

TITLE	Specialist Report Sociology
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PROJECT NAME	Consulting Services for the Establishment and Monitoring of the Instream Flow Requirements for River Courses Downstream of LHWP Dams
REPORT STATUS	Final
REPORT NO	LHDA 648-F-08
DATE	20 12.1999

EXECUTIVE SUMMARY

This report presents the combined findings from the sociological pilot study and socio-economic survey of the Instream Flow Requirement (IFR) Study of LHWP-affected rivers. The pilot study was conducted with the aim of establishing the corridor of villages affected by reduced flows and impounding of reservoirs and of determining the important flow-dependent variables affecting people either socially or economically. The pilot study and subsequent deliberations resulted in the conclusion that households living within a 5 km corridor of the river were affected and should be included for further study. The socio-economic survey established the precise population figures within this corridor and quantified the use of riverine resources and services for specified time periods among the affected communities, thereby providing the basis for costing and compensation calculations by the economist.

The socio-economic survey operated within a corridor of 5 km on both sides of the LHWP-affected rivers (Matsoku, Malibamatso, Senqu and Senqunyane Rivers). The **total population** (1999) within this corridor was calculated to be **154,587 (32,682 households)**. The main method used in the socio-economic survey was a household questionnaire applied to a sample size of 1,680 household interviews, distributed over 32 clusters and the eight IFR river sections. The main findings are briefly presented below:

- **Reeds** within the riparian zone are harvested by a total of 6,713 households (20.8%). These households collect a mean of 2.2 bundles annually, the mean market value being 10.3 Maloti per bundle.
- **Thatch grasses** within the riparian zone are harvested by a total of 7,972 households (24.7%). These households collect a mean of 6.5 bundles annually, the mean market value being 7.3 Maloti per bundle.
- The **crafts grass *leloli*** from the riparian zone is harvested by a total of 5487 households (17.0%). These households harvest a mean of 4.2 bundles annually, the mean market value being 12.1 Maloti per bundle.
- **Wild vegetables** from the riparian zone are harvested by a total of 13,911 households (43.1%). These households harvest a mean of 148 plastic bags annually, the mean market value being 2.08 Maloti per plastic bag.
- **Shrubs and debris** from the riparian zone are collected by a total of 15,170 households (47%). These households collect a mean of 190 bundles annually, the mean market value being 6.7 Maloti per bundle / headload.
- **Trees** from the riparian zone are harvested by a total of 7,327 households (22.7%). These households harvest a mean of 5.5 willow trees annually, the mean market value being 28.9 Maloti per willow. They also harvest a mean of 14.6 poplar trees annually, the mean market value being 16.1 Maloti per poplar.
- **Medicinal plants**, for curing humans and animals, are collected from the riparian zone by a total of 6,391 households (19.8%). They collect in different units such as handfuls, plastic bags and roots, the mean market value being approximately 48.1 Maloti annually per household.
- A total of 4,131 households (12.8%) own **fields** that are partly situated within the riparian zone. The mean annual cereal harvest per household on the field portion within the riparian zone is 155 kgs. A total of 438 households (10.6% of those owning fields within the riparian zone) harvest a mean of 30 kgs of pulses annually from the riparian zone.
- **Fish** is caught by a total of 5,098 households (15.6%). The annual mean catches of these households are 17.5 kg of Smallmouth Yellowfish (Chelefisi), 2.2 kg of Rock Catfish (Ramahetlana) and 3.0 kg of Rainbow Trout (Sekhoa). The approximate market value of fish is 10 Maloti per kg.

- **Sand mining** for private and commercial purposes is done by a total of 3,039 households. They reported their harvests in different units such as buckets, bakkies, trucks, 50-kg bags, etc. The mean annual market value per household for this activity is 383.9 Maloti.
- **Baptism** in the river is done by a total of 4,085 households (12.5%).
- **Leisure** activities are conducted by a total of 10,426 households (31.9%).
- **Casual drinking** from the river is done by a total of 17,354 households. On average, these households drink from the river 16.1 times per month during the summer and 8.9 times per month during the winter.
- A total of 359 households (1.1%) draw **water for domestic purposes from the river all year**. The majority of these households (210) are to be found along the upper Senqunyane River, downstream of Mohale Dam.
- A total of 2,026 households (6.2%) draw **water for domestic purposes from the river during the dry season**. The majority of these households (1,512) are to be found in the Lowlands along the lower Senqu River.
- A total of 5,360 households (16.4%) draw **water for domestic purposes from the river during severe drought**. The majority of these households (4,206) are to be found in the Lowlands along the lower Senqu River.
- A total of 20,426 households (62.5%) own **animals**. The mean animal numbers per household for the entire population in the 5 km corridor are 2.1 cattle, 2.4 sheep, 4.0 goats, 0.7 equines, 1.6 fowls and 0.1 pigs. A total of 6,434 households (31.5% of all animal owners) are dependent on the river for watering their animals during the dry season. A total of 11,439 households (56% of all animal owners) are dependent on the river for watering their animals in cases of severe drought.

The **remaining aspects** of river utilisation such as various flow regimes, washing clothes, personal hygiene, hunting, traditional healers, river snakes, other rituals and tourism were handled on an exclusively qualitative basis.

The significance of **distance** to, and **altitude** above, the river within the 5 km corridor is more relevant for resources such as wild vegetables and shrubs, that are harvested on a frequent and regular basis, than for resources that are harvested on an occasional or annual basis.

River utilisation is clearly linked to **gender** and **household size** in that large de-facto male-headed households are more likely to use the river than small female-headed households.

As may be seen, aquatic and riverine resources play a significant role in supporting the various rural livelihood systems of communities living along LHWP-affected rivers. It is obvious that a reduction in availability of these riverine resources translates more directly into the household economics of the poor and destitute than into those who are better off.

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LIST OF ABBREVIATIONS

BOS	Bureau of Statistics
CI	Chief Interview
EA	Enumeration Area used by the Lesotho Bureau of Statistics
HH	Household
HHI	Household Interview
IFR	Instream Flow Requirements. This refers to the magnitude, duration, timing and frequency of flows required to facilitate maintenance of a riverine ecosystem in some pre-determined condition
LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project.
PRA	Participatory Rural Appraisal. This refers to a particular tool-set of development-related social research.
SRUI	Specific River Users Interview
VDC	Village Development Committee

PART 1: INTRODUCTION**1 INTRODUCTION**

This report presents findings from the sociological component of the Instream Flow Requirement (IFR) Study of Lesotho Highlands Water Project (LHWP)-affected rivers. It is a direct continuation of the pilot study report. Since not all readers will be familiar with the findings of the pilot study, most of it is included in the present document, albeit in a modified order. In other words, the present report forms a combination and synthesis of the findings of phase one and two. It thus represents the efforts of eight months of social research, including three months of quantitative and qualitative fieldwork along LHWP-affected rivers.

Broadly stated, the objectives of the IFR-study are to assess the long-term impacts of a modified flow regime and to determine the Instream Flow requirements for the Rivers Senqu, Senqunyane, Malibamatso and Matsoku. This is in order to sustain the ecosystems, aquatic habitats and socially significant riverine resources at a predetermined state after construction of the various components of the LHWP. The report also includes recommendations for mitigation and compensation measures.

The contract for the consulting services for the Establishment and Monitoring of Instream Flow requirements for River Courses downstream of LHWP Dams was awarded to "Metsi Consultants", a joint venture between Southern Waters of South Africa (SW) and SMEC International of Australia (SMEC), by the Lesotho Highlands Development Authority (LHDA). The contract for sub-consulting services for the Sociology Component of the IFR-study was awarded to "Sechaba Consultants" of Lesotho.

The overall methodology used to assess the Instream Flow requirements for the study rivers is DRIFT (Downstream Response to Imposed Flow Transformations). The details of the methodology are presented in Task 2 Report Series - Report 648-10: Introduction and IFR process. The entire IFR process is based on eight river-sections as shown in Table 5.1.

The present report is organised in the following manner:

- Chapter Two presents the detailed objectives of both pilot study and socio-economic survey;
- Chapter Three sets out to outline the major elements of the methodology, outputs, findings and implications of the pilot study;
- Chapter Four conceptualises the corridor of river users;
- Chapter Five presents the statistical population of river communities used for Phase 2;
- Chapter Six gives an account of sampling considerations and procedures applied during Phase 2;
- Chapter Seven presents the complete range of tools used in Phase 2;
- Chapter Eight contains a comprehensive (qualitative and quantitative) presentation of the findings of all aspects of river utilisation, which were included in Phase 2;
- Chapter Nine outlines the research findings from groups of specific river users;
- Chapter Ten provides a qualitative background on those aspects of river utilisation, which were not included in Phase 2;
- Chapter Eleven quantifies the significance of altitude and distance in relation to river utilisation;
- Chapter Twelve attempts to analyse river utilisation in relation to certain poverty indicators among the population at risk;

PART 2: OBJECTIVES**2 OBJECTIVES OF THE SOCIO-ECONOMIC STUDY**

The overall objectives of the socio-economic study are to:

- identify those components of the riverine ecosystem which are used by people that will be affected by reduced flows;
- quantify them in terms of loss or gain to enable their costing by the economist;
- provide the basis for costing compensation and mitigation.

It was agreed that these objectives would be achieved in two phases. Phase 1 of the study would help identify the way in which rivers downstream of LHWP Dams are used. Phase 2, a socio-economic survey would help in quantifying those components of the pilot study identified as being important.

Phase 1 was designed as a pilot study in order to focus on the role LHWP-affected rivers play in the lives of the people who live along them, as well as on the anticipated effects of reduced flow regimes on riverine populations.

The **specific objectives expected from the pilot study** were to:

- establish the corridor of villages affected by reduced flows and impoundment of reservoirs, and recommend a reasonable distance from the river, as well as gradient and other factors affecting the use of the river, and specific reaches within which detailed surveys would be conducted;

- determine the important flow-dependent variables affecting people either economically or socially, to be included in the full survey and passed on to the ecologists for full consideration and;
- establish the degree of importance of all flow-dependent variables in people's lives.

Phase 2 was designed to specify and quantify usage of riparian resources as identified during Phase 1 among a precisely defined population of river users. River-related aspects of public and animal health were also to be addressed.

The **specific objectives expected by Phase 2 of the socio-economic study** were to:

- determine the precise figures for the population affected by modified flow regimes in LHWP-affected rivers and stratify those into the eight IFR river sections;
- quantify the use of riverine resources for specific time periods among the affected communities;
- specify the implications of modified flow regimes on the topics of public and animal health;
- provide the basis for costing and compensation calculations by the economist;
- describe anticipated social and economic consequences on the basis of quantified resource utilisation among the communities along LHWP-affected rivers as well as on the 32 scenario sheets from the biophysical IFR team

PART 3: THE PILOT STUDY**3 THE PILOT STUDY****3.1 OBJECTIVES, METHODS AND OUTPUT OF THE PILOT STUDY**

The pilot study was designed as an open-ended, anthropological and participatory exercise whose overall objective was to determine the roles LHWP-affected rivers play in the lives of the people who live along them. Anticipated effects of reduced flow regimes on riverine populations were an integrated part of this study, inasmuch as it was necessary to focus on those river-related components which are clearly flow-related and would thus be a part of Phase 2.

The pilot study was conducted over a period of six weeks (November/December 1998) at eight pilot-sites along all LHWP-affected rivers. The team consisted of one team leader and five research assistants, all recruited from Sechaba Consultants.

By far the most dominant method of data collection was the structured and open-ended interview with individuals and small groups. Large groups were avoided, as these tend to be too time-consuming and dominated by a few individuals. As the overall number of topics was too extensive to be covered by every informant or group, the interview usually concentrated on selected areas of interest and relevance, depending on the site and the informant. This interview form was supplemented by other PRA (Participatory Rural Appraisal) methods, such as:

- elite interviews with specialists in certain areas;
- two types of river transect walks;
- completion of river utilisation maps;
- river profiles;
- river utilisation calendars;
- photography.

One River Transect Walk concentrated on herbs and plants and was usually conducted by two researchers and a local herbalist. The other river walk was only practised in the Highland sites and concentrated on fishing and other issues of interest and was conducted by two researchers and a local fisherman. Finding a knowledgeable fisherman in the lower Senqu River valley became a problem, with the result that at Sites 6 to 8,

these walks were replaced by spending time with herdboys along the river.

The above-described methodology proved to be appropriate for the pilot study. The participatory and qualitative manner in which the research was conducted ensured that the collected data reflected the villagers' point of view and not the pre-defined answer categories of the social scientist in Maseru. Consequently, the Phase 2 socio-economic survey was based on categories and principles that made sense to the communities along LHWP-affected rivers.

The objectives of the pilot study were clearly met and are presented in more detail in the relevant chapters:

- the corridor of river utilisation was conceptualised and described (see chapter four), thus forming the basis for Phase 2 survey and making it possible to establish the statistical population;
- all relevant flow-dependent variables of river utilisation in the various ecological zones were recognised and described (see chapter eight, nine and ten). This qualitative information formed the foundation of tool development for the Phase 2 survey.
- The degree of importance of all flow dependent variables determined and, in co-operation with the other members of the social part of the IFR-team, shaped the final design of the Phase 2 methodology.

All qualitative information obtained through the pilot study which is relevant for the particular element of river utilisation, is presented during the relevant sections of chapter eight, nine and ten.

3.2 CONCEPTUAL OUTPUT OF THE PILOT STUDY / RIVER THEORY

This section attempts to conceptualise the overall findings of the pilot study into a 'river theory'. To begin with, the factors that determine river utilisation and flow dependency are presented and discussed, followed by a presentation of the 'river theory' as a model to predict river utilisation and flow dependency. The concepts

that are discussed are not only crucial if one is to grasp the nature of communities' interaction with rivers as well as their flow dependency, but were central to the tool development of Phase 2, and thus the link to the overall IFR process.

3.2.1 Factors determining the river utilisation and flow dependency of riverine populations

a) Water needs and availability

River use is, to a large extent, determined by the availability of other sources of water. An average household in the rural areas uses one 20-litre bucket of water for 1 - 3 household members on a daily basis. Where the water comes from depends on the available sources. Many villages in the mountains have gravity fed village water supply systems with water storage tanks and taps in the village. Others have springs or tributaries with various water qualities. Towards the Lowlands, boreholes and pumps become more frequent. As long as these water sources are reliable, easy to operate and within a reasonable distance from the household, they are generally preferred to the river. River water tastes muddier and is usually further away than the other sources. The reliability of these water sources varies greatly according to the site. Many villages complain about problematic water systems, depending on springs and boreholes that dry up during the dry season. Water sources can also change over time, meaning that a spring can become more unreliable. Another factor that influences water supply systems is very low temperatures, making pipes freeze during the winter months. These factors can make villagers rely on the river as the primary source of water for household consumption. A strong, reliable and easily accessible tributary can make many villagers virtually independent of the main river as these can be used for the majority of forms of river utilisation.

b) Availability of - and need for - riverine resources

Naturally, the need for - and use of - resources from the riparian area determines the way the river is used and consequently the flow-dependency of riverine populations. A surplus of a given resource can be sold, bartered or given away. The lack of a necessary resource has to be compensated for by something different. The flow-dependent variables that are frequently the subject of commercial transactions are: thatch grass, vegetables, reeds, *leloli* (crafts grass), firewood, herbs and fish. The degree of reliance on

natural resources in general largely defines how riverine resources are utilised. 'Townish' people from bigger settlements such as Marakabei, Ha Sekake, Mt. Moroosi or Thaba Tseka are far less dependent on riverine resources and consequently, the flow level of the river.

c) Topography between village and river

River use is determined by the topography between the village and the river. Very deep and steep river valleys do not permit any form of crop farming and can only be used for grazing and the collection of wild herbs and vegetables. The wider valleys of the foothills and Lowlands are characterised by areas next to the river that are suitable for crop farming. In cases where there are many fields along the river, people tend to spend a lot of time along the rivers and to use them in other ways.

