gift items, woolen garments and other goods.

Livelihoods on the whole however, are becoming more dependent on the market. The era of rapid and intensive development of the Himalayan Region began two decades ago when top priority was given to connect these areas with the plains by constructing roads. After the main roads were constructed, the construction of link roads started, which continues even now and is likely to continue until each village is linked with a main road. Construction of these main roads has brought about an end to the subsistence village economy and has replaced it with a money and market economy. Earlier, in villages along the roadsides, a few shops existed to supply salt, oil, jiggery and cloth. The barter economy has been replaced now however, with the money economy in which the villagers exchange products as both sellers and purchasers. The villagers are now obliged to sell their valuable products such as milk and ghee, and to adopt various means to earn money to satisfy their ever increasing demands. If the households produce more than their subsistence requirements then they sell that in the market. Surplus agricultural products are also sold by some richer households but for most of the households these products are mainly produced for self consumption. A few poor households however take loans from their relatives in times of need such as during marriage or if someone is ill.

Outputs from vegetable production and animal husbandry usually cannot be sold in the market because the holdings are very small and are sufficient just to meet their consumption requirements. Women play a very prominent role in agriculture and animal husbandry in these areas.

4.8 Political power and sources of support

There are a number of political parties active in the villages around Bhimtal and Naukuchiatal. Respondents reported that they could turn to political parties for support or advice in resolving conflicts. Bharatiya Janata Party (BJP) and Congress are primarily active in these villages. Samajwadi Party (SP) and Bahujan Samaj Party (BSP) are also present. Most people have very little access to political power. However, in terms of awareness of rights, men and women are aware of the places from where to take licenses for livelihood activities and the rule making bodies that are present in these places. They also know where to go for legal advice.

People who are below the poverty line have Below Poverty Line (BPL) cards which allow them to secure different benefits through the rationing system. One person has also built their house under the Indira Abash Yojana. People are aware about the different benefits to which they are entitled to although there is a perception that the local government has not done much for them. According to the people, the Government does not provide any help or any insurance benefits for them in case of any injury or accident. In spite of all these efforts one of the common complaints that the local people here made was that the Government including the Lake Development Authority (LDA) mainly focuses on Nainital region and as such the remaining lakes are neglected.

Aside from the state and political parties, most of the households maintain close relations with their family members and friends within the community, and these act as important sources of support. They meet regularly or whenever they find time. They gossip with each other or chat and share information amongst themselves. They also discuss issues regarding how to protect the environment, or lake related issues which show their concern for the environment. They also share finances when they are in need for situations such as medical emergencies or marriage, and their children's future. They also get financial help from each other if they need it. People share items like milk within themselves. A sort of mutual exchange prevails between the households. However, with an increase in the selling of land the previous tie between the households might decrease as households move away or shift out of their traditional agricultural livelihoods, reducing day to day contact with other community members.

4.9 Environmental Change and Aquatic Resources

4.9.1 Increase in pollution levels

The major problem of the lake as perceived by the local people is that there is increased pollution and excessive tourist and excessive tourist pressure. The data in

Table 7 only refers to fish caught by the department of fisheries employees. Nevertheless, it points to a downward trend in fish catches between 2007 and 2010, suggesting some environmental decline.

Boatmen, hoteliers, college teachers other local respondents the team spoke to felt that construction work and the incessant resale of land have had a derogatory impact on the lakeside areas. Sometimes the sewage drainage water and rain water goes to the lake and it makes the water extremely dirty. Washing of clothes and bathing in the lake is also making the lake water very unclean. Furthermore, the throw away mentality of the tourists is also responsible for environmental pollution. People throw away polythene and plastic packets in the lakes without any consideration. Polythene bags are prohibited in Nainital and there are also propositions to ban them in Bhimtal. This kind of waste is reportedly obstructing the free flow of the fresh water in the lakes.

It was also reported that indiscriminate cutting of trees is weakening the lands and creating soil erosion and landslides, which undermine water quality. According to LDA the farmers in the adjoining areas practice farming and use fertilizers in large amounts. These fertilizers wash into the lake during the rainy season thereby polluting the lakes. Not only water but soil and air are also being polluted due to indiscriminate cutting of trees, forest fires, use of pesticides for agricultural activities and smoke from burning fuel.

The boatmen of Nainital acknowledge however that a lot has been done to uplift the condition of lake and the surrounding areas. For example, Lake Development Authority had made efforts to mitigate the impact of increased tourist inflow. A lot of aeration work has been done and the oxygen dissolved in water has increased thereby increasing the visibility of the lake. Efforts such as tiling the path around the Nainital Lake so as to prevent dirty plain water from flowing into the lake water and thereby polluting it have been made.

Table 7: Annual fish catches and sales revenues*

Year	Total Quantity of fishes	Total Sale revenue of fishes (Rs)
2007-2008	48.70 Quintal	24,350
2008-2009	38.45 Quintal	19,225
2009-2010	37 Quintal 65 kg	18,227

	500 gm	
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*Source: Developed from Department of Fisheries (2011) Bhimtal

4.9.2 Climate Change

According to the fisheries department there are clear indications of gradual climatic change in these hilly areas. There is evidence that the major glaciers located in the Uttarakhand Himalayas are retreating at a rapid rate due to an increase in the atmospheric temperature. Furthermore, the snowline is also retreating to higher altitudes year by year. According to local hotel owners, tourists used to swarm to Nainital to see snow and to escape the scorching heat of the plains, however things have changed a lot. The weather has become warmer, Nainital has not received snow in the past two years. Owing to the effect of the gradual change in climate, the farming calendar has had to be shifted. The renowned apple orchards located at Ramgarh, Munsyari and other locations at similar altitudes, are deteriorating due to an insufficient chilling period required for the crop.