The topography also affects the accessibility of the river. Elderly women especially are often too weak to climb down to the river. In many cases, the villages are located more than 400 meters higher than the river itself. If the path is steep and slippery, access to and from the river can be a strenuous affair. However, apart from elderly people, even long and tough walks cannot prevent villagers from using the river resources that are available. An analysis of the effects of distance and altitude on river usage is presented in a quantified form in Chapter 11.

d) Nature of river

The river itself is another significant factor determining river utilisation. A deep and rapidly flowing river with big differences between the low water level and the various flood levels has a different riparian area than a more stable and slow flowing river section. The problem of crossing is largely determined by the nature of the river itself. Another factor is the bend of the river and where the bend is located in relation to the village. The outer side of the bend tends to be fast flowing, deep and carrying certain resources while the inner side of the bend is characterised by a slow flow, shallow water and other resources. Factors like the steepness of the banks, the availability of sandbanks, the water quality itself and the nature of floods and droughts all determine how the river can be - and is - used.

e) River infrastructure

River infrastructure is important to consider if one is to understand the nature of river use and flow dependency along the LHWP-affected rivers. Roads down to the river allow certain activities such as sand mining and brick

making. Bridges are even more important in that they entail a road down to the river (except in the case of footbridges) and in that they eliminate the crossing problem. A bridge can change the picture of river utilisation and flow dependency significantly. However, since most settlements along the LHWP-affected rivers have neither a road down to the river nor a bridge, the overall situation concerning this infrastructure should rather be understood in the context of a lack of it.

f) Culture, mentality and customs

Although societies evolve in response to their physical surroundings, cultural systems of meaning determine how these are used. The factor of culture appears to be crucial in grasping how rivers in Lesotho are used. The issues of ceremonies, river snakes, various forms of leisure, sense of beauty and the use of herbs and animals for medicinal purposes are, to a large extent, based on the norms, customs and beliefs of the Basotho nation. The whole issue of stock raising and the significance of animals to the Basotho has cultural dimensions as well as those of subsistence. Because income level and 'way of life' largely determine river utilisation and flow-dependency, it generally makes a large difference whether people live in a bigger settlement or in a remote village.

g) Crossing needs and movements of people

Unless there is a road on both sides of the river (only the case along the lower Senqu) there is always a 'right' side

of the river and a 'wrong' side of the river. Services such as schools, clinics, shops, mills, woolsheds etc. tend to be on the road side of the river. Consequently, the river has to be crossed by villagers from the "wrong" side on a regular basis. People on the "right" side however also have to cross the river in order to visit their relatives. These conditions can cause various problems for the affected people. Villagers suffer severe shortages because they cannot go shopping; people die because they cannot go to the clinic; shop owners lose out income because their customers cannot visit the shop; children cannot pass their exams etc. People who cross the river frequently also tend to use various river resources when they happen to be down at the river.

h) Forms of rural livelihood

The dominant forms of rural livelihood along the LHWP-affected rivers are dryland cropping and cattle farming, which are supplemented by incomes from migrant workers. Depending on the location, these two activities can be more or less river-related. Another activity that is river-related (but rarely practised) along the river is vegetable gardening. Fishing, hunting, crafting *leloli* products etc. are other forms of rural livelihood that determine river utilisation and flow-dependency.

Table 3.1 shows the factors of river utilisation and flow dependency in the study area.

Table 3.1 Factors increasing or decreasing river utilisation and flow dependency.

Increasing factors	Decreasing factors
Lack of reliable alternative water source	Presence of water source other than river
Lack of reliable tributary	Presence of reliable tributary
Shallow slope	Lack / availability of roads and bridges
Lack of infrastructure, services and jobs	Steep slope
Lack / Availability of roads and bridges	Lack of riverine resources
Availability of / need for riverine resources	Availability of alternative resources
High dependency on natural resources	Low degree of reliance on rural livelihoods
Frequent needs for crossing	No needs for crossing
Lack of alternative resources	

PART 4: SURVEY AREA / CORRIDOR CONCEPTUALISATION

4 SURVEY AREA / CORRIDOR CONCEPTUALISATION

Much discussion has gone into the question of how the corridor of river usage and flow level dependency can be grasped and used to form the base for Phase 2 of the socio-economic IFR-study. Since Phase 2 consisted of a quantitative exercise and had to link up with the overall IFR process, the precise number and demographic structure of 'river users' had to be determined.

The results of the pilot study convinced the consultant that the corridor-question has to be approached as an issue of property and politics, as well as one of geography and topography. In order to understand the issue fully, one has to differentiate between '**free resources**' and '**controlled resources**'. In fact, as resources in general are scarce throughout Lesotho, the chiefs responsible for the resources derived from rivers and riparian areas control them tightly. The area that belongs to a particular village, and is thus under the jurisdiction of the local chief, is fairly precisely demarcated. Consequently, the river stretch belonging to this particular village is equally clear. Usually the river itself forms the border to the village across the river, but there are exceptions to that rule. Every person living in a village that controls a certain section of the river, has the right of access to those resources that are controlled by the local chief (except herbs, for which a license is needed from the principal chief in some cases). Whether

and how the entitled population actually uses all available riverine resources depends on a variety of factors such as distance from and/or altitude above the river. What is crucial to note here is that a precisely defined population owns controlled riverine resources collectively. Thus, whilst the resources can be used, bartered, sold commercially, given away etc., the economic value remains in the hands of the entitled population.

Free resources are open to everyone who wishes to use them, although in some cases formal permission is needed from the chief (e.g. for the conduct of ceremonies). Given their geographical proximity, it is natural that the majority of the users of free resources are from villages next to the rivers. However, depending on the type of resource, the season and the availability of alternative resources, the size of the corridor varies widely.

Although there are minor variations, there seems to be general agreement on which resources are controlled and which are free, throughout the studied sites along LHWP-affected rivers.

Without claiming to be 100% accurate, a list of the major flow-dependent variables, which has been divided into controlled and free resources, may be seen in Table 4.1.

Table 4.1 Controlled and free resources in and along LHWP-affected rivers:

Controlled resources	Free Resources
Shrubs	Water for Domestic Uses
Trees	Watering Animals
Grazing	Fishing
Vegetables	Sand
Herbs	Washing
Reeds	Ceremonies
Thatch grasses	Leisure
<i>Leloli</i>	
Fields within Riparian Zone	

Sand mining needs permission in theory, but in practice people mine without it in most places. Miners from Qacha's Nek report to pay fees to the local chief at the sand mining site. **Vegetables and herbs** were also mentioned as free resources in a few cases (not everybody is precisely aware of what resources are free and controlled). **Forests** are often privately owned and sold commercially.

It appears that controlled resources are those which are clearly limited in their extent, while resources are characterised as free when they are abundant.

The main implication of these findings is that Phase 2 has to operate with three types of corridors: **a 5 km corridor, primary corridor and secondary corridor.**

The **5 km corridor** demarcates the corridor of river users in a geographic way by claiming that the maximum distance people cover in order to reach the river for harvesting certain riparian resources is 5 km.

Originally it was anticipated that a 1-km corridor should be used for the socio-economic survey of Phase 2. However, the pilot study has shown that the river has significance to villagers far beyond the 1-km corridor.

The new **5 km variable** derives from observations during the pilot study, which show that villagers living that far away from the river still utilise the river, amongst other things, for animal watering during the dry season. Further consultations with the IFR animal health specialists confirmed that 5 km is the maximum distance villagers would comfortably be able to cover on one day with their livestock. Since animal watering is the most important form of river usage for villagers from more distant locations, it was deemed necessary to widen the corridor to 5 km on both sides of the river. The

population living within the 5 km corridor thus constitutes the maximum number of river users of both free and controlled resources.

The 5 km corridor needs to be separated into a **primary corridor** and a **secondary corridor**. The **primary corridor** consists of all villages which fall into the 5 km corridor **and** which have the right of access to controlled riverine resources. The primary corridor is demarcated by political village boundaries. Hence, it cannot be determined by a desk study on maps, but has to be determined by empirical evidence, *i.e.* interviews with the responsible chiefs, as there is no available map in the country showing boundaries between villages, many of which are disputed. Ideally the data collection teams would have to visit every single chieftaincy along LHWP-affected rivers. As this was logistically impossible within the proposed budget and time frame of Phase 2, it was decided that chief interviews determining the primary corridor would be conducted in as many sites as possible. The aim is to get an overall picture of resource administration along all eight sections of LHWP-affected rivers. The **secondary corridor** is made up of all the villages which fall into the 5 km corridor but which have no access to controlled riverine resources.

In practice, it appears that in most areas, all villages within the 5 km corridor have the right of access to controlled riverine resources. In these cases, no secondary corridor exists within the 5 km corridor. If Phase 2 had operated within, for example a 10 km corridor, the secondary corridor would have been much more significant. In retrospect, it was noticed that, due to the topography of river valleys in Lesotho, not many settlements are located outside the 5 km corridor (except along the lower Senqu River, where the valley widens out).

PART 5: RIVER USERS

5 THE STATISTICAL POPULATION OF RIVER USERS

Using the corridors described in the previous chapter, it was possible to calculate the population of river users through a combination of field and desk studies. Due to the overall structure of the entire IFR process of stratifying LHWP-affected rivers into eight river sections, the population figures for the various corridors had to be further stratified into eight strata. In other words, population counts had to be conducted separately for each IFR river section. Each IFR river section constitutes one stratum.

Since the **overall** population of river users is geographically defined by the 5 km corridor, the population count of this group was done as a desk study in the following way:

- a set of 1:50 000 maps covering all sections of LHWP-affected rivers was procured from the Government Lands and Survey Department in Maseru;
- a 5 km corridor on both sides of the Senqu, Senqunyane, Malibatso and Matsoku Rivers, beginning at the Mohale Construction Site, Katse Dam and Matsoku Diversion Weir and ending at the exit of the Senqu River into the Republic of South Africa, was drawn onto the maps;
- lines showing the boundaries between the eight IFR river sections were added;
- using the Constituency based maps of the Lesotho Bureau of Statistics (BOS), the Enumeration Areas (EA), Enumeration Area Numbers and updated village names used in the 1996 Census of the BOS within the 5 km corridor, were demarcated on the maps;
- all EA numbers and villages were marked in the 1996 Census village population list of the BOS and entered into a spreadsheet;
- populations for the entire 5 km corridor and the eight IFR river sections were calculated and adjusted to take into account population growth and undercounting during the 1996 Census;
- although located right on the edge of the 5 km zone,

- the population of Moyeni town (District Headquarter of Outhing) was excluded from the population count. The high degree of urbanisation, paired with the distance from the river means that the Senqu River has little significance for the livelihoods of Moyeni's inhabitants;
- the populations within the primary and secondary corridor were determined from empirical evidence gathered in the field on the basis of village boundaries. Since the survey did not cover the entire length of the LHWP-affected rivers, the numbers for primary and secondary corridor are less certain than the 5 km corridor population numbers. It was assumed that an overall proportion between the primary and secondary corridors would emerge out of the field data.
- the final calculation of population numbers within the primary corridor for every IFR river section was conducted according to the following formula: 5 km population number minus secondary corridor population equals primary corridor population.

As may be seen in Table 5.1, the overall significance of the secondary corridor is negligible. In IFR River Sections 2 and 4, no secondary corridor was determined in the field. IFR River Section 6 has more secondary corridor because the valley widens out, which permits a more equal distribution of villages within the 5 km corridor. IFR River Section 7 equally has more secondary corridor, which, in this case, is to be explained by the narrowness of the river valley. Village boundaries are frequently to be found along the tops of ridges. Since the distance from the Senqunyane River to the next ridge is less than 5 km in many places, more secondary corridor 'pockets' occur along the upper Senqunyane River.

The implication for the determination of the economic value of river-use is that 'free' resources have to be calculated in relation to the number of households within the 5 km corridor, whilst 'controlled' resources are to be calculated in relation to the number of households within the primary corridor only.

Table 5.1 5 km, primary and secondary corridor population figures.

IFR No	River section by name	1999 population figures	No of HHs in 5 km corridor	Primary corridor population	No of HHs in primary corridor	Secondary corridor population
1	Matsoku River between Weir and Malibatso confl.	7 462	1 578	7 138	1 509	324
2	Malibatso River between Katse Dam and Matsoku confl.	2 879	609	2 879	609	0
3	Malibatso River between Matsoku confl. and Senqu River	15 367	3 249	15 343	3 244	24
4	Senqu River between Malibatso and Tsoelike River conflu.	26 719	5 649	26 719	5 649	0
5	Senqu River between Tsoelike and Senqunyane River conflu.	27 749	5 867	27 595	5 834	154
6	Senqu River between Senqunyane River confl. and RSA border	60 104	12 707	59 363	12 550	741
7	Senqunyane River between Mohale Dam and Lesobeng River confl.	10 819	2 287	10 306	2 179	513
8	Senqunyane River between Lesobeng and Senqu River conflu.	3 488	737	3 321	702	167
	TOTAL	15 587	32 682	152 664	32 276	1 923

PART 6: SAMPLING**6 SAMPLING CONSIDERATIONS AND PROCEDURES**

The overall considerations and assumptions, which guided the development of the sample size and sampling procedure, are described below:

First, the sample size within each strata (IFR river section) would not be based on a percentage of the overall population, but rather on an adequate number of responses in each strata in order to represent an indefinitely large population. The main objective would be to get enough responses to account for an anticipated percentage of users of a certain resource (e.g. if only 20% of community members use reeds, there would be a need to interview five community members in order to get one response on reeds) and to get enough responses to allow for analyses in a cross-tabulation.

Second, it was assumed that the above mentioned cross-tabulation would not need more than two times three cells (e.g. yes or no answers analysed by three independent variables (e.g. income status, family structure, distance from river, etc.). In such a cross-tabulation it is statistically prudent not to drop below seven responses (on average) per cell to maintain the validity of chi-square tests.

Third, the final calculation of the number of responses per strata would be as described below:

- **7 (minimum response per variable) times 6 (cross tabulation: 2 times 3) = 42.**

This number (42 responses per stratum) would be sufficient, if 100% of community members use e.g. reeds. However, it was anticipated that only 20% would use reeds, making it necessary for the minimum number to be multiplied by 5 (because five people would need to be interviewed in order to get one response). Since cross-tabulations were only done on an overall basis *i.e.*, they were not stratified, mean usage rates lower than 20% did

not undermine the statistical reliability of the results.

- **42 times 5 = 210 responses per stratum.**

Thus, 210 responses per stratum are necessary in order to get a statistically reliable result for the kind of analyses we aim to do.

- **210 responses per stratum times 8 strata = 1680 responses in total.**

The next step was to determine the number of clusters per stratum. A cluster constitutes an area within which responses are collected. The 210 responses per stratum had to be spread out sufficiently in order to avoid the so-called "neighbourhood syndrome" (the more clusters, the less the neighbourhood syndrome). Based on pilot study experience, it was assumed that four clusters in each stratum would give the necessary ecological and demographic diversity within a particular stratum. Four clusters were furthermore considered feasible in terms of the transport costs and the time frame of the Phase 2 socio-economic survey. Consequently the number of responses per stratum was divided by four in order to get the number of responses per cluster.

- **210 divided by 4 = 52.5 responses per cluster.**

In order to be on the safe side (and because one cannot make 0.5 interviews) it was decided to adjust that number from 52.5 to 54. Thus, the final number of responses per cluster is 54. In other words, a minimum of 54 household interviews had to be conducted within each cluster. The mean number of villages per cluster is 4.4, meaning that an average of 12.3 household interviews were conducted in each village visited.

The final distribution of clusters and the number of responses per stratum are shown in Table 6.1.

Table 6.1 Distribution of clusters and responses for Phase 2 household survey.

IFR	1	2	3	4	5	6	7	8	Total
Clusters	4	4	4	4	4	4	4	4	32
Responses	210	210	210	210	210	210	210	210	1680

Relating the precise population sizes per stratum to the generated results was done during the analyses. The data were weighted according to the population number per stratum in order to get an accurate picture of the situation for all eight strata as well as for the total population along LHWP-affected rivers within the above-described 5km, primary and secondary corridors.

Having determined the number of clusters per stratum, the next step was to choose the clusters on a random basis. This was done on the basis of Enumeration Areas on the Bureau of Statistics 1996 Census maps. The overall number of Enumeration Areas was divided by the number of clusters needed with the result that, for e.g. every fifth Enumeration Area was chosen as a cluster starting point. The starting point for counting was then chosen randomly (1 out of 5 randomly) and the clusters were marked on the map.

An average Enumeration Area has over 510 inhabitants, which was deemed sufficient for conducting 54 household interviews (assuming an average household size of approximately 5 members). However, in many cases, only part of the Enumeration Area is located within the 5 km corridor or within the primary corridor (within which the 1680 Household Interviews had to be conducted). Therefore, a cluster often covers villages from neighbouring Enumeration Areas to achieve the required number of interviews.

Since villages in the rural areas of the mountains tend to be very small (sometimes less than ten households), a cluster often covers up to five villages. In order to get an equal spread, effort was made to interview an equal number of people from the villages that make up the cluster. In total, 141 villages were visited during the course of the socio-economic survey.

PART 7: METHODOLOGY

7 METHODOLOGY OF PHASE 2

The tool-set used during the socio-economic survey was threefold. It consisted of:

- household interview (HHI);
- specific river users interview (SRUI);
- chief interview (CI).

The reason for the methodology being divided into three elements derives from the fact that river utilisation is, in fact, a rather complex matter. If a single tool were applied, hidden information may have been missed.

7.1 HOUSEHOLD INTERVIEW (HHI)

Given that the household is the primary production and redistribution framework as well as the most dominant unit of survival throughout rural Lesotho, the most crucial element of the methodology was the HHI. As shown in the sampling chapter, an equal number (210) of interviews were conducted in each of the eight strata. A total of 1680 HHIs thus resulted in an overall number of 7963 people (given a 4.74 people per HH ratio) being covered by the HHI.