As far as fisheries are concerned, it is under anthropogenic stress. The aquatic resources have suffered from a reduced flow in the rivers feeding and draining the lakes and increasing siltation. The cold water fisheries are known for their sensitivity. Most of the species have narrow thermal tolerance and as such the increase in temperature is dangerous for their survival, perhaps also explaining the decrease in fish stocks in Table 7.

4.9.3 Natural disasters

There was a severe landslide in 1880 on the 14th September, following high monsoon rains. This cost the lives of 151 people. In July 1867, a part of the hill above the west end of the main bazaar in Mallital came down. This was the first recorded major landslide of Nainital. The next was on Sept.18, 1880 near the Alma Hill on the Sher-Ka-Danda ridge. The catastrophe of a few seconds took the toll of 151 dead and missing. The last of the landslides of the 19th century was on 17th August 1898 when a large chunk of Kailakhan ridge slid down into the Ballia ravine above the brewery. After cloudbursts and landslides on September 21st, 2010 at least 76 people have died and several still missing in Uttarakhand. Almora, Chamauli, Uttarkashi and Nainital were the worst hit, with more than 25 homes being washed away.

4.4 Policies and institutions and impact on aquatic resources

In the context of highland aquatic resources, the majority of laws and policies to be analysed fall under the category of environmental laws. The project however is also concerned with

livelihoods associated with these resources and therefore labour laws, human rights laws and social security laws are also important. The purpose of this section is to review the existing laws and institutions which both enhance livelihoods and mediate access to natural resources in the Nainital region. For more information on policies and institutions see the HighARCS policy report for Nainital (Kundu et al., 2011).

4.4.1 Impact of NGO's and Local Community Groups

Chiraag is a well known Non Governmental Organisation (NGO) in Uttarakhand. They supply seeds like wheat and beans to the farmers in the village. It has been very effective in the upliftment of these regions and to mitigate the negative impact of the environmental degradation. They have set up a bio-gas facility plant, although it has not succeeded due to the cold climatic conditions in these areas. Another local organization named Gawal Sena is operating in these areas. Their main aim is to stop the incessant sale of the land in the mountainous regions. They are trying to organize local people to protest against these constructions which are occurring so frequently in these areas.

Water tanks have been built in Sanguri village at every home with the help of the Lake Development Authority, Bhimtal and G.B. Pant Institute of Himalayan Environment Development, Katarmal, Almora. An engineer from G.B. Pant Institute of Himalayan Environment Development informed us about the building of a Water Harvesting Tank for irrigation purpose. This is done because there is no irrigation water facility in Sanguri village though it is very close to Bhimtal Lake. They are also involved in various other types of work such as to keep a watch on the erosion of the hills and to plant different flower saplings through poly houses.

An important institution meeting the needs of lakeside communities involved in tourism is the boatmen union. The boatmen union controls the way boats operate in the lakes. For example, they follow a queue and a number system. This number system has been introduced with consensus from all the boat owners and boatmen. A queue has to be maintained and only then the tourists can be taken for a boat ride. It is highly effective as each boatman gets a serial number from the union and they wait serially for their turn to come. The union maintains a register which keeps track of the number of boats that are plying on an average each day and the boats which will ply the day after. For instance, during the off season, the boats are less in demand, so the boatmen know when their turn will come according to the serial number and so they can engage in other livelihood activities while they wait. This gives an equal opportunity for all the boatmen and means the opportunity is not only available for those with the best marketing skills. This union is also very helpful as it gives boatmen monetary and other kinds of help when they need. The union also keeps an eye on the whole system of boating for providing the best service to the visitors. According to the boatmen in Bhimtal and Naukuchiatal, the number of boats plying here can be increased while assuring them an income since the system is numbered and therefore fair.

There is also a car owners and drivers union which provides car for rent for the tourists to visit different places.

4.4.2 Key Management institutions for aquatic resources

Many environmental resources are often openly accessible to all members of local communities, and hence can be classified as 'common property'. For this reason there is a need to for laws and regulations to protect these resources while also solving conflicts that are arise due to the lakes' utilization by multiple individuals. To address the issue of unplanned growth of Nainital and pollution in the lake and its catchment area the Government of Uttar Pradesh constituted a Lake Development Authority in 1984. Respective government departments also make rules. A number of committees have been appointed from time to time, the latest being the Brajendra Sahay Committee by the Uttar Pradesh Government (1994-1995). There are also some informal management regimes such as an association of local traders who voluntary banned of plastic bags.

Aside from the district and local level institutions, at a countrywide level, the National Lake Region Special Area Development Authority (NLRSA) is the overall planning and development authority for the Nainital lake region area. It comprises of five planning zones Nainital, Bhowali, Mehragaon (khas), Bhimtal (including Sattal) and Naukuchiatal. This authority takes responsibility for preparing and enforcing the development plans for lake conservation. NLRSA is the nodal agency for Nainital Lake Conservation Project (NLCP) to the total amount of Rs. 65 crores. An amount of Rs. 47.96 crores (1 \$=46.65 Rs AS PER 14.7.10) is earmarked for Nainital Lake and the rest Rs. 16.85 crores for the other four lakes in the region. This programme is funded by the central (70%) and the state (30%) government.

Figure 33: Office of Nainital Nagar Palika Parishad



Figure 34: Office of Nainital Nagar Palika Parishad



Under the Nainital Lake Conservation Project, works have been proposed in the following broad sectors:

- Sewerage and sanitation works
- Hydraulic works

- Restoration and development works
- Catchment conservation works
- Infrastructure facilities
- Social awareness and participation plans.