Since the findings, needs and concerns of a wide range of disciplines within the entire IFR process had to be integrated in the HHI, the development, testing and refinement of the HHI has been a long and time consuming process. The final version (see Appendices) contains eight sections and various sub-sections:

A. Household Information	Demographic information on household members; Housing, roofing, fencing; Water sources for domestic water supply
B. Vegetation Section	Reeds, thatch grasses, <i>Leloli</i> , wild vegetables, shrubs / debris, medicinal plants, agriculture
C. Fish Section	Fish resources
D. Public Health Section	Domestic water supply, casual drinking; Family health information, nutritional information
E. Sand Mining Section	Sand mining
F. Animal Health Section	Household animals, animal health, grazing patterns
G. Religion & Leisure	Baptism, swimming, exercising

The ultimate aim of every section was to quantify the usage of the particular riparian zone resource both within the household and within a given period of time. This information was computed in order to link it to the “consequence descriptions” from the biophysical team. Hence, the generated data forms a kind of baseline data on the basis of which projections for the future will be made, *i.e.* “what are the social and economic consequences if the availability of resource X is reduced by Y percent?”

There are a number of **limitations** to the methodology in general and its applicability in the particular context of the IFR study, which deserve to be mentioned here:

- a) The impact of the finalised construction of Katse Dam on riparian resources and the utilisation of the Malibatso River is already severe. Therefore, the application of the HHI in River Sections 2 and 3 is a survey which maps the results and consequences of manipulated flow regimes, rather than the establishment of baseline data on which future projections could be made. Put more bluntly: in these sections, the study should have been conducted ten years ago. Similarly, the ongoing construction activities on the Senqunyane River (Mohale Dam, River Section 7) and on the Matsoku River (Matsoku Diversion Weir, River Section 1), affect river utilisation in varying degrees, according to how close to the construction site one chooses to study.
- b) Some parts of the HHI applied in the IFR socio-economic survey are gender specific in the sense that men are better suited to answer certain sections than women are and vice versa. It is assumed that the basic ‘Yes / No’ information beginning every section can be answered by both men and women alike, *i.e.* in all 1680 households. It is furthermore assumed that the sample size is large enough to gather a sufficient number of men and women as household interviewees in order to ensure “gender equality” within the gathered data. Similarly, river utilisation by children in general and herdboys in particular often remains hidden in an ordinary HHI, where the interviewee is an arbitrary person

(whoever happens to be at home, when the research assistant turns up). In order to address this problem, it was decided to include herdboys in the list of specific river users, who were approached in a somewhat different way (see section 7.2.).

- c) A general weakness of every structured questionnaire is that the complexities and ambiguities of social realities are too complicated to be fully captured. Structured questionnaires generally allow only predefined answers, while the respondent may give answers that do not fit the answer categories. However, the extensive pilot research, paired with a long questionnaire development period in which many different stakeholders were involved has resulted in a HHI design that matches the social and economic realities of communities along LHWP-affected rivers as well as possible. Furthermore, the depth of quality of the information on river utilisation in Lesotho has already been described in the pilot study report. In order to be able to quantify, compute and compare statistically reliable results, a structured questionnaire such as the HHI is the only feasible method.

7.2 SPECIFIC RIVER USERS INTERVIEW (SRUI)

The pilot study showed that LHWP-affected rivers are not only used as part of the rural livelihoods of "ordinary" Basotho households, but also by a number of specialised, semi-professional occupations. The list of specific river users is as follows:

- Fishermen
- Herbalists
- Sand miners / Brick makers
- Boat operators
- Forest owners
- Herdboys
- Vegetable collectors

These groups were approached with a specifically designed set of questions, which aimed to quantify the economic aspect of their interaction with the river. The objective was to get a clear picture of an average representative of the above mentioned occupations. Since there are only very few representatives of these occupations in each location, these groups could not be captured by the sampling procedure of the HHI, but had

to be looked for. In practice, the field team leader was appointed the task of establishing the contact with these groups, usually via the chief. Since the number of SRUI is relatively small (depending on how many interviewees could be contacted) the obtained information is not stratified. The SRUI cannot always be limited to the 5 km corridor. Brick makers especially often live outside the 5 km corridor and travel long distances to mine sand.

7.3 CHIEF INTERVIEW (CI)

The chief is always the first person to contact once one enters a village. This is a necessity, not only to obtain formal permission to conduct HHIs within the communities under his/her jurisdiction, but also because the entire issue of resource usage and administration is typically the responsibility of community leadership, usually the chief and/or Village Development Committee (VDC). The chief interview was the responsibility of the team leader and focused on a number of issues:

- first, the precise **demarcation of primary and secondary corridor** had to be conducted in cooperation with the chief. They know precisely where boundaries between villages are located and what kind of arrangements concerning resource utilisation exist between the different communities. More precisely, he/she is in a position to say which communities have the right to use 'controlled' riverine resources and which communities do not have this right;
- second, the chief is supposed to provide the study with **quality information on all alternative water sources** within the community, such as the village water supply system, springs and river tributaries. The pilot study showed that the availability and reliability of alternative sources of water is paramount in determining communities' river usage, especially within the areas of domestic water usage and animal watering;
- third, the chief is asked questions on the **degree of availability and usage of the particular riverine resources**. This element was introduced following a request made by the economist, that aims to determine whether communities harvest all of a particular resource that is available, or only part of it. However, this question only makes sense for the sections dealing with riparian vegetation and sand.

At this point, the Consultant wishes to raise a concern regarding the third element of the chief interview. If this information is to be used for final calculations of compensation payments due to the part or entire loss of certain resources, two additional factors need to be brought into consideration. In case the data shows that only 50% of this resource is utilised and this resource is likely to be reduced by 50% due to reduced flow regimes, the utilised amount would theoretically still be available to the communities. In practice, the time and effort required

to collect / harvest the remaining 50% of that particular resource may be far higher than before. Furthermore, as studies focusing on 'perceptions of loss' along the highly affected Malibatso River have shown, the concept of *"it's not worth going there any more"* is fairly dominant among the affected communities. This means that if the availability of a resource is reduced by 50%, for the communities it may be lost by 100% because they think in cost-benefit terms due to the, in many cases, long and strenuous hike down to the river.

PART 8: RESULTS**8 COMBINED RESULTS OF THE SOCIO-ECONOMIC SURVEY AND PILOT STUDY**

This chapter sets out to present the combined results of the pilot study (Phase 1) and the socio-economic survey (Phase 2) in a detailed and comprehensive manner. All elements of river utilisation, which were identified as flow-dependent and socially significant during Phase 1 and which were decided to be included in the socio-economic survey of Phase 2 are presented here. Each section contains four elements, namely:

- A qualitative presentation and description of the particular element of river utilisation (similar to the pilot study final report).
- Description of the link to the biophysical sector of the overall IFR process.
- Presentation of the quantification tool (questionnaire element).
- Quantification tables including qualitative comments on the results.

Most of the quantified results are shown as means (averages) of all the responses. In a few cases, the mode (the most frequently mentioned response) was preferred, as the mean gave a distorted picture if the standard deviation (the distance between each score and the mean) is considered too high. In case the number of responses dropped below the statistically necessary minimum (see chapter 6), the data is presented in a non-stratified form, *i.e.*, it is not specified for each IFR river section.

8.1 COLLECTION OF REEDS

Reeds are used for roofing as the first layer underneath the thatch grass. They are necessary for the construction of the traditional type of *rondavel* or *heisi* (rectangular thatched house). Since the majority of villages along the LHWP-affected rivers are of the traditional and remote type with few modern houses, reeds remain an important riverine resource. Reeds are also present in some swampy areas along the tributaries, but the primary source remains the river itself. Reeds are rather scarce except in a few areas. They are frequently the subject of commercial transactions. Since many sites do not have their own reeds (any longer) they have to be bought. A new *rondavel* needs about 10 – 20 bundles,

but once laid, reeds last for a lifetime and few repairs are necessary.

8.1.1 Botanical description

Phragmites Australis (*Lehlaka*; Common Reed) is a perennial woody graminoid with creeping rhizomes, culms 1.5 – 3 m tall and plumes of silky white spikelets. *P. australis* occupies marshy, swampy ground and is found along streams and in standing water. It tends to grow in the water or in the wet bank zone in Lesotho's rivers, where heavy silt loads are often deposited (IFR Report No 648-F- 14).

8.1.2 Survey questions

Has any household member harvested reeds from the riparian zone in the last 5 years? Yes. ____ No. ____
If yes, when were reeds harvested for the last time?

State amount for private use. _____

State amount sold. _____ Price / bundle. _____

The results of the reed survey appear in Table 8.1. While the results on the number of bundles which are used for private consumption and for sale, as well as the price information are fairly consistent throughout the studied sites, it is interesting to note that the number of households harvesting reeds differs significantly. IFR River Section 1 is well above average and IFR River Section 5 well below average. This can largely be explained by the nature and state of the riparian vegetation. While IFR 1 is fairly easily accessible and characterised by relatively rich vegetation, IFR River Section 5 has many steep-gorge sections, where reeds are not found. This pattern had already been observed during the pilot study and is repeated in the case of other plants which are harvested from the riparian zone. 56% of those who harvested reeds within the last five years had done so two years ago. Whether this is due to a good "reed-year" in 1997 or to the informants' difficulties in recalling further back remains to be investigated. The price variation also suggests that scarcity results in higher prices, an important factor to be considered when estimating compensation.

Table 8.1 Survey results for reeds.

IFR	% HHs who have harvested reeds within last 5 years	Mean number of bundles per HH for private use over last 5 years	Mean number of bundles sold over last 5 years	Mean price per bundle	Percentage when harvested last time				
					'99	'98	'97	'96	'95
IFR 1	39.2	3.5	1.0	9.30	26.3	50.5	13.7	5.3	4.2
IFR 2	19.5	3.9	2.6	11.78	7.1	45.2	23.8	11.9	11.9
IFR 3	14.9	6.7	3.6	15.41	15.6	65.6	12.5	6.3	---
IFR 4	19.5	9.9	5.6	12.16	2.2	62.2	24.4	6.7	4.4
IFR 5	4.2	3.2	3.0	14.67	---	50.0	25.0	---	25.0
IFR 6	27.5	6.4	6.1	8.83	---	58.5	21.5	7.7	12.3
IFR 7	25.3	4.8	3.3	11.36	12.3	59.6	14.0	5.3	8.8
IFR 8	19.4	3.5	3.4	9.11	17.5	57.5	15.0	2.5	7.5
Overall	20.8	6.5	4.6	10.30	12.5	56.0	17.7	6.3	7.6

8.2 COLLECTION OF THATCH GRASSES

The most important species of thatching grasses are '*mohlomo*', '*qokoa*' and '*lengana*'. Other shrubs that are suitable for roofing purposes are '*mosea*', '*tsahane*', and '*lebate*'. In most cases these thatching materials grow on the slopes of the river basin (they like the higher temperatures of the valleys) and higher up the mountains, where they are harvested during the winter months and sold in bundles. They are sometimes found right next to the river. Their flow dependency is relatively low. For a rondavel of approximately 5 to 6 meters in diameter, 80 to 160 bundles are needed (depending on the skill of the person doing the roofing). A thatched roof lasts for approximately 20 years, after which repairs are needed.

8.2.1 Botanical description

Artemisa afra (*Lengana*) is terrestrial. Besides its use for thatching, the plant is widely used as a medicinal plant against all kinds of colds. It is a strongly aromatic perennial shrub, with leafy stems covered with greyish hairs. The species grows on cool and rocky slopes, river terraces, narrow valleys, near paths, along streams and in forest margins. *Hyparrhenia pilosissima* (*Qokoa*) and *Hyparrhenia hirta* (*Mohlomo*) are also terrestrial (IFR Report No 648-F-16). As they are unpalatable to animals, these species continue to thrive in areas where other thatch grasses are no longer available due to overgrazing.

8.2.2 Survey questions

<p>Has any household member harvested thatch grass from the riparian zone in the last 5 years? Yes. ____ No. ____ If yes, when was thatch grass harvested for the last time? ____ State amount for private use. ____ State amount sold. ____ Price / bundle. ____ State types of thatch grass harvested. _____</p>

Table 8.2 shows a regular pattern in the harvesting of thatch grasses from the riparian zone, in that the mean numbers of bundles harvested for private consumption and for sale, as well as the price information, is consistent throughout the studied sites. Similar to the reed harvest, the percentage of households harvesting grasses is considerably lower in IFR River Sections 5 and 6. Concerning IFR River Section 5 this may be explained by the state and nature of the riparian vegetation. In IFR River Section 6 however, the reason for fewer households harvesting thatch grasses from the riparian zone has to be sought in the fact that IFR 6 is characterised by a higher degree of urbanisation. There are more iron roofs to be found here. Consequently, the need for thatch grasses decreases. The mean number of bundles used for private consumption (overall approximately 4 bundles annually) matches the information collected during the pilot study that one needs a minimum of 80 bundles to build a small rondavel and that the life expectancy of a thatched roof is at least 20 years. In practice, people harvest thatch grasses in

accordance with community allocation rights of 'plots' and store the bundles for later use, whether for sale, barter, repairs, etc.

The percentages of different grass species used may be found in Table 8.3. Totals may exceed more than 100% as many respondents use more than one species. *Hyparrhenia hirta* (*Mohlomo*) appears to be the most significant thatch grass species and has been identified throughout IFR River Sections 1 to 8. Although the proportional distribution of the three mentioned species was not determined during the socio-economic survey, *Hyparrhenia pilosissima* (*Qokoa*) has to be considered insignificant in its amounts as it was not identified within the riparian zone by the botanists.

8.3 COLLECTION OF *LELOLI* (CRAFTS GRASS)

Leloli is used for making ropes for roofing, weaving various handicrafts and for medicinal purposes. This plant requires a wet habitat and thus grows along the riverbanks, along tributaries and in other moist places. The quality of the plant is however influenced negatively by floods, in that it breaks easily when dried for production. *Leloli* is harvested and stored during February. Besides the production of ropes, *leloli* crafting is practised by households, who have acquired the necessary skills and who can generate an additional income out of the sale of *leloli* products. *Leloli* can still be found growing in many places.

Table 8.2 Survey results for thatch grasses.

Site	% HHs who have harvested thatch grasses within last 5 years	Mean number of bundles used for private consumption within last 5 years	Mean number of bundles for sale within last 5 years	Mean price per Bundle	% when harvested last time				
					'99	'98	'97	'96	'95
IFR 1	39.6	10.6	7.3	8.3	22.5	53.8	16.3	6.3	1.3
IFR 2	34.9	23.7	20.1	7.2	15.0	68.3	6.7	5.0	5.0
IFR 3	26.0	20.9	14.1	8.8	14.6	58.5	17.1	7.3	2.4
IFR 4	48.2	25.1	16.8	8.3	13.4	64.9	15.5	3.1	3.1
IFR 5	18.6	14.7	8.8	8.6	21.2	42.4	21.2	3.0	12.1
IFR 6	14.0	13.3	9.8	5.9	6.1	75.8	6.1	6.1	6.1
IFR 7	28,1	20.9	15.7	7.6	16.4	65.5	9.1	1.8	7.3
IFR 8	30,1	17.8	8.9	4.9	7.3	69.1	16.4	3.6	3.6
Overall	24.7	19.4	13.2	7.3	15.0	62.6	13.7	4.4	4.4

Table 8.3 Types of thatch grasses reported in %.

	<i>Mohlomo</i>	<i>Lengana</i>	<i>Qokoa</i>
IFR 1	79.6	4.3	47.3
IFR 2	96.0	5.3	53.3
IFR 3	80.4	13.7	51.0
IFR 4	100	2.8	---
IFR 5	95.1	---	14.6
IFR 6	96.8	---	35.5
IFR 7	62.7	32.2	42.4
IFR 8	98.4	1.6	19.4
Mean	92.5	5.4	23.2

8.3.1 Botanical description

Cyperus marginatus (Leloli) is recognised by stout creeping rhizomes, cylindrical leafless culms up to 1-m tall and simple or compound umbel-like inflorescences with glossy red-brown spikelets. It grows along the edges of streams, marshes, damp rocky slopes and in water. It requires being close to water or partially immersed at all times. *C. marginatus* was recorded throughout all the zones although it occurred in denser stands in the Wet Bank zone of the riparian area (Report No 648-F-16).

8.3.2 Survey questions

Has any household member harvested *leloli* from the riparian zone in the last 12 months?
Yes. ____ No. ____
If yes, how many bundles of *leloli* were harvested?

Used for what? _____
If sold, state price per bundle. _____

Code
1=Ropes 2=Handicraft 3=Medicinal use 4=Other

As Table 8.4 shows, *leloli* is harvested in total by 17.0 % of the statistical population in the primary corridor. Differences between the IFR river sections are similar to other botanical resources in that the percentage harvesting reeds is higher in IFR River Section 1 due to a healthier riparian environment and lower in IFR River Section 5 due to the nature and state of the riparian vegetation. The usage pattern is clear as *leloli* is mainly utilised for handicrafts (total 73.1 %) with a very consistent distribution throughout IFR River Sections 1 to 8. This corresponds to the patterns of frequency and amount in IFR River Section 5, as this is the area where more people collect *leloli* for sale. Only in IFR River Sections 2 and 6, does *leloli* appear to have a significant role as a medicinal plant. On a few occasions, *leloli* was said to play a role during circumcision rituals.