While the LDA is focused on managing the lakes of the region, Nainital Nagar Palika Parishad (NNPP) is the urban local authority for the actual town of Nainital (see Figure 33 and Figure 34). The town's population as reported by the Census-2001 was little over 38 thousand, which has since then grown, as reported, to 44 thousands, which at least doubles during tourist seasons. To cope with the unusual situation of seasonal increase in population, the Nainital Nagar Palika Parishad (NNPP) has to constantly 'network' with a number of other organizations and agencies. In other words, Nainital civic administration has to be constantly prepared to meet seasonal, anticipated 'emergencies' in addition to meeting the 'normal' civic needs of the city. Broadly, the institutions involved in infrastructure/service provision in the city are:

1. Nainital Municipal Council (NNPP)
2. Nainital-Lake-Region Special Area Development Authority (NLRSDA)
3. Uttarakhand Pey Jal Nigam
4. Uttaranchal Jal Sansthan
5. Public Works Department
6. Regional Transport Office
7. Uttarakhand State Electricity Board
8. Uttarakhand State Environment Protection and Pollution Control Board
9. Uttarakhand State Urban Development Agency
10. Uttarakhand Transport Authority

Besides these, the state level field administration, particularly District Administration headed by the District Magistrate (DM), the Divisional Commissioner (DC), and 'heads' of functional departments such as the Executive Engineer and the Superintending Engineer are closely associated with some aspects of city administration. Various state-level agencies are responsible for some of the major infrastructure and service provisions of the city. The responsibility often is limited to the planning, designing and execution of projects, which are then transferred to the agencies directly responsible for the operation of infrastructure facilities.

4.4.3 Lake Restoration Initiatives by National Institute of Hydrology

The National Institute of Hydrology (NIH) of Roorkee who prepared a plan for the restoration of the lake, at an estimated cost of Rs 50 crore (about US \$ 10 million), sponsored by the Ministry of Environment and Forests, Government of India, who are also now guiding the restoration measures. The Conservation and Management Plan evolved by NIH is not only focused on the

lake itself but also proposes to tackle the immediate periphery of the lake which is a source of pollution. The restoration works that have been implemented or are in different stages of implementation include the following:

- Limnological measures such as controlled aeration of hypolimnetic water, siphoning of hypolimnetic water, biomanipulation and limited sediment removal from the deltas of drains, which lead to the lake.
- Soil Conservation & Slope Stabilization measures in the form of soil conservation and watershed management activities in the catchment area of the lake, slope stabilization, Drainage line treatment, landslide scars to be treated with Coir geotextiles with gabion cross-barriers and proper maintenance and cleaning of the drainage system
- Provide 100% coverage of the town surrounding the lake with sewers and Sewage Treatment Plants (STPs).
- Improved sanitation around the lake and in the catchment with new community toilets to cover all sections of the society, improved design of household toilets.
- Limited dredging of the lake, particularly near the deltas of drains that bring sediments.
- Fish (*Gambusia affinis*) introduced a few years ago to control mosquito larvae, the fish have started feeding on the larger zooplankton resulting due to scanty larvae population resulting in adverse impact on the lake water quality. This needs to be controlled by putting minnow traps in the lake.
- The outflow from the lake is into the Balia Nala drain controlled by a set of sluices located at the lake bridge. The sluices, which are old, need renovation and replacement. The Balia Nala also needs slope stabilization measures to check landslides
- Shoreline Development and improvement of facilities at all important monuments and temples located in the periphery of the lake and providing avenue paths and roads.
- Improved Public Awareness and Public Participation programmes.
- The “Nainital Jheel Parikshetra Vishesh Kshetra Vikas Pradhikaran” could function better in a limited role as a promoter and a facilitator for developmental and commercial activities with jurisdiction extended to cover all four lakes in the district, as at present a plethora of organizations are functioning in the notified area such as Nainital Nagar Palika Parishad, Jal Nigam, Irrigation Department, Power Corporation, Forest Department and Fisheries Department who are directly involved with the lake.

Figure 35: Mission Butterfly lake restoration project in Nainital



The Honorable Supreme Court of India in its judgment of 1995, in response to the Public Interest Litigation, gave the following recommendations, which have also been addressed in the restoration measures mentioned above.

1. Sewage water has to be prevented at any cost from entering the lake.
2. So far as the drains, which ultimately fall, in the lake are concerned, it has to be seen that building materials are not allowed to be heaped on the drains to prevent siltation of the lake.
3. Care has been taken to see that horse dung does not reach the lake. If for this purpose the horse stand has to be shifted somewhere, the same would be done. The authorities would examine whether trotting of horses around the lake is also required to be prevented.
4. Multi-storied group housing and commercial complexes have to be banned in the town area of Nainital. Building of small residential houses on flat areas could, however, be permitted;
5. The offence of illegal felling of trees is required to be made cognizable.
6. Vehicular traffic on the Mall has to be reduced. Heavy vehicles may not be permitted to ply on Mall;
7. The fragile nature of Ballia Ravine has to be taken care of. The cracks in the revetment of Ballia Nullah have to be repaired urgently.

4.4.5 Recent works of Lake Conservation Programme

The Lake Development Authority is a regulatory body and has had a number of successes in improving the quality of the environment of each of the lakes in the region. In 2003, DO levels was 9.5 mg/lit now it is 9.5 at top at 8.5 at bottom. Water transparency has also increased now to 2-3 meters. Water of the lakes had become dark due to low DO (dissolved oxygen) level; however Nainital Lake Conservation project was undertaken to clean the lakes' water and oxidize them.