8.4 COLLECTION OF WILD VEGETABLES FOR HOUSEHOLD CONSUMPTION

Wild vegetables (*moroho*) are an important part of the daily Basotho diet and are collected from the riparian zone almost everywhere (see Table 8.5). The importance of the riparian zone for vegetables varies from being almost negligible in areas where access to the river is strenuous and the number of vegetables is small due to livestock grazing in the river basin for long

periods, to places where most vegetables for household consumption are collected along the river banks. Most villagers collect the bulk of the wild vegetable harvest in the fields rather than along the riparian zone. Concerning the Lowland areas, many wild vegetables are collected in the fields next to the river, meaning that their growth is still influenced by the moisture coming from the river. The biggest value of vegetables from the riparian zone may lie in the fact that they ripen earlier than in other locations and that some species can be harvested during winter, when alternative sources are few or dried up. The team was also frequently told that vegetables found along the river grow bigger and richer, especially after rains and floods.

Wild vegetables are collected by women, usually in a plastic bag or basin and are measured in plastic bags or handfuls (*mafupu*). According to the women interviewed during the pilot study, the ideal is to be able to give one spoonful of cooked vegetables to every family member every day. However, since it depends on the type of vegetable, it is difficult to relate one spoonful of boiled vegetables to one handful of raw vegetables.

8.4.1 Survey questions

Has any household member collected wild vegetables from the riparian zone for household consumption in the last 12 months? Yes. ____ No. ____
If yes, please state the number of handfuls (*lefupu*) or plastic bags per week for summer and winter.

All types of vegetables	Summer	Winter
Handfuls per week		
Plastic bags per week		

Please state the proportions of the single vegetable species (*use stones or beans*).

Vegetable species	Used in summer?	Summer %	Used in winter?	Winter %	Price / unit
Papasane					
Seruae					
Theepe					
Sepaile					
Qhela					
Manolo					
Leshoabe					
Selae					
Tenane					
Lerotho					
Other:					
Other:					

Table 8.4 Survey results for *leloli*.

	% HHS who have harvested <i>leloli</i> within last 12 months	Mean number of bundles harvested	Mean price/ bundle	Percentage usage			
				Ropes	Handi-craft	Medicinal	Sale / Other
IFR 1	39.8	3.4	8.8	8.2	81.4	2.1	8.2
IFR 2	15.3	3.5	13.8	6.1	78.8	6.1	9.1
IFR 3	11.2	3.1	15.9	12.5	83.3	---	4.2
IFR 4	23.6	4.9	8.0	17.3	76.9	1.9	3.8
IFR 5	5.1	5.3	6.5	---	81.8	---	18.2
IFR 6	16.9	2.9	13.0	17.1	63.4	9.8	9.8
IFR 7	25.0	11.7	15.1	1.9	84.9	---	13.2
IFR 8	21.8	4.6	11.9	4.5	70.5	---	25.0
Overall	17.0	4.2	12.1	13.1	73.1	4.8	9.0

Table 8.5 Botanical description table for wild vegetables.

Sesotho name	Scientific name	Part of riparian zone	Relative importance
<i>Selae</i>	<i>Water Cress</i>	Wet bank	9.8
<i>Papasane</i>	<i>Rorippa nudiuscula</i>	Wet bank	17.3
<i>Seruoe</i>	<i>Chenopodium album</i>	Wet bank	16.3
<i>Lerotho</i>	<i>Lepidium myriocarpum</i>	Wet bank	2.5
<i>Theepe</i>	<i>Amaranthus tunbergii</i>	Dry bank	11.8
<i>Sepaile</i>	<i>Sisymbrium thellungii</i>	Dry bank	13.2
<i>Ohela</i>	<i>Lepidium capense</i>	Dry bank	6.0
<i>Moetse</i>	<i>Tragopagan porrifolius</i>	Dry bank	2.4
<i>Leshoabe</i>	<i>Senecio gerrardii</i>	Dry bank	7.5
<i>Tenane</i>	<i>Wallenbergia androsacea</i>	Dry bank	5.7
<i>Leharasoane</i>	<i>Sonchus dregeanus</i>	Dry bank	1.1

The major problem behind the two above-stated survey questions is that most informants have serious difficulties in recalling quantitative information on the particular vegetable species. This problem was solved by applying a two-fold approach. First, a straightforward question was asked where informants could choose between giving quantitative information in handfuls or plastic bags. Second, a PRA (Participatory Rural Appraisal) exercise was performed, where informants were asked to illustrate the proportions of a typical collection unit for a single vegetable species during summer and winter. Combining the data generated by this approach produced the necessary data on particular vegetable species, which was then grouped according to riparian growth zones, in order to be linked to the IFR process. The reason that the list of vegetables for analysis was different from the one used in the questionnaire is that some vegetables mentioned in the questionnaire were found insignificant

(mentioned by less than 1% of all collectors), while some species mentioned under "other" in the field had to be included in the final analysis.

The results of the wild vegetable survey may be seen in Table 8.6. Although informants had the choice to give quantities in handfuls or plastic bags, too few opted for handfuls to enable valid and meaningful analysis of the data. Again, the numbers of collected units are very consistent. No major variations have been observed in the amounts of wild vegetables collected in the riparian zone during summer and winter. However, the percentage of households harvesting wild vegetables along LHWP-affected rivers varies considerably from IFR River Sections 1 to 8. As observed earlier, easy access and a relatively healthy state of the environment results in IFR River Section 1 having the highest number of households harvesting wild vegetables from the river.

Table 8.6 Survey results for wild vegetables for private consumption.

Site	% HHs who have harvested wild vegetables from riparian zone for private consumption	Mean number of plastic bags per week during summer (7 months)	Mean number of plastic bags per week during winter (5 months)
IFR 1	66.9	4.4	2.2
IFR 2	34.4	3.4	1.8
IFR 3	31.2	4.3	2.4
IFR 4	61.1	4.9	2.4
IFR 5	30.7	3.1	1.8
IFR 6	43.6	2.9	1.8
IFR 7	36.4	4.8	2.9
IFR 8	29.1	2.8	2.1
Overall	43.1	3.8	2.1

The lowest percentages were recorded at IFR River Sections 2, 3, 5 and 8. These are the reaches, which are clearly most difficult to access. IFR River Sections 2 and 3 are already said to be seriously affected by the effects of Katse Dam. In addition to that, a significant proportion of the population in IFR River Section 3 lives in Thaba Tseka town. As the pilot study has shown, people from urbanised areas use the riverine resources less intensively than those in rural areas.

The mean price for one plastic bag of vegetables is 2,08 Maloti (Table 8.7). All prices are fairly consistent, except that the price for Tenane is higher than the other vegetables. Stratification was not feasible, given the overall number of responses for many of the above mentioned vegetable species.

- *Papasane, Serue, Theepe* and *Sepaile* are the most important vegetables during summer.
- *Papasane, Selae* and *Leshoabe* are the significant species during the winter months.

8.5 COLLECTION OF SHRUBS AND DEBRIS FOR FUEL

In most cases, riparian areas are the preferred places for fuel collection. Whilst fuel wood from real trees is dealt with in the next section, this section covers shrubs and debris exclusively as a source of fuel. It is, however, recognised that the difference between a shrub and a real tree is a fluid one. A list of the shrubs that are important sources of fuel is given in Table 8.8.

As a rule, vegetation is always richer along rivers and tributaries. Depending on the state of environmental

degradation, different species of trees and shrubs may be found along the river. Many shrubs and trees have been planted as seedlings by floods and they benefit from the proximity to the river in terms of regular flooding and air moisture. While the various kinds of shrubs can be found in many places on the mountain slopes, they often look in much better condition when close to the river.

Debris and logs can be found along the river after floods. The riverine communities harvest these fuel sources but they do not play a significant role in the overall supply of fuel.

Girls and women do most of the collection of wood for fuel. They collect either daily or several times a week, depending on the availability of other fuel sources (dung, gas, etc.), household size, season, level of income, way of life and other factors. The amount needed is also dependent on whether beer brewing is practised or not, and varies between one bundle per person per week to one bundle per four people per week. One bundle or headload usually weights between 10 and 20 kg, depending on the mix. Fuel wood collection is commercialised in many villages, meaning that some people may be designated as semi-professional firewood collectors. The unit of sale is always the bundle. Since firewood is scarce, its collection could easily become a source of conflict when collection rights, areas and periods are violated.

Whether a collector goes to the river or to other places largely depends on the natural environment, the distance to the river as well as the need and the availability of

other sources. Older women often find it too strenuous to collect along the river and thus rely on shrubs growing on the slopes surrounding the village if these are available.

8.5.1 Survey questions

Has any household member harvested shrubs and debris for fuel from the riparian zone in the last 12 months? Yes. ____ No. ____
If yes, state number of bundles per week and price for summer and winter in the table below.

Shrubs and Debris			
Summer		Winter	
Bundles per Week	Price per Bundle	Bundles per Week	Price per Bundle

As may be seen in Table 8.9, the percentage of households collecting shrubs and/or debris from the riparian zone varies between the highest percentages, which were recorded at IFR River Sections 1 and 4, and the lowest percentage, which was recorded at IFR River Section 7. The high percentages at IFR River Sections 1 and 4 are due to a combination of the availability of shrubs in the riparian zone and a shortage of shrubs elsewhere. The low percentage at IFR River Section 7 may be explained by two factors. Firstly, there is an abundance of shrubs to be found on the mountain slopes (as already noted in the pilot study report). Secondly, a relatively high number of trees can be extracted from the riparian zone at this IFR river section (see also next section under poplar harvest in particular).

Table 8.7 Proportions of vegetable species collected during summer and winter months within riparian zone.

Vegetable Species	Mean price per plastic bag in Maloti	Proportions of vegetable species in % during summer (7 months)	Proportions of vegetable species in % during winter (5 months)
Papasane	2.3	18.9	30.4
Serue	1.9	19.3	7.6
Theepe	1.7	14.3	1.8
Sepaile	1.9	15.2	9.9
Qhela	1.9	5.9	6.3
Leshoabe	1.8	7.3	11.0
Selae	2.3	8.6	15.9
Tenane	3.4	5.7	6.8
Lerotho	2.3	2.3	3.8
Moetse	1.9	1.5	4.4
Leharasoana	2.4	0.9	1.9

Table 8.8 Botanical description of important utilised shrubs

Scientific Name	Sesotho Name	Part of riparian zone
<i>Artemisia afra</i>	<i>Lengana</i>	Wet bank / Dry bank
<i>Buddleja salviifolia</i>	<i>Lelothoane</i>	Wet bank / Dry bank
<i>Diospyrus austro-africana</i>	<i>Senoko-noko</i>	Dry bank
<i>Diospyros lycioides</i>	<i>Lehjajoe</i>	Dry bank
<i>Ghompostigma virgatum</i>	<i>Mosika-noka</i>	Wet bank / Dry bank
<i>Leucosidea sericea</i>	<i>Cheche</i>	Dry bank
<i>Rhamnus prinoides</i>	<i>Mofifi</i>	Dry bank
<i>Rhus divaricata</i>	<i>Kolitsane</i>	Dry bank

Table 8.9 Survey results for shrubs and debris.

Site No	% HHs who have harvested shrubs or debris from the riparian zone within the last 12 months	Mean number of bundles per HH per week during summer	Mean price per bundle during summer (6 months)	Mean number of bundles per HH per week during winter	Mean price per bundle during winter (6 months)
IFR 1	69.8	4.8	6.9	4.6	7.1
IFR 2	49.3	6.3	6.8	5.1	7.2
IFR 3	39.3	4.5	7.7	4.0	8.1
IFR 4	69.1	5.1	7.2	4.0	7.2
IFR 5	42.5	3.9	5.5	3.5	5.1
IFR 6	41.9	3.2	5.8	3.6	6.1
IFR 7	35.5	3.8	7.0	3.7	9.4
IFR 8	39.5	3.9	6.0	3.3	6.1
Overall	47.0	4.1	6.5	3.8	6.9

8.6 HARVESTING TREES FROM THE RIPARIAN ZONE

Riparian areas constitute the main source of real wood in the form of various tree species, the most important being willow and poplar (Table 8.10). Trees along the rivers are some of the most highly valued riverine resources, not only because they deliver wood for various purposes, but also because of their function as erosion controllers, and thus, field protectors. Consequently, the harvest of these trees is one of the most tightly controlled aspects of river utilisation. In many cases these trees are "owned", more often than not by the chief. Trees are also often reserved for funerals, when large quantities of wood are needed. One can see many planted poplar forests along LHWP-affected rivers. The trees in these forests benefit from the proximity to the river and are not particularly endangered by either floods or droughts, due to their deep roots.

8.6.1 Botanical description

Salix babylonica (Weeping Willow) is a medium to large deciduous tree with long and slender branches hanging vertically. It is an invasive species that is a native of Asia. *S. babylonica* grows and is grown on the banks of rivers and dams. In the studied sites it was recorded in the riparian Wet Bank Zone and occasionally in the Lower Dynamic Zone (IFR Report No 648-16).

Salix fragilis (Brittle Willow) is a deciduous tree with smooth, polished ascending branchlets that are brittle at

the base and snap off easily. *S. fragilis* invades watercourses and is found to occur in both the riparian Wet Bank and Dry Bank Zones.

Salix mucronata is a semi-deciduous to evergreen shrub or small tree with somewhat drooping leaves. *S. mukronate* grows on stream and riverbanks. During the botanical study, this species was characteristically found in the riparian Wet Bank Zone.

Populus canescens (Poplar) prefers wet places, but can be found throughout the Wet Bank and Dry Bank Zones.

Although there are three different kinds of willows, the Basotho normally use the same word (*Moluoane*) for all three willow-species. It was therefore decided to group trees into willows, poplars and other. Since the price per tree is naturally determined by its size, price will be stated as a range from the cheapest to the most expensive tree. In order to have a firm foundation for predicting the social consequences of lost tree resources, it was decided to include a column on usage.

8.6.2 Survey questions

Has any household member harvested trees from the riparian zone in the last 12 months?
Yes. ____ No. ____
If yes, please list the type, number, price per tree and usage in the table below.

Tree type	No harvested	Price / tree	Usage
Willow			
Poplar			
Other:			

Code

Usage: 1=firewood 2=housing construction 3=sledges and yokes 4=Sale
5= Other

Usage patterns of both poplar and willow trees may be seen in Table 8.11. Since willows grow naturally along Lesotho's rivers, the mean number of willows harvested is fairly consistent throughout IFR River Sections 1 to 8. Harvest of the cultivated poplar tree, in contrast, varies from IFR River Sections 5, 6 and 7, where many poplar woodlots are to be found to IFR River Sections 2,3 and 4 and in particular 8, where fewer poplars are planted and thus harvested. As mentioned before, the relatively rich vegetation in IFR River Section 1 attracts far more households than in all other IFR river sections, while IFR River Section 5 offers less natural vegetation of use to communities along that particular stretch. It is also important to note that willows and poplars 'coppice', *i.e.*, they re-grow after being harvested.

Except in IFR River Section 8, the pattern of utilisation of willow trees is clear. The larger proportion of willow trees (overall 74,6 %) is used for firewood and the remainder mainly for the construction of houses, sledges and yokes. Concerning IFR River Section 8, firewood from willows is replaced by other fuel sources such as shrubs and dung. The general shortage of trees in this river section means that proportionally more trees are used for the construction of housing, sledges and yokes. Poplars are generally used more frequently for construction purposes as their straight growth makes them far more suitable for building activities.

8.7 COLLECTION OF MEDICINAL PLANTS FOR HUMANS AND ANIMALS FROM THE RIPARIAN ZONE

Herbs are collected in many places along LHWP-affected rivers and form an important part of the overall health and medical support system (Table 8.12). A few basic herbs are known by most people, while comprehensive knowledge on herbs and herbal treatments is usually limited to healers, herbalists and sangomas. Many villages have one or more of these professionals. The collection of herbs is often regulated in the same way as other controlled resources. In a few cases, a special

license is needed. Some specific herbs have great value and sangomas travel long distances to get them. Likewise, some sites experience many outsiders coming in to harvest herbs.

Overall flow dependency varies according to the species and is difficult to determine precisely because, for many of the herbs, alternative growing sites exist. Many herbs that are found along the riverbanks are also found on the slopes or even high up in the mountains. The difference is that herbs from the riparian zone grow bigger and are said to be more "powerful" than herbs from other locations. This is usually attributed to flooding and moisture along the river. A reduced flow level is therefore likely to affect the overall number and quality of herbs from the riparian zone to a certain degree.

8.7.1 Survey questions

Has any household member collected medicinal plants from the riparian zone in the last 12 months?
Yes. ____ No. ____
If yes, please fill in the table below.

Plant Name	Used? Tick	Units harvested	Price per unit	No harvested in last 12 months
<i>Kuena</i>				
<i>Lengana</i>				
<i>Loli</i>				
<i>Qobo</i>				
<i>Phonyoka</i>				
<i>Mosika Noka</i>				
<i>Moriri oa</i>				
<i>Matlapa</i>				
<i>Keketsa</i>				
<i>/Mositsane</i>				
<i>Pakisane</i>				
<i>Mohloare</i>				
<i>Seletjane</i>				
<i>Tsikitlane</i>				
<i>Khomo Ea</i>				
<i>Balisa</i>				
Other:				

Code

1=Handful 2=Plastic bag 3=Whole Plant 4=Bundle 5=Root 6=Other

Has any household member collected medicinal plants for curing animals from riparian zone in the last 12 months? Yes. ____ No. ____
If yes, please fill in the table below.

Table 8.10 Survey results for trees.

Site	Percentage of HHS who have harvested trees from the riparian zone within the last 12 months	Mean number of willow trees harvested within last 12 months	Mean price per willow-tree	Mean number of poplar trees harvested within last 12 months	Mean price per poplar-tree
IFR 1	59.2	4.7	49.5	7.3	37.4
IFR 2	31.2	3.4	34.2	4.6	26.7
IFR 3	16.7	7.4	30.1	6.4	12.1
IFR 4	24.9	5.0	15.6	7.6	9.2
IFR 5	15.3	6.2	30.0	11.6	9.2
IFR 6	20.9	4.5	28.6	17.37	17.3
IFR 7	32.2	7.5	20.0	21.4	9.5
IFR 8	25.2	9.4	20.6	---	---
Overall	22.7	5.5	28.9	14.6	16.1

Table 8.11 Willow and poplar usage patterns.

IFR No	Proportional willow usage					Proportional poplar usage				
	Fire wood	Construction	Sledges and yokes	Sale	Other	Fire wood	Construction	Sledges and yokes	Sale	Other
IFR 1	91.9	1.5	---	3.0	3.7	40.0	44.0	---	4.0	12.0
IFR 2	86.4	4.5	4.5	2.3	2.3	67.6	20.6	5.9	2.9	2.9
IFR 3	81.3	9.4	3.1	3.1	3.1	20.0	80.0	---	---	---
IFR 4	66.0	23.4	8.5	2.1	---	60.0	30.0	---	---	10.0
IFR 5	75.0	8.3	8.3	---	8.3	66.7	16.7	---	---	16.7
IFR 6	75.0	5.0	20.0	---	---	52.6	42.1	---	---	5.3
IFR 7	72.1	9.3	11.6	4.7	2.3	44.8	41.4	3.4	10.3	---
IFR 8	18.5	29.6	29.6	3.7	18.5	---	---	---	---	---
Overall	74.6	11.1	10.2	2.0	2.2	52.1	39.2	0.8	1.9	6.0

Table 8.12 Botanical description of medicinal plants for humans and animals.

Sesotho Name	Scientific Name	Part of Riparian Zone
<i>Kuena</i>	<i>Mentha longifolia</i>	Wet bank
<i>Loli</i>	<i>Cyperus marginatus</i>	Wet bank
<i>Mosika noka</i>	<i>Ghompostigma virgatum</i>	Wet bank
<i>Qobo</i>	<i>Gunnera perpensa</i>	Dry bank
<i>Hloenya</i>	<i>Diloma anomala</i>	Dry bank
<i>Lengana</i>	<i>Artemisia afra</i>	Dry bank
<i>Phonyoka</i>	?	Dry bank
<i>Moriri oa Matlapa</i>	<i>Lichens</i>	Dry bank
<i>Mositsane</i>	<i>Accadia dealbata</i>	Dry bank
<i>Pakisane</i>	<i>Ursinia nana</i>	Dry bank
<i>Mohloare</i>	<i>Olea africana</i>	Dry bank
<i>Seletjane</i>	<i>Hermannia</i>	Dry bank
<i>Tsikiltane</i>	<i>Gazania krebsiana</i>	Dry bank
<i>Khomo ea Balisa</i>	<i>Bulbina narcissifolia</i>	Dry bank
<i>Poho Tsehla</i>	<i>Xysmalobium indulatum</i>	Dry bank
<i>Mofifi</i>	<i>Rhamnus prinoides</i>	Dry bank

Plant Name	Used? Tick	Units harvested	Price per Unit	No harvested during last 12 months
<i>Sehalahala</i> <i>Sa Matlaka</i>				
<i>Khama</i> <i>Khamane</i>				
<i>Mofifi</i>				
<i>Khoara</i>				
<i>Mositsane</i>				
<i>Mosali</i> <i>Mofubelu</i>				
<i>Hloenya</i>				
<i>Moherane</i>				
<i>Cheche</i>				
Other:				

Code

1=Handful 2=Plastic bag 3=Whole Plant 4=Bundle 5=Root 6=Other

The results of the medicinal plant surveys are given in Tables 8.13 and 8.14.

As was the case with the wild vegetables, the list used in the questionnaires differs from the one used in the analyses. For the final presentation it was decided to prepare one list containing both herbs used for humans and for animals. Only two plants, Mofifi and Hloenya, were included in the analysis from the list of medicinal plants used for animals. All others were mentioned too rarely (less than 1% of all collectors) or could not be identified. Hloenya, a small perennial herb, appears to be the most widely known and utilised medicinal plant and was more often mentioned in connection with medicine for humans. Price information was difficult to obtain in that most collectors never buy or sell and thus have no idea about the market value of a particular plant. The dominant units of measurement are handfuls and roots in particular, depending on the plant species.

8.8 AGRICULTURE WITHIN THE RIPARIAN ZONE

Fields along the river benefit from their proximity to the water. Crops that are planted next to the rivers are

maize, sorghum and sometimes pulses. Fields next to the river are clearly preferred by villagers because their yield is generally higher and the crop matures faster than on other sites. This is due to the better soil quality as a consequence of flood-transported sediments, the water and moisture from the river itself as well as higher temperatures in the river basin. Fields next to the river are also an important source of the wild vegetables that are collected on an almost daily basis. Sizes of fields next to the river (and correspondingly their yield) are bigger at IFR River Section 1 (along the Matsoku River) and where the Senqu River enters the Lowlands (IFR River Section 6). In the remaining Highland sections, fields are cultivated where the topography permits. In some places, irrigation of fields next to rivers is practised on a manual basis with buckets. Large-scale gravity-fed irrigation might be technically possible at many sites, but has to date not yet succeeded, for a number of social and economic reasons. While crops do not benefit from being flooded, the soil quality clearly does benefit in the long run due to the deposit of fertile soils and nutrients. Reduced flow levels might equally affect air moisture.

Vegetable gardening along the river was encountered only once at Motenalapi (IFR Section 7). The garden is new and is located next to the river. It is irrigated manually with buckets and the operator aims to sell vegetables locally. This initiative is in good shape and looks promising. It is too early to say whether there is a market for these vegetables in such a remote place.

8.8.1 Botanical description

The cultivation of maize, sorghum or pulses in fields along the rivers usually takes place on the edge of what is called the Back Dynamic Zone, *i.e.*, the upper end of where the river exerts its influence. This zone is shaped by sporadic large floods of the order of 20-year interval or even longer (IFR Report No 648-F-14). Since agricultural land is scarce in most communities, villagers are tempted to extend their fields towards the river, if the topography permits it.

Table 8.13 Survey results for the collection of medicinal plants.

IFR-Section	IFR 1	IFR 2	IFR 3	IFR 4	IFR 5	IFR 6	IFR 7	IFR 8	Overall
% HHs who have collected medicinal plants for humans	39.2	18.1	26.5	26.1	11.2	16.1	28.6	11.2	19.8
% HHs who have collected medicinal plants for animals	22.9	17.2	15.0	20.0	5.6	7.6	25.0	7.3	12.3

Table 8.14 Amounts and prices of harvested medicinal plants.

Sesotho Name	Scientific Name	% collectors who reported to use	Mean annual amount in handfuls	Mean annual amount in no of roots	Mean price per unit in Maloti
<i>Kuena</i>	<i>Mentha longifolia</i>	4.5	5.1		8.0
<i>Loli</i>	<i>Cyperus marginatus</i>	2.6		5.7	9.9
<i>Qobo</i>	<i>Gunnera perpensa</i>	5.9		5.7	9.9
<i>Mosika noka</i>	<i>Ghompostigma virgatum</i>	2.4	5.1		8.0
<i>Hloenya</i>	<i>Diloma anomala</i>	17.3		7.4	4.8
<i>Lengana</i>	<i>Artemisia afra</i>	5.8	5.1		8.0
<i>Phonyoka</i>	?	8.3		5.7	9.9
<i>Moriri oa Matlapa</i>	Lichens	3.6	5.1		8.0
<i>Mositsane</i>	<i>Accadia dealbata</i>	2.0		5.7	9.9
<i>Pakisane</i>	<i>Ursinia nana</i>	1.5		5.7	9.9
<i>Mohloare</i>	<i>Olea africana</i>	2.1	5.1		8.0
<i>Seletjane</i>	<i>Hermannia</i>	3.3		5.7	9.9
<i>Tsikatlane</i>	<i>Gazania krebsiana</i>	3.7		5.7	9.9
<i>Khomo ea Balisa</i>	<i>Bulbina narcissifolia</i>	4.1		5.7	9.9
<i>Poho Tsehla</i>	<i>Xysmalobium indulatum</i>	4.6		5.7	9.9
<i>Mofifi</i>	<i>Rhamnus prinoides</i>	1.2	5.0		8.3

8.8.2 Survey questions

Does the household have fields right next to the river?
Yes. ____ No. ____
If yes, please state their yields in 50 and 80 kg bags or tins for the last two seasons in the table below.

	Bags cereals '98	Bags cereals '97	Pulses '98	Pulses '97
Yield in 50 kg bags				
Yield in 80 kg bags				
Tins				

State field size in Sesotho Acres. _____
Proportion of field threatened by flooding in %? _____
How are the fields ploughed? _____

The results of the agricultural survey may be seen in Table 8.15. Since many fields regularly lay bare, it was necessary to recall two harvesting seasons to get a realistic picture of the yield from the particular field. While pulses are measured in tins, cereals can be measured in bags of 50kg or 80kg and thus informants had to have the choice between these two bag sizes. Two additional questions were added in order to get an

idea of the size of the field and its proximity to the riparian zone. Although Sesotho Acres are a somewhat shaky unit of area measurement (being one-dimensional), it is the only field unit suitable for interviewing, because it is used within the communities to calculate ploughing fees. Since only a proportion of the fields next to the river could be characterised as being within the Back Dynamic Zone a question on proportions had to be added as well. The last question covers the relationship between agriculture and animal health.

The relatively large variation in percentages of households owning fields next to the river is due to variations in the geographical suitability of the riparian areas for agriculture. Apparently, IFR River Sections 5 and 8 do not have many areas suitable for agriculture next to the river. Similarly, IFR River Section 1, where the river is still young and not yet flowing through a deep gorge, provides better opportunities for agriculture. In IFR River Section 6, surprisingly few households have fields next to the river. The mean yield per field (see Table 8.16) in IFR River Section 6 is, however, considerably higher, which indicates that the field size increases as the Senqu River enters the Foothills and Lowlands. One also has to recognise however that at least 50 % of IFR River Section 6 should be characterised as still being part of the Mountains. The

Table 8.15 Survey results for agriculture within the riparian zone.

Site	% households owning fields next to the river	Average field size in Sesotho acres	Average proportion of field threatened by flooding	Percentage using oxen for ploughing
IFR 1	23.7	10.9	43.9	100
IFR 2	21.9	4.7	56.0	100
IFR 3	15.3	5.9	48.8	100
IFR 4	12.0	7.6	44.5	100
IFR 5	5.1	3.2	29.7	100
IFR 6	12.3	9.3	58.5	92.3
IFR 7	27.2	6.5	26.3	100
IFR 8	3.4	3.6	55.0	100
Overall	12.8	7.7	46.7	97.0

Table 8.16 Survey results for yields within the riparian zone.

Site No	Average annual yield of field (if cultivated) in		Mean annual yield produced within the riparian zone	
	50 kg cereal bags (valid for all HHs who have fields next to river)	Tins of pulses (valid for 10,6% of HHs who have fields next to river)	50 kg cereal bags (valid for all HHs with fields next to river)	Tins of pulses (valid for 10,6% of HHs who have fields next to river)
IFR 1	6.5	2.9	2.8	1.3
IFR 2	3.6	2.6	2.0	1.4
IFR 3	4.2	2.5	2.1	1.2
IFR 4	5.8	3.5	2.6	1.5
IFR 5	1.0	3.0	0.3	0.9
IFR 6	10.9	2.5	6.2	1.4
IFR 7	6.7	4.9	1.7	1.3
IFR 8	5.5	1.2	3.0	0.7
Overall	6.6	3.2	3.1	1.5

variation in the mean annual yields in the various IFR river sections is due to the nature of the riparian zone (gradient and soil quality) and the field size, which is largest in IFR River Sections 1 and 6. Both IFR river sections have many areas where the river is easy accessible and the gradient of the Back Dynamic Zone is not very steep, meaning that agriculture is well established next to the river.

Columns 3 and 4 in Table 8.16 show the mean annual yield of the fields next to the river, which are located within the riparian zone, *i.e.*, the Back Dynamic Zone. The numbers are derived from multiplying the mean yield of an entire field by the proportion of the field which is threatened by flooding (e.g. 6.6 (mean yield in 50 kg bags for all IFR river sections) times 0.47 (proportion of

the fields threatened by flooding) equals 3.1 (total yield in 50 kg bags within the riparian zone).

8.9 CATCHING FISH

Fishing is done at all sites but its importance decreases slightly in the lower reaches, where fewer (or no) semi-professional fishermen are located. All males, but especially boys fish now and then if agricultural activities leave time for it. Some villages have a number (1 to 6) of semi-professional fishermen, who fish on a more regular basis and who sell fish frequently to other villagers or in nearby towns. A number of people, especially within communities along the upper reaches of LHWP-affected rivers, are making an additional income by selling fish to people in Thaba Tseka, Katse, Marakabei and Mohale.

Except along IFR .River Section 5, where the river is deep and the velocity high, the main fishing season lasts from October to March. However, the river is ideal for fishing when it is rather low, with water up to the waist. During the winter months, the fish disappear due to the low temperatures. They hide under big rocks or are said to die because of algae or ice on the river.

The overall abundance of fish is said to be high and unaffected except along the Malibamatso River, where the Katse Dam is said to have seriously affected the number and size of fish.

The techniques which are applied to catch fish, are very simple. Usually the gear consists of a single line with a single hook and a little stone twisted onto the line, approximately 15 cm before the hook. The weight is necessary in order to be able to throw the line and to make the hook and bait sink to the bottom of the river. The most commonly used baits are papa, worms, grasshoppers and small frogs. Nets or fishing rods are hardly used along the LHWP-affected rivers. The fisherman usually sits on a rock on the riverbank and waits until a fish takes the bait.

Although the villagers who were questioned generally communicated fishing as an important river use during the pilot study, the overall significance of fish in their diets is not very high. In fact, most households (84.4%) have not caught fish during the last 12 months. People without access to fish (lack of cash; nobody in the household fishes) never eat it. The households where fish is on the menu regularly are those where one family member does a lot of fishing. In the bigger settlements fishing is less important than in the small and remote villages. Table 8.17 describes the important fish species.

8.9.1 Fish species caught in LHWP-affected rivers

Smallmouth Yellowfish: *Chelelisi*

This fish type appears to be the most common and important at all study sites. The habitat of this species is the bottom of the river and they are not very sensitive to muddy water (although catching them is difficult during floods). Their size ranges from a few hundred grams up to 3 kg. Prices vary accordingly between 1 and 25 Maloti.

Rock Catfish: *Ramahetlana*

These are very small (max.: 25 cm long) but can be found in large quantities. During floods and while the river is very muddy it is the only fish that one is sure to catch. The team was told that one could catch up to 50 *Ramahetlana* on a good day. They are normally not sold but used for household consumption. Herdboys especially catch these fish. In the Highland sections where the real Letsoala does not occur, this fish is often called *Letsoala*.

Sharpteeth Catfish: *Letsoala*, (pl. *Matsoala*)

This species can grow very big (up to 2 meters according to villagers). It lives on the bottom and in the deep pools. Along the Lowland reaches it was a well-known fish species. It is popular for household consumption but caught only occasionally. One has to have heavier fishing gear for the larger fish. Prices start from 20 Maloti and vary according to size.

Rainbow Trout (*Sekhoa*)

Trout has been introduced by the English and is therefore called "*Sekhoa*" (white man's fish). It is well known only in the Highlands. Less abundant than the Yellowfish, it is highly valued. Villagers along the upper Senqunyane River make an income by selling trout to the reopened Marakabei Lodge. Their weight varies between 200 g and 1.5 kg.