The following main proposals are recommended by the lake conservation programme as part of the Phased Action Plan:

1. Reconstruction of road side surface masonry drains in damaged portions
2. Rehabilitation of existing main drains
3. Removal of obstruction from the drains
4. Slab culverts for internal roads
5. Precast covers over the drains
6. Construction of cross walls and catch-pits
7. Provision of fine screens with platforms for cleaning
8. Laying of under ground 450mm pipes in small lengths
9. Provision of manholes of 900mm or other openings where existing
10. Drains have been permanently covered other misc. works
11. Outfall structures

All these programs have been undertaken for the advantage of the people. Since Nainital is mainly a tourist spot, the tourism sector has become sufficiently important to the economy. According to an estimate, 42 million jobs (directly as well as indirectly) are presently generated by this sector. In the Lake districts of Uttarakhand, the lakes constitute the most important factor in attracting tourists and hence all effort has been directed towards their conservation and preservation. The different agencies have undertaken different policies and programs to directly preserve the lake and indirectly maintain the livelihood of the vast majority of the people who are dependent on these aquatic resources.

4.4.6 Impact of regulatory institutions on livelihoods

These multiple management institutions have a number of implications for local livelihoods. To pursue livelihood activities such as fishing and boating, or to run a hotel, restaurant or shop on the lakeside, it is first necessary to take a license, as suggested above. For example, as noted earlier, the Lake Development Authority (LDA) has banned Fishing in Nainital Lake. Almost 1.5 lakh fish has been fed in the lake water. Pant Nagar University collects the fishes from the lakes when they grow large in number, and instead they plant fish seeds for culture. The fisheries

department and Nainital Nagar Palika make rules on the quantities and species of fish which can be collected. In general people do not have any influence over the rule making process.

According to a LDA official, the different activities undertaken by them have actually benefitted the local people. Fishing has been banned but it has not totally affected the livelihood of the fishermen because here people are engaged in multiple livelihood options. Those who were engaged in fishing are also engaged in boating. So they are now earning income from boating. And with a rise in the number of tourists visiting Nainital every year, it is hopeful that this will lead to an increase in the livelihood options of the people. The regulations on livelihoods arguably are beneficial for poor households if they improve the environment of the lake and thus maintain the inflow of tourists.

Despite the efforts of the Government to work towards the betterment of the people, some respondents are not very satisfied with these works. From an interview on 11th March, 2011, a local person who is a boatman said that, “*The Government did not do any conservation effort, nothing at all.*”

4.4.7 Conflicts between stakeholders over Natural Resource Management

Even with the complex layers of management, overlooking the lake resources, there are a number of tensions between different stakeholders over the regulations managing the lake and its environs.

Firstly, Jal Sansthan was established in 1975. It was established to meet the need of drinking water in several villages of the hilly areas. The organization is supposed to pay a tax to the irrigation department; however there has been a long standing disagreement between these two organizations. The Jal Sansthan argues that they should not have to pay any form of Tax for water which should come free of cost.

Secondly, the fishermen complained that the government should do more to reduce harmful methods of fishing. Illegal fishing should also be prohibited; or else the fish population would dip beyond control. However it must be mentioned that these fishermen are not a part of any rule making group. There appears to be a conflict of interests between the rule making organizations and the people for whom the rules are being made. Hence greater participation of common people would be necessary in the management of biodiversity in these lakes without affecting the livelihood of the people.

Finally, the main livelihood activities of some people in these sites are rickshaw pulling. Their income is more or less the same throughout the year. It is not totally dependent on tourism since, during peak tourist season their incomes does not increase but rather decreases as the congestion on the road means it takes more time to travel. They are pursuing the same occupation over the

last 10 years. In the opinion of Nagar Palika rickshaw pulling activity is affecting the traffic situation. That is why; there is some limitation on the timing that the Rickshaw Pullers can operate. They stop Rickshaw Pulling from 6pm to 9pm during peak season time. However, this ban is impacting the livelihood activities of these people.

4.10 Gender relations

4.10.1 Gendered Division of Labour

It is crucial to understand not only how different wealth or occupational groups utilize aquatic resources, and the associated power relations, but also the divisions within the household unit itself. The most well documented axes of differentiation are that of gender. Local people reported that there is no significant division of labour between men and women. Nevertheless, we could observe some jobs which are primarily carried out by women and some other jobs which are done only by men. For example, collection of firewood, cooking and cleaning the house, collection of fodder for animals appeared to be primarily the job of girls and women (see Figure 36). Animal husbandry on the whole was mostly a female task. Men were mainly engaged in outside tasks such as boating, fishing, photography and car driving. The reason for this division of responsibility is a traditional one and occurs mainly because of the difference in instrumental and affective roles which are attributed to men and women. These instrumental roles are performed by men and affective roles by women and that is why, men participate in the roles of earning money and women are confined to roles of child bearing and rearing. However, this ideology has been changing in recent year and women do participate in different kind of roles but still in some activities, although this traditional division still persists.

Figure 36: Woman collecting Firewood in Karkotak village above Bhimtal Lake



Figure 37: Women play an important role in livestock raising



Although both men and women participate in agricultural activities, women have the double responsibility for much household works like cooking, cleaning, maintaining house, and looking after the babies. They also travel to the market to buy goods. They are also very hard working.

While men are often engaged earning cash income for the household, in a few instances they are reported to waste time and money playing cards, drinking and gambling.

Appropriate development plans must aim at improving women's status. The various developmental plans which are aimed towards an increase in the outside economic activities of the household have adversely affected the women by increasing their workload. This has resulted in an increase in the burden of women who have to do time consuming and strenuous works like fetching water from faraway places, collecting firewood as well as even other agricultural works as well as running businesses in the tourism. This indicates not only an inappropriate division of labour between male and female but also an unequal distribution of labour hours.

4.10.3 Changing Role of women

Despite persisting inequalities, on the whole the position of women has improved over the last generation. The primary development is the improvement of women's education status and literacy. Earlier they did not participate much in outside activities but now they are participating in different work activities outside home. There is more employment of women – particularly skilled employment example, with women working as a teacher, or in the local Integrated Child Development center. Women also have their own restaurants and small shops around the lakes. Also there are women who are teachers in schools and colleges. Women now are also found to have taken up jobs such as bus conductors which were traditionally the male domain. According to women in the Focus Group discussion, the numbers of women headed households are increasing in number. It was also found out from the Focus Group discussion that girl child is getting better education facilities nowadays. Women are also teaching their sons and daughters with great interest. The attitude of people has also changed over the time. According to a lecturer in Bhimtal, *“people of Uttarakhand believe that the education is the best dowry to a girl rather than gold or money”*.