Table 8.17 Ichthyofaunal description table.

Scientific Name	Sesotho Name	Common Name	Social Significance
<i>Austroglanis sclateri</i>	<i>Ramahetlana</i>	Rock Catfish	Commonly caught
<i>Barbus aeneus</i>	<i>Chelelisi</i>	Smallmouth Yellowfish	Most commonly caught
<i>Barbus kimberleyensis</i>	<i>Motorofisi</i>	Largemouth Yellowfish	Not commonly caught
<i>Clarius gripius</i>	<i>Letsoala</i>	Sharpteeth Catfish	Not commonly caught
<i>Labeo capensis</i>	???	Orange River Mudfish	Not caught / Fairly unknown
<i>Onchorynchus mykis</i>	<i>Sekhoa</i>	Rainbow Trout	Commonly caught

8.9.1 Survey questions

Has any household member caught fish from the river in the last 12 months? Yes. ____ No. ____
If yes, please give information on species, numbers caught per month and sizes for summer and winter in the table below.

Species	Summer			Winter		
	Lrg	Med	Sml	Lrg	Med	Sml
<i>Chelefisi / Sesotho</i>						
<i>Ramahellana / Letsoala</i>						
<i>Trout / Sekhoa</i>						
Other:						

Species	Price lrg.	Price med.	Price sml.
<i>Chelefisi / Sesotho</i>			
<i>Ramahellana / Letsoala</i>			
<i>Trout / Sekhoa</i>			
Other:			

Where are the fish sold? _____

Code
1=Own village 2=Neighboring village 3=District centre 4=Other _____

How many dead fish (found along the riverbank) has the household eaten within the last 12 months? _____

Results of the fishing survey appear in Table 8.18.

The computed data on fish catches showed that some informants tended to exaggerate (high standard deviation). The presentation of the mean numbers would therefore be misleading to the reader. Fish catches were therefore calculated as overall weight (in kgs) for the various species. The following weights were used:

- 'Large'=1500gr
- 'Medium'=500gr
- 'Small'=200gr

The computation was done for the three major fish species in order to be able to link up with the overall IFR process. Data on the mean catches per fishing household and fish prices are presented in Tables 8.19 and 8.20 respectively.

The reported numbers of the various species are consistent and coincide with both pilot study findings as

well as with the habitat of the species. As expected, catches of the Smallmouth Yellowfish are lowest at IFR River Sections 1 and 2. IFR River Section 1 may not be the perfect habitat for the Smallmouth Yellowfish (and was not sampled by the fish specialists either), while IFR River Section 2 is affected by Katse Dam. The Rock Catfish is caught in its largest numbers in the lower Senqu River. The Rainbow Trout, which is a typical Highland fish, is not caught in the lower Senqu River, but regularly at IFR River Sections 4,5,7 and 8.

Price information is based on interviews with semi-professional fishermen as well as pilot study information.

Of those households who sell fish,

- 71,5% reported to sell fish within their own village
- 11,9% reported to sell fish in the neighbouring villages
- 16,1% reported to sell fish in the district centre.

A total of 12 households reported to have collected dead fish along the riverbanks. This aspect has to be considered as insignificant when considering households. However, data gathered among herdboys (see section 9.6) shows a considerable consumption of dead fish by this particular group.

8.10 PUBLIC HEALTH SECTION

The most commonly reported diseases among communities within the 5 km corridor are flues and colds, various forms of diarrhoea, cholera, typhoid, malnutrition, headaches, respiration problems, chest pain, allergies, etc. In cases where specific health problems can be attributed to the river, this is largely determined by the way villagers interact with the river as well as by the state of the river itself.

As mentioned before, the consequences in terms of public health below Katse Dam are said to be severe in that many villagers reported the water being too contaminated to be safely used as drinking water (see Table 8.22 on casual drinking). Furthermore villagers complain about skin rashes after crossing the river or after swimming in the river. The poor water quality is said to be caused by the growth of algae (*bolele*), due to the reduced flow and small black insects (*thalaboliba*, *maphela*, *mankulunyane*) occurring in the water. While algae growth is a well known problem and part of the water quality study, the above-mentioned small insects

Table 8.18 Survey results for fishing.

IFR-Section	IFR 1	IFR 2	IFR 3	IFR 4	IFR 5	IFR 6	IFR 7	IFR 8	Overall
% HHs who have fished during last 12 months	15.9	13.5	16.3	22.1	14.0	18.2	14.3	9.7	15.6

Table 8.19 Mean fish catches per fishing household per month during the fishing season (approximately 6 months) in kilograms.

Fish species / sites	Smallmouth Yellowfish	Rock Catfish	Rainbow trout
IFR 1	4.1	1.2	2.2
IFR 2	11.7	2.7	2.2
IFR.3	17.5	1.5	1.6
IFR 4	22.6	1.2	4.8
IFR 5	13.0	0.6	8.5
IFR 6	17.9	3.4	0.0
IFR 7	15.4	2.3	7.5
IFR 8	13.0	0.2	6.9
Overall	17.5	2.2	3.0

Table 8.20 Fish prices in Maloti.

Fish Species	Large	Medium	Small
Smallmouth Yellowfish	10 - 15	4 - 10	1 - 3
Rock Catfish	---	---	1 - 3
Rainbow Trout	10 - 20	5 - 10	1 - 5

could not be identified by the IFR process and were thus excluded from the process.

While similar problems are also known at the other sites, they appear to be far less severe in IFR River Sections 1 and 4 to 8 (IFR River Section 7 has experienced periodic problems of colloidal material as a result of various construction-phases of Mohale Dam). Since people from many riverine communities have to resort to the river for drinking during dry seasons or droughts, they are aware of the health threats posed by a low river. In most cases, the problem materialises in attacks of diarrhoea that last for no longer than 2 to 3 days.

The most serious health threats however come in the form of floods, which can drown people, as well as from the river snake, which hypnotises people and drowns them. Skin rashes or skin swellings are equally explained by the river snake and its bad and heavy breathing during lowflows in the river.

It was often noted that the increased heat and cold in the river valley can cause or enhance certain diseases such as colds, asthma or arthritis. Other health problems that were mentioned and that can be related to the river are dirt and mud in the ears after swimming, causing ear infections as well as mosquito bites that turn into ulcers (mosquitoes are said to be more abundant along rivers).

An important way in which rivers can affect the health status of riverine communities is when a flooded river cuts people off from health services.

In order to record the anticipated and quantifiable effects of modified flow regimes on public health, the survey had to focus on three major areas. Firstly, on **household health baseline data** in general, including the nutritional significance of flow-dependent riverine resources in particular. Secondly, on the patterns of **river water utilisation** for domestic purposes and casual drinking. Thirdly, on matters of nutrition concerning certain riverine food resources.

8.10.1 Biophysical link

The link goes via the Public Health Specialist, the Water Quality Analyst as well as the Macroinvertebrate Study. In terms of nutrition, vegetation and fish specialists constitute the link.

8.10.2 Household health baseline data survey questions

Family Health (List all diseases, accidents or disabilities suffered within the last two months)

HHD mem.	Problem	How many days ill	Where / Who treated	Total charge	If none, why not treated

Codes:

PROBLEMS			WHERE TREATED	WHY NOT
1=Respiratory	11=Measels	21=Injury	1= Not at all	1=No need / desire
2=Diarrhea	12=Hepatitis	22=Assault	2=Family/Friend	2=Too expensive
3=Malnutrition	13=Kidney	23=Blind	3=Traditional healer	3=Too far
4=Skin&Tissue	14=Liver	24=Deaf	4=Drug seller	4= Transport too expensive
5=Viral disease	15=Stroke	25=Crippled	5=Village health worker	5=Hours not convenient
6=Burn	16=Cancer	26=Retarded	6=Clinic	6=Did not know where
7=Tuberculosis	17=Diabetes	27=Mental probl.	7=Private doctor	7=Too many waiting
8=Asthma	18=HIV /AIDS	28=Dental probl.	8=Hospital	8=Too sick
9=Heart disease	19=Other STD	29=Other _____	9=Chief	9=Due to work
10=High blood	20=Cold /Flu /Fever	_____	10=Other _____	10=Other _____

Table 8.21 shows the most frequently mentioned health problems in households over the last two months. Health problems, which were mentioned by less than 0.5% of the survey population are not included. The full data set has been passed on to the public health experts for further analysis.

8.10.3 River water utilisation for casual drinking and domestic water supply survey questions

Has any household member used the river for casual drinking while collecting firewood, vegetables, doing washing, etc? Yes. ____ No. ____
If yes, please state the frequency of drinking during summer and winter in the table below.

	Summer	Winter
Drinking frequency per month		

Source of Water for Domestic Use:

Water supply	All year	Dry season	Wet season	Drought	Never
Taps					
Spring covered					

Table (cont.)

Spring uncovered					
Borehole / Pump					
River					
Tributary					
Dam					
Rainwater Tank					

Results of the household health and casual drinking and domestic water supply surveys are given in Tables 8.22 and 8.23 respectively.

Except at IFR River Sections 2 and 3, more than 50% of households use the river for casual drinking, usually whilst conducting other tasks, such as collecting firewood or vegetables, fishing, washing clothes or while working in fields close to the river (Table 8.22). Women and herdboys especially are the groups that frequently use the river for casual drinking. IFR River Section 4 scores the highest value, which has to be seen in relation to the top position of IFR River Section 4 in the fields of shrubs, thatch grasses and leisure activities. As observed in connection to other riparian resources, IFR River Sections 1 and 7, the 'true' Highland IFR river sections, are amongst those using the river a lot. The reason for IFR River Section 2 having usage levels far below average has to be attributed to peoples' fear of acquiring health problems if they drink water from the Malibatso River below Katse Dam. The reason for IFR River Section 3 also being significantly below average may be explained by the fact that a considerable part of the population in IFR River Section 3 lives in Thaba Tseka town. They were thus characterised as being urbanised, resulting in a lower degree of river utilisation.

The above-mentioned frequencies for casual drinking are fairly consistent for both summer and winter, reflecting the fact that communities in general, and women in particular, interact with the river more often during summer, when the riparian vegetation offers a greater range of resources than during winter. Herdboys are expected to be an exception to this rule, in that livestock are mainly kept along the rivers during the three winter months (see also the Animal Health Specialist Report No 648-F-10, on the grazing patterns of the various types of animals).

In Table 8.23., water for domestic use has been distinguished from casual drinking in that it constitutes the water that is carried in buckets to the home of the

Table 8.21 Survey results for household health.

Type of Disease	Frequency (unweighted number of households reporting problem)	Percentage
Cold/ Flu/ Fever	349	25.4
Diarrhoea	119	8.7
Respiratory	77	5.6
Knees, feet, hands	67	4.9
Dental problem	58	4.2
Headache	57	4.1
High blood pressure	56	4.1
Whole body pain	49	3.6
Heart disease	48	3.5
Injury	47	3.4
Stomach pains	38	2.8
Back pain	37	2.7
Tuberculosis	34	2.5
Eyes	32	2.3
Mental problem	20	1.5
Waist	20	1.5
Skin and tissues	20	1.5
Chest	19	1.4
Kidney	16	1.2
Crippled	14	1.0
Blind	13	0.9
Burn	12	0.9
Measles	13	0.9
Old age	9	0.7
Methapo /stress	9	0.7
Stroke	9	0.7
Other STD	8	0.6
Ears	8	0.6
Shoulders	8	0.6
Neck	8	0.6
Asthma	7	0.5
Deaf	7	0.5
Ulcer	7	0.5

Table 8.22 Survey results for the percentage and frequency of casual drinking.

	% of HHs using the river for casual drinking	Average / Frequency / Month	
		Summer (7 months)	Winter (5 months)
IFR 1	58.8	19.5	11.8
IFR 2	19.5	15.6	7.1
IFR 3	40.0	14.5	8.5
IFR 4	71.2	16.7	7.2
IFR 5	49.8	13.1	8.8
IFR 6	50.4	15.8	9.1
IFR 7	57.1	22.3	14.2
IFR 8	51.5	15.8	8.7
Overall	53.1	16.2	89.0

Table 8.23 Survey results for the main water supply systems for domestic purposes.

Percentage of HHs getting water from:						
	Taps all year	Covered spring all year	Uncovered spring all year	River all year	River during dry season (3 months)	River during drought
IFR 1	30.6	27.8	30.6	2.8	12.2	4.9
IFR 2	24.2	18.6	40.0	0.5	2.3	1.0
IFR 3	25.6	24.2	31.6	0.5	---	0.5
IFR 4	41.6	9.3	35.4	0.4	1.3	1.3
IFR 5	53.0	2.3	33.5	---	0.5	2.8
IFR 6	51.3	6.4	12.7	0.4	11.9	33.1
IFR 7	---	29.5	42.9	9.2	8.3	23.5
IFR 8	2.4	18.9	61.7	0.6	2.9	8.7
Overall	41.2	11.0	26.5	1.1	6.2	16.4

respective household. The amount used varies from 7 to 20 litres per capita per day (pilot study information). Since many villages rely on more than just one water source, informants had the choice of ticking more than one option. The first three columns were included in order to contextualise and give background information on variations in the general state of village water supply systems in the various IFRs. Column four shows the percentage of households using the river water for domestic purposes all year round. While the percentages are insignificant at most IFR river sections, IFR 7 differs extremely in that 9.2% of all households rely on river water for the whole year. In actual numbers, this percentage translates to 995 people or 199 households. In IFR River Section 1, 2.8% of the population relies on river water the whole year round. Here, this percentage translates into 208 people (42 households).

In total, the survey recorded 1.1% (1700 people or 340 households), who draw water from the river all year round.

Column five gives the percentage of people drawing water from the river during the dry season. As expected, IFR River Section 6 shows the highest percentage (11.9%; translating into 7152 people or 1430 households), which may be attributed both to the lower degree of reliability of village water supply systems in the Lowlands and to easier access to the river. As already noted in the pilot study report, the Senqu River becomes an important water source during the approximately three months of the dry season. Other IFR river sections, where a considerable percentage of households use the

river for drawing water during the dry season, are IFR River Sections 1 and 7. Here, the reason may be sought in a combination of easy access to the river and low reliability of existing water sources.

In total, the survey identified 6.2% (9584 people) who have to rely on the river as their source of domestic water during the dry season.

The last column shows the percentage of households who draw water from the river during droughts (as in the beginning of the 1990s). One would expect the percentage to be generally higher than during normal dry seasons. This is the case for all IFR river sections and the total but not in IFR River Section 1. The reasons for this anomaly to the general trend remain to be investigated more thoroughly.

As the above numbers show, there is a significant part of the overall population, which is at risk from drinking river water, either during the dry season or all year round.

8.10.4 Nutritional baseline data : survey questions concerning flow-dependent riverine resources

Of the total amount of wild vegetables harvested during the last 12 months, please state the proportions sold, consumed by household members 0 to 5 years old and consumed by household members 6 years and older.

% proportion sold	% consumed by 0-5 year olds	% consumed by 6 and above

Of the overall number of fish caught during the last 12 months, please state the proportions sold, consumed by household members 0 to 5 years old and consumed by household members over the age of 6.

% sold	% consumed by 0-5 year olds	% consumed by 6 and above

Concerning the issue of nutrition, the public health specialists requested all information to be split into those between the ages of 0 and 6 years and those of 6 years and above. Nutritional requirements are different for these two groups, which is the reason why they have to be analysed separately.

Table 8.24 shows how the vegetables that are collected and the fish that are caught are used in households without children under 6 years of age. Generally, fish is more likely to be sold than vegetables are. The sale of vegetables is more widespread in the Highland areas than in the lower Senqu River Valley (IFR River Sections 5 and 6). Fish are sold more often along the Senquyane River than along the other LHWP-affected rivers.

Table 8.25 shows similar data for households with members under six years of age. As may be seen, the regional pattern of the sale of vegetables and fish among households with children under 6 years of age follows that for households without children under 6 years of age closely. Of interest is the fact that once children under six years old enter the household, their portion of vegetables comes from what used to be eaten by the

elder members of the household, while their fish comes from that which used to be sold. In other words, the sale of vegetables is not affected by the presence of children under the age of 6 years, while the sale of fish is significantly affected by their presence in the household. The reasons why the significance of fish as a source of income decreases when there are children under 6 in the household, needs further exploration.

8.11 ANIMAL HEALTH

Animal health in relation to rivers has to be understood in the context of the prevalent range of management practices *i.e.*, at what time of the year and for how long the animals are in contact with the river. In the Highlands, animals spend a relatively short period of the year along the river. Along the Senqu River Valley many communities do not have cattle posts in the mountains (or they are not in use any longer due to stock theft), thereby reducing the overall grazing area to the river valley itself and the fields surrounding the village plus some areas nearby. It goes without saying that longer periods in the river valley increase the occurrence of river related animal health problems.

As was the case with public health issues, problems were said to increase when the river level falls beyond a certain minimum, after which algae (*bolele*) and a number of insects are not washed away any longer. Animals drinking water from stagnant pools are reported by villagers to be more likely to acquire certain diseases. A number of river-related diseases are also explained by the increased heat, the abundance of fleas, ticks and flying insects as well as the rocky and steep terrain in the river valley.

Table 8.24 Mean proportions of vegetable and fish utilisation in households without children under 6 years of age (63.3% of all households).

Site	Percentage of vegetables sold	Percentage of vegetables eaten by household members 6+ years of age	Percentage of fish sold	Percentage of fish eaten by household members 6+ years of age
IFR 1	10.6	89.2	27.2	72.8
IFR 2	5.3	94.2	32.8	67.2
IFR 3	13.3	86.7	36.2	63.7
IFR 4	5.4	94.3	45.3	54.7
IFR 5	---	100	20.9	79.1
IFR 6	---	100	30.3	69.0
IFR 7	8.8	90.2	53.3	46.7
IFR 8	1.6	98.0	55.0	45.0
Overall	3.7	96.2	34.4	65.3

Table 8.25 Mean proportions of the vegetable and fish distribution in households with children under 6 years of age (36.7% of all households, with a mean of 1.35 children under 6 years of age per household).

Site	% of Vegetables sold	Percentage of vegetables eaten by household members 0-6 years of age	Percentage of vegetables eaten by household members 6+ years of age	% of fish sold	Percentage of fish eaten by household members 0-6 years of age	Percentage of fish eaten by household members 6+ years of age
IFR1	5.1	12.2	82.6	32.5	11.6	55.9
IFR2	5.8	14.6	79.6	38.5	8.6	53.1
IFR3	6.9	15.8	77.3	32.3	9.2	58.5
IFR4	4.3	10.5	85.2	34.0	7.7	58.3
IFR5	---	9.1	90.9	10.3	6.0	83.7
IFR6	3.0	12.4	84.6	20.0	8.9	71.1
IFR7	12.3	16.7	70.9	26.9	9.2	63.8
IFR8	2.40	11.8	85.8	35.0	15.8	49.8
Overall	4.1	12.1	83.7	24.1	8.3	67.6

Lists of river-related animal diseases, as well as the insects that are said to result in animal health problems are given in Tables 8.26 and 8.27 respectively.

The periods that animals spend along the rivers are largely determined by the local range management plans (if there are plans that are followed). The results show that the river is used as a grazing ground mainly during the winter months. Here, animals can escape the cold and snow in the mountains and at the same time feed on the leftovers in the nearby fields. Where cattleposts are available in the high mountains, the majority of animals use them during the summer months. A certain number of animals remain in the village to do work in the fields. These animals graze along the river for a much longer period. The quality of grazing in the river basin and on the riparian zone varies from site to site. Floods are said to improve the quality of grazing significantly.

Conflicts over grazing areas and rights are common in rural Lesotho, the riparian areas being no exception from that rule. Since water itself is the most significant free resource, watering of animals is permitted for anybody who wishes to do so. During droughts, Lesotho's rivers become lifelines for a large number of animals.

8.11.1 Biophysical link

The biophysical link goes via the botanists, the animal health specialist, the water quality specialist as well as the macroinvertebrate specialist.

8.11.2 Survey questions

<p>Has the household any animals at present? Yes. ____ No. ____</p> <p>If yes, please give information on number, type, disease pattern, riparian grazing pattern and mortality of the domestic animals within the household.</p>

Type	No	Diseases (last 12 months)			Months present on river	Hours / Day	Deaths / last 12 months	Cause of death
		No	What	When				
Cattle (0-6 mnths)								
Cattle (>6 mnths)								
Sheep (0-4 mnths)								
Sheep (>4 mnths)								
Goats								
Horses / Donkeys								
Pigs								
Fowl								

Codes:

Diseases & Death Reasons:

- | | | |
|--------------------------|--------------------------|----------------|
| 1=Lintla | 10=Letsoella | 19=Other _____ |
| 2=Bluetongue | 11=Maphela | 20=Unknown |
| 3=Hloana (Horsesickness) | 12=Kuidi (Insect) | |
| 4=Papisi | 13=Mankukunyane (Insect) | |
| 5=Seterefe | 14=Thalaboliba (Insect) | |
| 6=Matsetse / Lekhoekhoe | 15=Bolele (Algae) | |
| 7=Nyooko | 16=Stuck in Mud | |
| 8=Manyooa | 17=Starvation | |
| 9=Monyekane | 18=Lekhethe | |

Disease when:

- | |
|------------|
| 1=Summer |
| 2=Winter |
| 3=All Year |

Table 8.26 River-related animal diseases.

Sesotho Name	English Name	Scientific Name	Characteristics
<i>Linta</i>	Fleas	<i>Ctenocephalides spp.</i>	Mainly Cattle
<i>Papisi</i>	Bots	<i>Gasterophilus intestinalis</i>	Mainly Horses
<i>Seterefe</i>	Strangles	<i>Streptococcus equi</i>	Horses / Donkeys
<i>Sheep Scab</i>	Sheep Scab	<i>Psoroptes ovis</i>	
<i>Matsetse/Lekhoekhoe</i>	Mange (Cattle) Mange (Cattle&Horse) Mange (Sheep) Ticks	<i>Sarcoptes scabiei var bovis</i> <i>Psoroptes Equi Var Bovis</i> <i>Psorptes ovis</i> <i>Boophilus spp.</i>	External Parasites
<i>Nyooko</i>	Tick Fever Red Water	<i>Anaplasma spp.</i> <i>Babesia spp.</i>	Mainly Sheep
<i>Manyooa</i>	Roundworms Tapeworms Coccidiosis	<i>Haemonchus contortus</i> <i>Strongyloides</i> <i>Ostertagia spp.</i> <i>Oesophagostomum spp.</i> <i>Cestoda spp.</i> <i>Coccidia spp.</i>	Internal Parasites
<i>Monyekane</i>	Enterotoxaemia	<i>Clostridium Type D</i>	During Drought
<i>Letsoetla</i>	Laminitis Hoof Rot	<i>Staphylococcus & Streptococcus spp.</i> <i>Sphaerophorus necrophorus</i>	Hoof Disease
<i>Maphela</i>	Liver Fluke	<i>Fasciola hepatica</i>	Snails

Table 8.27 Water Insects that are said to result in animal health problems.

Sesotho Name	English name	Scientific name
<i>Mankukunyane</i>	Unknown	Unknown
<i>Kuili</i>	Beetle type	<i>Coleoptera</i>
<i>Thalaboliba</i>	Beetle type	<i>Gyrinidae</i>

Is the river the only source of water for livestock during the dry season and during severe droughts?

	Yes	No
Dry season	_____	_____
Severe droughts	_____	_____

As can be seen, the logic of the above questions is to establish the baseline morbidity and mortality information needed in case animal health is affected by modified flow regimes as well as to calculate the costs of preventing outbreaks or epidemics of certain diseases. The information is specified in various categories of animals due to the fact that they have different patterns of interactions with the rivers.

To establish and quantify grazing patterns, it was decided to count the number of months per year and hours per day that animals spend along the rivers. Knowledge of how much certain animal categories consume per hour, which is known to the animal health

specialists can be used to determine a particular 'grazing amount'. To establish the watering patterns of animals, two Yes / No questions were added. Their aim is to determine the frequency of river use for watering animals during the dry season and droughts.

The results of the animal ownership and watering pattern survey, as well as the animal numbers within the corridors along the LHWP-affected rivers are presented in Tables 8.28 and 8.29 respectively.

The comprehensive results of the animal health section of the socio-economic survey, such as the grouping of the animal numbers, diseases, reasons for death, grazing patterns, etc., have been passed on to the animal health specialist of the IFR social team for further analysis. Animal numbers were grouped in order to explore the distribution of their means. Diseases and reasons for deaths were grouped in two ways: firstly, into viral diseases, external parasites,

internal parasites, diarrhoea for unknown reasons, bacterial diseases and other; and secondly, into diseases and reasons for death, which were directly river-related and those which were not. The animal health specialist will proceed with the final analysis and interpretation of the collected data. For those readers without access to the animal health specialist report, Tables 8.30 and 8.31 show the occurrence of diseases and deaths that are directly river-related (diarrhoea, Manyooa, insects (*Kuidi*,

Thalaboliba, *Mankukunyane*), algae, bogging) for all IFR river sections.

These results illustrate that certain animal categories are at higher risk than others. Sheep and goats in general and sheep under the age of four months in particular are especially vulnerable to river-related diseases.

Table 8.28 Survey results for animal ownership and watering patterns.

Site	% HHs owning Animals	River-dependent during dry season (3 months)	River-dependent during drought
IFR 1	79.6	64.1	80.8
IFR 2	67.0	23.8	55.8
IFR 3	47.9	48.4	59.5
IFR 4	58.4	44.7	64.6
IFR 5	57.7	22.8	59.1
IFR 6	66.5	20.8	53.8
IFR 7	73.3	41.5	65.5
IFR 8	62.1	27.7	55.3
Overall	62.5	31.5	56.0

Table 8.29 Animal numbers within the corridor along LHWP-affected rivers (in means per household for the total population).

	Cattle	Sheep	Goats	Equines	Fowl	Pigs
IFR 1	3.8	2.9	2.7	1.3	2.3	0.1
IFR 2	2.4	4.8	2.3	1.1	1.6	0.04
IFR 3	1.7	2.4	1.3	0.5	1.2	0.01
IFR 4	1.8	3.1	2.4	0.8	1.8	0.01
IFR 5	1.6	2.1	3.9	0.6	1.1	0.01
IFR 6	2.0	1.4	5.2	0.6	1.7	0.2
IFR 7	3.6	6.2	6.1	1.3	2.0	0.1
IFR 8	1.7	1.6	5.7	1.1	2.7	0.1
Overall	2.1	2.4	4.0	0.7	1.6	0.1

Table 8.30 River-related diseases amongst animal categories along LHWP-affected rivers.

Percentage of animals having suffered from a directly river-related disease within last 12 months						
	Cattle: 0-6 months	Cattle: 6+ months	Sheep: 0-4 months	Sheep: 4+ months	Equines	Goats
Overall	0.0	4.0	45.0	19.6	1.8	27.1

Table 8.31 River-related deaths amongst animal categories along LHWP-affected rivers.

Percentage of animals having suffered from a directly river-related death within last 12 months						
	Cattle: 0-6 months	Cattle: 6+ months	Sheep: 0-4 months	Sheep: 4+ months	Equines	Goats
Overall	4.0	4.7	49.2	9.3	3.0	22.2

8.12 SAND MINING FOR PRIVATE AND COMMERCIAL PURPOSES

In order to manufacture concrete blocks for the construction of houses, one needs coarse (rough) sand, fine sand, water and cement. Rivers can deliver the first two things. However, since water is also available from other places, more block makers are to be found in other sites than close to the rivers. Block making needs substantial amounts of sand, which requires access to the river by motorised transport. This reduces the sites where large scale sand-mining can be done to a few places, such as Marakabei bridge, Koma Koma bridge or the road along the Senqu close to Whitehill / Tebellow. Sand mining on a larger scale is done by a truck, bakkie or tractor entering the riverbed while the river flow is low. Men are usually hired (not necessarily from the local village) to dig the sand and fill up the truck or tractor. Although in theory permission is needed in order to mine sand on a larger scale, this law is not enforced everywhere. Sand is thus classified as a "partly free" and "partly controlled" resource. The corridor of people benefiting from river sand and the associated block making is large. Whether people choose a house built of modern blocks or stones is largely a question of income and access to building materials.

Sand comes with, and is replaced by, floods. Should the river not flood any more, a decrease in the amount of sand, especially the rough type (which needs higher flow velocity to be transported through the river channel), is to be expected. Villagers along the Malibamatso River already complain about the river becoming less sandy and more muddy as the result of the low flow since the construction of Katse Dam.

8.12.1 Biophysical link

The link goes via the sedimentology / geomorphology specialists. The volume and associated velocity of low flows and high flow events determine the shape of the river channel and pool depth as well as the transport and deposit of coarse and fine sand and colloidal material. Modified flow regimes are thus likely to affect the availability of sand resources.

8.12.2 Survey questions

Has any member of the household mined sand from the riparian zone within the last 12 months?

Yes. ____ No. ____

If yes, state the type, amount and unit of sand mining.

Sand type	Number	Units	Price per Unit
Rough Sand			
Fine Sand			

Code:

1=Bucket 2=Wheelbarrow 3=Bakkie/load 4=Truckload 5=50kg bags 6=Other

The results of the sand mining survey may be seen in Table 8.32. Of those households who reported having harvested sand within the last 12 months, 56.9% have harvested rough (coarse) sand. Of those households who reported having harvested sand within the last 12 months, 100% have harvested fine sand.

The bucket and the truck seem to be the most significant units of harvesting of both sand types (see Tables 8.33 and 8.34). Why the scotchcart is so important in the case of fine sand but completely insignificant in the case of rough sand, needs to be explored further. Both prices and mean annual amounts are fairly consistent. The wheelbarrow is an insignificant measurement unit and thus no price was given.

8.13 BAPTISM

Rivers in Lesotho play an important role within the various cultural and religious ceremonies that are conducted on a regular basis. Roughly, the groupings that use the river for their ceremonies can be separated into the **Apostolic Church**, the **Zion Church**, the **Sangomas** and traditional healers, as well as the **initiation schools**. However, as the borders of these groups' spiritual knowledge systems are not clearly demarcated, they cannot be understood independently from one another. All of them relate to a rather vaguely described esoteric power within the river. Both churches and sangomas conduct similar cleansing rituals and often it turns out to be the same person acting within a church or as the traditional healer. Distinctions between the cultural systems that determine river use among churches and sangomas are blurred and may appear confusing to the outsider at first glance.

Both Apostolics and Zionists use the river for the baptism of new members and for cleansing purposes. Baptising has to be done in the river because Jesus Christ is said to have been baptised in a river. Cleansing is done with the intention of giving one's sins to God. Members of a particular fraction within the Apostolic Church also drink river water for cleansing. Although information varies

slightly from site to site, it appears that baptisms are done on a regular basis and especially around Christmas
Table 8.32 Survey results for sand mining.

IFR-Section	IFR 1	IFR 2	IFR 3	IFR 4	IFR 5	IFR 6	IFR 7	IFR 8	Overall
Percentage of households mining sand	37.6	13.5	9.8	9.7	5.1	8.1	10.6	4.9	9.3

Table 8.33 Average amounts and prices of rough sand harvested.

Unit	Bucket	Wheelbarrow	Bakkie	Truck	50 kg Bag	Scotchcart
Percentage of those who reported having mined rough sand	36.7	5.2	6.5	29.0	21.5	1.1
Mean annual amount harvested	7.1	5.2	4.3	3.75	8.7	5.0
Mean price per unit	5.0 (mode)	---	86.4	226.2	30.0	60.0

Table 8.34 Average amount and price of fine sand harvested per household.

Unit	Bucket	Wheelbarrow	Bakkie	Truck	50 kg Bag	Scotchcart
Percentage of those who reported having mined fine sand	16.1	2.0	2.6	16.3	18.3	44.8
Mean annual amount harvested	5.2	7.3	3.6	5.0	7.4	7.1
Mean price per unit	5.0 (mode)	---	99.2	235.7	32.5	42.0

and Easter and on Sundays during summer. This may be attributed to the higher water level and the higher water temperature. The person to be baptised has to stand in the river up to the chest level and be immersed by the priest up to 7 times. This activity requires a site where one can stand safely in the river and at the same time being sufficiently covered by the water. Usually a pool is chosen where the flow is not too strong. It rarely happens that the river is too low for this activity, thereby forcing the religious community to postpone the baptising. The Apostolic Church is present at all sites, whereas the Zionists were mentioned more often along IFR River Sections 5 and 6. There are usually alternative sites present for baptising. In fact, as it is considered to be dangerous to baptise in the Senqu River, a smaller tributary is often chosen for baptisms (e.g. the Sebapala River, Tsoelike River, Mashai River, etc).

8.13.1 Biophysical link

The link goes mainly via the sedimentology specialists, who predict that modified flow regimes will impact the outlook and depth of pools, which are necessary for baptism. Water quality may have importance as well in case the water quality becomes critical for this activity.

8.13.2 Survey questions

<p>Has any member of the household used the river for baptism or other ceremonial purposes in the last 5 years? Yes. ___ No. ___</p> <p>If yes, is there any alternative baptism site outside the main river? Yes. ___ No. ___</p> <p>If yes, what additional time is needed to reach this alternative site? _____</p> <p>What is the anticipated cost of reaching this alternative site? _____</p> <p>Would you be willing to be transported to an alternative baptism site? Yes. ___ No. ___</p>
--

The results of the baptism survey may be found in Table 8.35. The following points should be noted:

- The mean time to reach the alternative site is approximately 3 hours.

Table 8.35 Survey results for baptism.