Women's decision making power in the family has also improved. Now they can participate in decision making in their household. However, although marked improvements in the lives of women have been noticed in the urban areas; their situations have not changed as much in the villages and interior areas. The girls here are still not sent to schools; they work at home and are mostly uneducated. They get married at an early age of 15 or 16. Women in the village and interior areas still have comparatively limited sources of income and are relatively dependent upon their husbands.

Box text 2: Perception of gender inequality by local college lecturers

In a focus group study in Bhimtal, four women who are all college professors named, Mrs Pushpa Chandra, Mrs Sayra Ali, Mrs Manisha Joshi, Mrs Archana Verma participated. These women said that the conditions of women belonging to 85% of the families are very disheartening. However, they themselves belong to families where women are respected and their conditions are better. According to these professors, women here are more hard working. According to them, whereas men spend their time playing cards at home, drinking, gambling and all such activities, they also feel that women should be more aware themselves. Their thoughts should be changed. They should respect each other and that they should be united within themselves and then they can uplift their condition.

4.10.3 Importance of the lakes in the lives of men and women

Women are not involved in any type of fishing or boating related activities. It is considered a men's domain. In the Indian socio-cultural context, a woman does participate in activities outside the household in different capacities but certain activities are still dominated by men. Women do not as a livelihood option participate in fishing and boating in Uttarakhand. It also clear therefore that women benefit directly to far lesser extent than their male counterparts.

Nevertheless, women are dependent on the lakes indirectly as they are the main source of household drinking water that they are expected to provide. The lake water after being treated in the plant is supplied as drinking water. For the girls in Bilaspur Village in Pandeygaon the lake water is very important and they use water from canals. Drinking water is also brought from streams or hand pump. Similarly, women play a very important role in agriculture as their male counterparts are mainly engaged in other earning activities, so women has to look after the cultivation, which depends on irrigation water in Bhimtal and Naukuchiatal. In Bhimtal women also use the water channelled into the irrigation canals. Even then, they have to travel far to use this water

4.11 Age relations

4.11.1 Differentiation of livelihood activities (age)

Another important axes of differentiation within the household which is often overlooked is that of age. On a day to day basis, children contributed to household labour primarily through involvement in household reproductive tasks, especially when their parents were away, such as cleaning, cooking and fetching water Figure 38. They always wash their own clothes. These children did not have a personal source of income. If they needed money for anything they asked their parents. The boys in classes 5 to 7 for example help with household activities such as bringing in water, as well as activities such as selling milk and helping in the fields. In this work, their elder brothers or sisters often help them.

On the whole however, contributions to family labour by girls are generally a lot higher. The girls who are in primary classes are engaged in the usual daily works such as the filling up of water. This is a common task as very few households have their own hand pump. The rest of the households need to fill water from the canal for either household work or for drinking purpose. Although boys help with this, girls play a more significant role. The collection of firewood, one of the most time consuming tasks, is also primarily considered a girls task, often carried out with their mothers, particularly in more remote villages. Few young people get any money on behalf of the work, although they sometimes get some amount of pocket money which they spend in meeting their own personal need.

Young people rarely get paid for their work. They are helped by their younger and elder brothers or sisters in this works. However, they do get some pocket money if they go out with their friends or they get money to recharge their phones. (*Boys and Girls Focus Group, Bhimtal and Naukuchiatal, April 2010*)

4.11.2 Education

There appears to be a pattern whereby young people's role in day to day household livelihood activities would decrease as they got older with an increased emphasis on education. Education was also an important expenditure for all households. All household heads want their sons and daughters to receive proper education and also do some service jobs in future. Even poorer household members also try to spend as much money as possible for the education of the children. In the last few decades, literacy rates have increased considerably among the people in this region. The younger generations are more or less completely literate now.

Boys in particular were very ambitious and wanted to join the army, a very prestigious occupation. Education is an important factor in today's world so parents irrespective of being rich, medium and poor all want their children to be educated. There are far more opportunities for young people nowadays if they have an education, in both the government and in private firms. There has been an increase in the number of International schools and Institutes in these regions. After talking to many students we came to know that both boys and girls in general aspire to pursue higher studies and take up government jobs. Both boys and girls want to pursue their studies until graduation and appear for civil service exams. We interviewed a few girls who have come from Haldwani and Nainital to Bhimtal to pursue their doctorate degrees. With these degrees they can get well paid jobs as job opportunities are also on the rise.

Even from the poorer (coping) families they want their children to study at least until class 8 or 10 so that they can get a job in some office in some clerical positions. However, in poorer families even now, the emphasis is given more on the education of the boys than the girls; although this is slowly changing. Many of the young people aspire to leave the community to

work outside, although some did appreciate their community and wanted to seek skilled employment locally. Few foresee themselves becoming farmers.

For both boys and girls however, access to education does not automatically spell economic opportunity as the competition is increasing manifold. A case to be mentioned here is that of a boatman in Naukuchiatal. His son has done masters degree with 50% marks. But even after studying so much he has not got a good job. So he has started doing photography business. This has made some neighbours in the village doubtful about getting jobs after studying. (*General notes from discussion, Naukuchiatal*).

Furthermore, while the opening of schools and colleges has been a major development in the hills, the present education pattern which is focusing more on rote learning rather than understanding has resulted in a gap in the learning pattern of the youth. The problem of unemployment for the educated youth has also started to creep in this region. The educated unemployed have adopted professions in real estate and as contractors which has lead to over-exploitation of the natural resources. These educated groups are also taking up different other professions like photography and candle making shops.

It is important to note that although education is becoming increasingly important, children must still contribute to family labour, particularly for poorer households for whom it acts as an additional constraint on the education of the younger generation. Boys who are older in the classes 9 and 10 are mainly occupied with their studies and school, although they must combine this with work activities. After school, they either go for tuition or do homework at home. In the evening, they bring water for home or wood from the forests and then they play. Then after that, they study, watch TV, help others in household activities, have their dinner and sleep (see Boxed text 3). They also help their younger brothers or sisters with their studies or other household activities. If they have elder brothers or sisters, then they are helped by them. Nevertheless, studying appeared to play an increasingly important part in their lives, particularly in richer households.

The girls also consider that study is the most important task for them. They all aspire to do something meaningful in their future and want to be either doctors or engineers or do service and do not want to pursue the same occupation as their parents. Nevertheless, opportunities for girls to pursue their education are more limited than boys, particularly when they have a greater responsibility for household tasks such as collecting wood and water.

Figure 38: Young girl filling drinking water in Bhimtal



Figure 39: School Children in Bhimtal



Boxed text 3: Young people's day to day schedule

Rafiqul Islam is a student at a college in Haldwani and is engaged in both Boating and Fishing. His father is a driver who has his own vehicle. He does boating and fishing when his college is closed. He likes doing both studying and fishing and boating. He does the work as a supportive income for the family. His typical daily routine is as follows:

5am- Wakes up

6am- At Jheel for fishing

7am- Starts for college

1pm- Back from College

2pm-7pm- At Jheel side

8pm- At home

8.30pm- Studying

9pm- Dinner

9.30-10pm- Sleep

4.12 Non-use values, gender and age

It is important to note that a livelihood should not only offer economic security but overall wellbeing, including the fulfillment of non-economic aspirations. In focus groups, respondents were asked to rank different measures of wellbeing, including economic security, protection of traditional cultures and values, maintenance of good relations with family and friends and maintenance of good health. Economic security was given the most important place by women followed by maintaining good relations with others and good health and lastly following traditional culture and values. And in some other focus groups good health was ranked least important. The men also placed economic security as the most important factor, followed by maintenance of good health and good relations with others. The maintenance of traditional culture and values was placed last. According to a member in men's focus-group study, securing food is the most important objective for these men because only after that poor people like them could think about tradition and culture. The female respondents were also of the same opinion and they also placed economic security and good health as the most important factor.

Even when economic security was the first priority, the discussion above suggests that there are numerous non-economic considerations to bear in mind when assessing a households overall wellbeing. It is important also to note in this context, that aquatic ecosystems themselves do not only offer a source of livelihood security, but they also have 'non-use' cultural values attached to them. The people in the study villages said that the lake is like a lifeline for them as they are all dependent on the lake to some level. However, this is not only because these lakes provide job opportunities for the people but also because it is a visual attraction. Although women in

different villages may not be directly dependent on aquatic resources, they reported that they would feel sad if the lake was not there anymore as it is the main place of recreation for them. The children had similar views, stating that “*The lakes are eternal to them*”. These children had a rich knowledge of the lake and its history. They were able to tell us detailed narratives of the legends recalling how it was formed. This suggests that they have a cultural attachment to the lake as an important part of their daily lives. Students from larger urban centers such as Nainital itself and Haldwani visit the lakes also for picnics and other similar excursions.

Many spiritual and religious activities are performed around these lakes, as is evident from the large number of temples along the shores. However, most recreational activities such as boating, angling, and yachting are the domain of tourists. However, the research team did often observe local young boys and girls sitting beside the Bhimtal Lake to talk and pass the time. Sometimes the children would play in the lakeside park in Bhimtal and Naukuchiatal, but otherwise local people did not report using the lake for non-economic activities. Nevertheless, local people use the lake shore for leisure activities such as playing cards, as well as for day to day socializing (see Figure 40).

Figure 40: Boatmen playing cards at Bhimtal



Fishing is likely to have a recreational as well as financial aspect. Many of the local people who fish (primarily the Muslim community in Bhimtal) are not poor ‘coping’ households, but own other businesses. They often fish for just one or two hours a day, with only one man reportedly fishing all day every day. Since the income and time commitment is not significant, it is likely to

have a leisure aspect as well as offering households some cash. Boatmen in their focus group discussion noted that their livelihood activities also provide a means of recreation for them.

4.13 Ecological Knowledge, gender and age

4.13.1 Men's knowledge

Local people in Uttarakhand have a rich knowledge regarding the environment. However, there are differences according to the gender and age of respondents. Occupations such as boating and fishing are solely the domain of men. The boatmen and fishermen displayed a rich knowledge of how the environment is changing and which conditions were more prone to fluctuation. Most fishermen and boatmen have not taken any training but have learnt it from family, relatives and friends. Some have also learnt it through their experience. No proper training facilities exist for the fishermen or boatmen to learn fishing and boating techniques. People also learn from one another, discussing their occupation, environmental problems and other livelihood strategies with known people in their communities.

There are a number of further examples of ecological knowledge. Local boatmen in Nainital are aware of the depth of the lakes. As in Nainital, the boatmen said that near the boundaries of the lake the depth is less at around 70-80 ft but near the temple the depth is close to 250 ft. They also have a good knowledge inherited from their elders of the names of the different fishes for example, mahseer, rohu, nayan and silver carp. Associated with this is an awareness of the best times to catch fishes, and their availability. Respondents explained in detail how during winter because the surface water is cooler, the fishes move to the bottom layers as it is comparatively warmer. Thus fewer fishes are found there. Opposite to this, during summer, the surface is warmer, so the fishes move towards the surface that is the Epylimnion layer, so more fishes are found.

Other male respondents, such as rickshaw pullers and car drivers, did not have such a rich knowledge of the changing ecosystem, but were aware of the problems created by population and tourism pressure, and pollution from hotels and restaurants that release garbage into the water.

4.13.2 Women's knowledge

Clear confirmation was not available as to whether men or women possess more ecological knowledge. What did appear apparent was that women had a richer knowledge of agricultural and forest ecosystems than of the lakes, as they played a more important role in tasks such as cultivation and collection of firewood. Women in one focus group described how global warming had changed the cycle of the seasons. They felt that rainfall had recently become very

erratic, while the cold in winter as well as snowfall had decreased. All these have affected productivity in agriculture. Furthermore, they recalled how because of deforestation, land slides and soil erosion had increased. Although their knowledge of the lakes may be less than that of their male counterparts, they still displayed some knowledge of the degradation of the lake ecosystem.

4.13.3 Boys and Girls' knowledge

Children play a limited role in direct aquatic dependent activities such as fishing or boating. Nevertheless, they demonstrated some environmental knowledge and awareness that the lake had become a lot more polluted in recent years, particularly due to a landslide last monsoon which had brought a lot of dust and soil into the water. From a focus group with boys in Bhimtal, they recalled how lake water quality has deteriorated because of increased rainfall and run off from the lake surroundings, worsened by the indiscriminate felling of trees. If the lake water is regularly channelized through the dams then the polluted water could be removed. They reported how it was necessary to repair and maintain the dam as they felt it had not been constructed properly. Cracks could be seen which needed to be repaired otherwise it would not be able to take much pressure. The girls in another focus group noted how the lake water had changed its colour and was not as clear as before. They suggested that it is necessary to clean the lake water.

A noticeable phenomenon was that the knowledge the older generations possess is more diverse and practical than that of boys and girls. They are able to more clearly explain the environmental change and degradation that is occurring in the present times due to their practical experience as farmers, fishers and boatmen. On the other hand, the present generation is more aware of the remedies for environmental protection. This was primarily due to the higher level of education amongst the younger generation, particularly with regards to students in higher classes such as in classes 8 to 12. This may be because environmental studies form a part of their curriculum.

4.14 Ecosystem services

The human economy depends upon the services provided free by ecosystems. The concept of Ecosystem Services provides a useful framework to describe these benefits that people obtain from ecosystems and brings together the issues raised in this report:

Four main ecosystem services have been identified. Some of them outlined in the report so far are discussed briefly below, although for more detail, see the HighARCS Biodiversity Report for Nainital.

Provisioning services: The ecosystem provides various goods for example, genetic resources, food and fiber, and fresh water.

- The lake provides the main source of supply of water for domestic and other uses. Presently 12 electric pumping stations exist in the town through which about 4451920m³ of water is supplied to the town. This water meets the needs of over 5 Lakh people including locals and tourists.
- The lake supports the habitat for many fish species which have livelihood value. Ducks are also found in these lakes. Previously, the lake was known for its mahseer (tor tor) fish, which is rarely found nowadays due to pollution. At present, the mahseer species is being introduced on an experimental basis. If it is successful, then fishing can be an important source of livelihood for the small scale local fishermen and also may increase the revenue of municipality and the fisheries department.
- The lake offers numerous livelihood activities including boating, as well as the tourism related activities along its shore.
- The lake also acts as an educational resource by acting as a laboratory for various researchers, for example, in cold water fishery development.

Regulating services: The benefits obtained from the regulation of ecosystem processes, including, for example, the regulation of climate, water, and some human diseases.

- The lake is also important in regulating the micro climate of the region by release and uptake of heat. This climate is also an important attraction for the tourist to these places.

Cultural services: The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g. knowledge systems, social relations, and aesthetic values.

- The discussion on non-use values has suggested that the lake has a cultural, aesthetic, recreational and scenic value – ‘cultural services’.
- The religious and historic sites on the Nainital and Bhimtal lake shores suggest it also has a spiritual value. Every year, there takes place a Mela which is called the ‘Harela Mela’. It also attracts large number of tourists every year. Tourism supports the economy of this region.

Supporting services: Ecosystem services that are necessary for the production of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.

- The Nainital lake recharges the springs in nearby areas through which villagers also fulfill their water requirement.
- The lake can also be seen to support the rich biodiversity both in itself and in the catchment area.

The ecosystem services supplied annually to resource users in India are worth many crores of rupees. Economic development which leads to the clearing of forests for infrastructural

development, agricultural purpose's and over utilisation of environmental resources destroys habitats and impairs services which can create costs to humanity over the long term that may greatly exceed the short-term economic benefits of development. These include various imbalances in the environment such as, melting of glaciers due to global warming, the greenhouse effect which affects the environment and humans alike, and the degradation of environments with particular aesthetic and cultural value.

5. CONCLUSION

The scenic beauty of Nainital and the adjoining lakes of Bhimtal and Naukuchiatal attract many visitors. This has led to significant development of tourism and hence the most popular livelihood activities fall within this sector. Boating, agriculture and fishing (though restricted to some sites), hotels, restaurants, operation of small shops, labouring, photography, and rickshaw pulling are important livelihood options. Some activities such as boating, fishing, agriculture are directly dependent on aquatic resources. Hotels, resorts, restaurant owners are indirectly dependent; and activities such as car repairing, rickshaw pulling are not directly dependent on the lakes but are dependent on the tourism economy.

However, there are a number of livelihood challenges faced by local people. For those who are directly or indirectly dependent on the lakes there is seasonality of livelihoods due to the regions tourism based economy. Furthermore, the huge inflow of tourists offers many opportunities for the livelihood of the people, although it is creating pressure on the land as well as on environmental conditions and it is leading to an increase in construction activities.

There are also difference between households regarding the different ways in which they utilize aquatic resources, their degree of dependence on aquatic resources, the benefits which are acquired from these resources. There are three different categories of households: accumulating, subsistence and coping households. The people here pursue different types of activities, so there is no absolute dependence of one household on the other. Nevertheless, it is clear that households who are situated differently economically benefit in different ways from the lake. Richer household may employ labourers for agriculture, boating or fishing purposes and thus can 'accumulate' through utilizing the lake resources. For poorer households however, there are few sources of accumulation, although access to the lakeside economy for boating, labour or small scale trade is essential for their subsistence.

Livelihoods have been changing in recent years, with the decline of agriculture and an increase in land sales to outsiders. This over is likely to increase the number of 'poor' households dependent upon labour for their subsistence, while also undermining traditional support networks within communities. This is likely to increase the competition for jobs and may lead to further

livelihood insecurity in the long run. Although the increase in tourism may compensate in some ways, it is clear that this will increase the pressure on the lakeside environment. Another positive change over recent years has been the increased levels of education amongst the younger generation. While this has improved gender equality and has offered new livelihood opportunities, not all individuals are able to secure new employment, and it is evident that there are still significant livelihood challenges to be addressed in the year's ahead.

There are a number of key 'problems' identified by respondents that are worth considering at the end of this report before the preparation of action plans, although this list is by no means exhaustive. For women, the unstable climate and fluctuating agricultural yields was a major concern. The erratic rainfall was a particular important issue, along with the drinking water shortages in summer which oblige them to travel long distances. Women also complained about the absence of suitable marketing channels for selling handicrafts and other commodities, stating that the Nainital Nagar Palika is not cooperative and that it is difficult to secure a trading permit. A priority for men was that the downstream areas of the lake receive irrigation water from the lakes only, and a proper irrigation system should be developed for the upstream areas. Key problems raised by boatmen and fishermen included the seasonality of livelihoods, whereby in December and January it is very difficult to meet their subsistence needs. For the young boys and girls transportation is a major problem in their lives. They must travel to distant places for studying or to find reputed schools and colleges. The transport facility in Bhimtal or Naukuchiatal is not so developed also and fluctuates a lot. Furthermore, their travelling expenses become high.

For the maintenance and development of these regions it is necessary to develop an action plan which will be beneficial for both the conservation of biodiversity of the lakes as well as the livelihood of the local people. It is necessary to involve the local people in the decision making process so that they can identify their needs for their own betterment. At every step however, there is scope for governmental intervention either by formulating certain policies or by legislation that will be beneficial for all.

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Annexure:

Table 8: Number of Households belonging to the different wealth categories

Field Sites/ Wealth category	Accumulating	Subsistence	Coping
Nainital	3	8	19
Pandeygaon	3	22	6
Chanoti	8	17	5
Total	14	47	30

Source: Field interviews

N = 91

Table: 9 Comprehensive list of fishing and boating occupations in all the three field sites:

Number of households	Rich	Medium	Poor
Involved in fishing	2	2	2
Involved in boating	7	9	5
Having their own boat	7	8	-
More than one boat	4	1	-

Source: Field interviews

N = 91

Table 11: Changes in the number of boating licenses issued in Bhimtal

	2006-07	2007-08	2008-09	2009-2010	2010-2011
Shikara	-	-	-	-	1
Rowing boats	56	56	58	62	68
4 Seater Paddle Boats	-	-	-	-	-
2 Seater Paddle Boats	-	-	-	-	-
Kayak	-	-	-	-	-

Source: Department of Irrigation, Bhimtal

Table 12: Change in the boating licenses in Naukuchiyatal

	2006-07	2007-08	2008-09	2009-2010	2010-2011
Shikara	54	54	55	57	61
Rowing boats	2	2	2	1	1

4 Seater Paddle Boats	24	24	23	23	21
2 Seater Paddle Boats	15	15	15	13	17
Kayak	-	-	6	6	9

Source: Irrigation Department, Bhimtal

Table 13: Change in the boating licenses in Sattal

	2006-07	2007-08	2008-09	2009-2010	2010-2011
Shikara	-	1	-	-	-
Rowing boats	51	51	51	88	96
4 Seater Paddle Boats	27	27	33	39	42
2 Seater Paddle Boats	3	3	-	2	-
Kayak	8	8	16	16	16

Source: Irrigation Department, Bhimtal

Table 14: Licenses given to the boatmen

	2006-07	2007-08	2008-09	2009-2010	2010-2011
Bhimtal	40	40	41	42	44
Naukuchiatal	42	42	39	42	43
Sattal	66	66	72	82	84

Source: Irrigation Department, Bhimtal

Table 15: Activities which are pursued in Nainital

Direct Dependence on lake	Indirect Dependence on lake	Not Dependent on lake
Fishing	Business	Rickshaw driving
Fish culture	Car Rent	Construction labourers
Farming	Service	Teacher
Boating	Car Driving	Other Labourers (Construction)
Household Work	Photography	Army
		Students

Source: field interviews

Table 16: Activities which are pursued in Bhimtal:

Direct Dependence on lake	Indirect Dependence on lakes	Not Dependent on lakes
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Agriculture	Business	Service
Household Work	Boat repairing	Telephone booth
Labour (Fish and agriculture)	Resort manager	Property dealer
Boating	Driver	Works in hotel
Fishing		School store incharge
Pump maintenance work		School teacher
		Student

Table 17: Activities which are pursued in Chanoti village near Naukuchiatal

Direct Dependence on lake	Indirect Dependence on lakes	Not Dependent on lakes
Agriculture	Business	Service
Boating	Driver	University/clerical staff
Household Work	Resort owner	Army
Labourers (Fish and agriculture)	Restaurant	Students
Livestock Raising	Photography	Construction work
Horticulture	Horse Rider	