Site	Percentage HHs who have used the river for baptism within the last 5 years	Percentage HHs who stated that an alternative site is available	Percentage of HHs who are willing to be transported to alternative site
IFR 1	24.1	4.5	10.6
IFR 2	10.2	0.8	6.0
IFR 3	8.4	7.6	6.4
IFR 4	8.8	11.8	11.0
IFR 5	9.8	17.7	4.4
IFR 6	16.1	14.8	18.6
IFR 7	10.6	13.5	7.9
IFR 8	6.8	13.1	3.2
Overall	12.5	12.7	11.5

- The anticipated mean cost is 11 Maloti.

The overall significance of the rivers for baptism is fairly consistent with an overall of 12.5%. The only exception was recorded at IFR River Section 1, where the percentage of people who have used the river for baptism within the last five years is significantly higher (24.1%) than in other river sections. This indicates that the churches, such as the Apostolic Church and the Zionist Church, who frequently use the river for baptism are more widespread in IFR River Section 1.

The question of alternative sites for baptism is dependent on whether there is a suitable tributary in the nearby surroundings. Since tributaries in the Highlands rarely reach a volume that makes them suitable for baptism, the percentage stating that alternative sites are available is naturally low in IFR River Sections 1, 2 and 3. In the remaining 'true' Highland site, IFR River Section 7, a number of respondents regarded the Makhalleng River as well as the Mantsonyane River as alternative baptism sites. The final question on willingness to be transported to an alternative baptism site did not turn out to be completely culturally sensitive, as it is the priest alone who can decide on the matter. The pattern of responses seems to reflect the accessibility of the river *i.e.*, where there are roads along the river, the willingness to be transported is higher. In truly remote areas, respondents can hardly imagine how they could be transported to an alternative site. The answers reflect the problems in asking questions which are not based on realistic options

but aim at calculating the replacement value of a river service.

8.14 LEISURE

Various types of sport, such as swimming, running, fighting and horse riding are practised along and in the river, mainly by young males. Furthermore, it is not unusual to find Basotho sitting with a view of the river enjoying themselves. Riverine populations find the river very beautiful, especially when it is flooded. Elderly people can tell stories about the beauty and abundance of natural resources along the rivers many years ago.

8.14.1 Biophysical link

The link goes via the sedimentology specialists and the hydrology and hydraulics specialists. In the case that water quality were to suffer considerably, water quality specialists become relevant too. Otherwise, the pools and river stretches that are used for swimming and the river banks, which are used for running and horse-training are mainly described by the above mentioned disciplines.

8.14.2 Survey questions

Has any member of the household used the river for leisure purposes (swimming, exercising, etc.)?

Yes. ___ No. ___

If yes, is there any alternative leisure site outside the main river? Yes. ___ No. ___

If yes, what additional time is needed to reach this

alternative site? _____
 What are the costs of reaching this site? _____
 Would you be willing to be transported to an alternative
 leisure site? Yes. ____ No. ____

Table 8.36 reflects the results of the leisure survey. The following points were evident:

- The mean time taken to reach the alternative site is 1.1 hours.
- The anticipated cost is 9.2 Maloti.

An overall percentage of 31.9% of all respondents reported to have used the river for leisure purposes,

mainly swimming and exercising. The low percentage in IFR River Sections 2 and 3 is most likely due to peoples' fear of contaminated water, below Katse Dam, which is said to cause skin rashes. The other decisive factor determining whether people use the river for leisure purposes or not is the belief in the river snake. As noted during the pilot survey, the belief in the river snake is especially widespread in the lower Senqu River valley, which could explain the low percentage of usage at IFR River Section 6. Similarly to the issue of baptism (see Table 8.35), the availability of alternative sites seems to be more limited at IFR River Sections 1, 2 and 3.

Table 8.36 Survey results for leisure.

Site	Percentage of HHs who have used the river for leisure	Percentage of HHs who stated that an alternative site is available	Percentage of HHs who are willing to be transported to alternative site
IFR 1	46.9	9.0	18.5
IFR 2	21.4	4.3	10.6
IFR 3	23.7	5.4	9.4
IFR 4	59.7	37.7	21.3
IFR 5	30.2	24.4	6.8
IFR 6	22.5	13.7	16.2
IFR 7	30.0	18.2	19.7
IFR 8	24.8	18.8	5.0
Overall	31.9	18.7	14.6

PART 9: RESULTS FOR SPECIFIC RIVER USER GROUPS

9 RESULTS OF SPECIFIC RIVER USERS INTERVIEWS

During the course of the pilot study, it was observed that a limited number of people use the river in a more extensive way than the average household does. Their number is very limited, which is the reason why Phase 2 had to target them, using different tools. However, it is acknowledged that the riparian zone, or the river itself are important elements of their livelihoods. Therefore, they can be designated as semi-professional. In practice, the boundary between an 'ordinary, average river using household' and a 'semi-professional river user' is, of course, a blurred one.

For a final calculation of the overall economic value of their activities, a determination of their numbers (e.g. how many semi-professional fishermen live along LHWP-affected rivers?) would be crucial. To do this, one would have to elaborate a precise definition of who qualifies as a semi-professional river user. However, since part of this group has been captured in the household survey by random sampling procedures, the overall income generated by fishermen, herbalists and sand miners has to be considered to be included in the overall economic value, captured by the socio-economic household survey. The percentage of households collecting vegetables for sale, plus the number of herdboys, is available from the household survey information. The economic value of forest-owners' activities can be calculated from the overall number of trees harvested, which is outlined in section 8.6. The remaining gap in the overall economic value is thus made up of the total number of boat operators.

The aim was thus to conduct interviews with one representative of each group in each cluster, giving an ideal number of 32 informants per group. In a few cases, however, the teams had difficulties in locating a representative of each group in each cluster. In some

cases, for example, there was no herbalist in the village. In other cases, the only boat operator in the village was away.

9.1 FISHERMEN

As fishing during the winter months has to be considered negligible (see also section 8.9). Table 9.1 relates only to spring, summer and autumn and shows the mean catches and prices of three species and three sizes.

- Since catches of Sharpteeth Catfish are negligible, this species was not included in the table.
- The average time that semi-professional fishermen spend fishing varies from 6 to 45 hrs. per week, with a mean of 26.9 hrs. per week during the fishing season (6 months).
- The cash income that fishermen can generate by selling fish ranges between 5 and 300 Maloti per month with a mean of 86 Maloti per month during the fishing season (6 months).

9.2 HERBALISTS

The herbalist section in the specific river users interviews encountered a number of methodological problems. Firstly, and as already noted in the pilot study report, many herbalists are uncooperative and not willing to share their knowledge with outsiders. Secondly, the list of herbs generated by this exercise contains many unidentified herbs. Thirdly, as prices (if given at all) usually come as a whole prescription of a certain medicinal treatment, it is difficult to determine the proportion of the herb-value within the entire treatment. For the process of quantifying the economic value of herbalists' activities, it is referred to the medicinal plant section within the household interview chapter of this report.

Table 9.1 Fishermen catches and prices per month.

Species	Large/Mean Price	Medium/Mean Price	Small/Mean Price
Smallmouth Yellowfish	11.4 / 14 Maloti	14.3 / 6.7 Maloti	12.6 / 3.6 Maloti
Rock Catfish	---	---	23.3 / 2.7 Maloti
Rainbow Trout	No catches reported	15 / ---	No catches reported

9.3 SAND MINERS AND CEMENT BLOCK MAKERS

Sand mining is done along all LHWP-affected rivers and has already been discussed in the household interview section. However, many professional block makers travel long distances to mine sand for the manufacturing of blocks. Many of them live outside the 5 km corridor, which is the reason why they had to be targeted separately.

- The “average” block maker harvests a mean of 6.5 truckloads per month for a mean price of 310 Maloti over a period of 8.6 months per year. In most IFR river sections, sand mining is not possible during part of the year due to the high water level.
- The proportional value of sand (in relation to cement, labour, water and transport) in one brick is said to be around 30%.

9.4 BOAT OPERATORS

This category of river users was only recorded in IFR River Sections 4, 5, 6 and 8. The reason for the lack of boat operators in the Highlands is that river depth is lower, making the periods when crossing by foot is not feasible much shorter. In addition to that, the high velocity of a flooded river at IFR River Sections 1, 3 or 7 would make the regular operation of a boat crossing difficult.

The number of months during which boats operate varies from 6 (in the upper IFR River Section 4) to 12 from IFR River Section 5 downstream, due to the increasing depth and width of the Senqu River. The number of passengers depends on the size of the settlement where the crossing is located, but as a rule, it is highest during December due to Christmas activities and lowest during the dry winter months, when crossings by foot or by car are more feasible.

The economic value of this activity is usually independent of the number of passengers, as most boats are operated by the government, guaranteeing the operator a fixed monthly salary between 800 and 975 Maloti. Since the survey was conducted during winter months, no private operators were located. However, during the pilot study, which was conducted during summer, the team noticed a number of private initiatives, either in private or in government boats, making a considerable income from

taking people across the river. The total number of private or government boat operators is unknown.

9.5 FOREST OWNERS

There are a number of individuals who own and sell trees from the riparian zone. Both willows and poplars are owned and sold. In many cases, it is the chief who claims to own the trees. The forest owners, who were localised by the Phase 2 study had, in the last 12 months sold:

- an average of 4.1 willow trees for a mean price of 60.5 Maloti per tree and
- An average of 9.1 poplar trees for a mean price of 32.7 Maloti per tree.

In some villages that were visited, villagers could harvest the trees that they needed from the riparian zone free of charge after having asked for permission from the chief.

9.6 HERDBOYS

The activities that are conducted by herdboys along the river remain hidden to other family members and would have been overlooked by an exclusive household survey. Herdboys, who live within the 5 km corridor, make up approximately 7.5% (n=3432) of the survey population between 5 and 16 years of age and spend an average of 5.4 months along the river. They usually take livestock down to the river during the cold and dry winter months and into the spring. During the rest of the year, a smaller number of animals are held in the river basin. These are often smaller animals, such as goats, or those, which do the ploughing work around the villages.

While the collection of vegetables is completely insignificant among herdboys, fish appears to be an important element in their daily diet during the months they spend along the river. The mean number of fish caught per month is 20.8, the majority of which are of the small Rock Catfish species and small to medium sized Smallmouth Yellowfish. Occasionally, they collect dead fish, the mean being 7.9 dead fish during the last 12 months. The fact that herdboys are usually present along the river during the winter months when fish die due to low water temperatures means that herdboys often find dead fish along the riverbanks.

Apart from IFR River Section 2, most herdboys drink from the river on a daily basis and without serious health problems being reported.

9.7 COMMERCIAL VEGETABLE COLLECTORS

The percentage of households in each IFR river section who collect wild vegetables for sale may be found in Table 9.2. Table 9.3 contains the overall percentages of households collecting *Selae*, *Tenane* and *Sepaile* for sale. The following points became evident during the wild vegetable collection survey:

Of those who collect *Selae*,

- 76% reported to collect between 8 and 40 plastic bags per month;
- 35% reported to collect for between 2 and 3 months per year;
- 44.7% reported collect for 12 months per year (matches botanical description of availability all year);
- 70.9% reported the price for one plastic bag of *Selae* to be between 0.50 and 2.50 Maloti;

Of those who collect *Tenane*,

- 73% reported to collect between 8 and 20 plastic bags per month;
- 72% reported to collect for between 3 and 7 months per year (matches botanical description of seasonal availability);
- 73.7% reported the price for one plastic bag of *Tenane* to be between 0.50 and 2.50 Maloti;

Of those who collect *Sepaile*,

- 81% reported to collect 8 to 40 plastic bags per month;
- 70.8% reported the price of one plastic bag of *Sepaile* to be between 1.00 and 4.00 Maloti;
- *Sepaile* grows during autumn and summer only

Table 9.2 Survey results for the collection of wild vegetables for sale.

	IFR 1	IFR 2	IFR 3	IFR 4	IFR 5	IFR 6	IFR 7	IFR 8	Overall
Percentage of HHs who collect wild vegetables for sale	11.4	3.3	6.0	6.2	---	1.3	7.4	0.5	3.4

Table 9.3 Percentages of households collecting *Selae*, *Tenane* or *Sepaile* for sale.

Species	<i>Selae</i>	<i>Tenane</i>	<i>Sepaile</i>
Of all households collecting for sale, percentage of households collecting this particular species	32.4	26.5	47.0

SECTION 10: QUALITATIVE INFORMATION**10 QUALITATIVE INFORMATION ON RIVERINE ASPECTS AND ELEMENTS OF RIVER UTILISATION WHICH ARE NOT QUANTIFIED**

Numerous discussions between LHDA, Metsi Consultants and all members of the social team have resulted in a number of river related factors, which were identified during Phase 1, being left out from the socio-economic survey of Phase 2. It is, however, anticipated that not everybody reading the Phase 2 report is familiar with the findings of Phase 1. River-related aspects, which were not included in Phase 2, are thus briefly presented during the course of this chapter.

10.1 FLOW REGIMES

This section describes varying flow regimes and the social significance they have according to the interviewed communities in detail. Focus is directed upon recent changes in flow regimes and their consequences, as well as on the positive and negative aspects of floods and low flows in rivers.

10.1.1 Changes in flow regimes

Apart from extreme floods and severe droughts recalled by interviewees, the most significant change in the flow regime (mainly IFR River Sections 2 and 3) of LHWP-affected rivers can be traced back to the construction of **Katse Dam**. Naturally, the severity of the impact is highest in IFR River Section 2, immediately downstream of the Katse impoundment. For the other sites (the entire Senqu River downstream of the Malibatso confluence), the impact materialises in that floods are said to have become lower and less violent. This is noticed even as far downstream as the confluence of the Senqu and Tele Rivers.

In IFR River Section 2, changes in the flow regime of the Malibatso River are said to have resulted in a number of **negative consequences** such as poor water quality, less fish, less sand, more mud, public and animal health problems and more stock theft due to the loss of the higher water level that had previously functioning as protection against stock thieves. The positive consequences that were mentioned were easier crossing of the river and the possibility of extending fields towards the river. In IFR River Sections 3 and 4, the major complaint is less fish, because the upper Malibatso is said to have functioned as a breeding ground for a

number of fish species before the Katse Dam was built. In the remaining IFR river sections that were affected by the construction of the Katse Dam, the impact is seen as mainly positive in that the floods are less violent and disastrous. Apart from the deposits of sand, soil and seedlings, the extreme floods can cause great trouble to riverine populations. Floods can make the river difficult to cross or extend the periods when crossing is impossible, as well as endangering humans, animals and fields, uprooting trees and other plants in the riparian zone etc.

Concerning extreme variations in the flow regime of LHWP-affected rivers, everybody remembers the drought of the early 1990s and the associated low flows in the rivers, as well as the last truly high floods. The destruction that was caused by these floods can still be seen in the form of damaged fields along the river. The extreme flow levels associated with these events will not be dealt with in detail. In what follows the focus will be directed towards "normal" floods and "normal" low rivers, which occurs on a regular basis at least once a year.

10.1.2 Positive and negative aspects of floods

Floods have a range of positive and negative aspects that will be outlined below. Despite the fact that an overall picture emerged of floods being a nuisance rather than of enormous benefit, during the fieldwork in all 8 pilot sites as well as in the 141 villages, where the socio-economic survey was conducted, many villagers acknowledged that floods are a natural and necessary part of "their" river.

On the one hand, floods carry certain resources with them. The most important are debris and logs, sand, soil, seedlings and certain species of fish. Since floods do not only "bring" these resources but also "take" them away (*i.e.*, wash away sediment and uproot vegetation), the real benefits are depicted as not very significant, from the point of view of the villagers. More important is the water itself that supports part of the riparian vegetation, such as willows, reeds, *leloli*, herbs and vegetables. Not to be underestimated is, in some cases, the role a high river can play in preventing stock theft, especially in IFR

River Sections 5 and 6. In the same areas floods also play an important role in supplying the crops that grow close to the river with moisture and nutrients.

The negative aspects of floods are numerous and can be separated into problems associated with the difficulty or inability to cross the river and the damage that is done to riverine resources. The range of social / economic / health problems caused by flooded rivers is too large to be mentioned in detail. Examples are cancelled visits to relatives, the inability to go shopping or grinding maize, missed exams by schoolchildren, weaned babies whose mothers were stuck on the other side, serious diseases that couldn't be treated in time, miners who lose their jobs due to delayed departure, shop owners losing out on income due to people unable to cross to shop at their stores etc. What people are most concerned about is the risk of drowning for people and animals and the risk of fields getting eroded. It is then when the river directly threatens the dominant livelihood dynamics of riverine populations.

Only a few informants had clear ideas about positive and negative aspects of specific floods within the annual cycle. Two informants in IFR River Sections 7 and 8 stated that a high flood at the end of the rainy season could be of benefit as it provides sand for the sand-mining season (when the river is low) as well as debris and logs for the cold winter months. One informant in IFR River Section 7 mentioned the increased need for firewood for Christmas celebrations as a good reason why floods before Christmas are important. However, floods before and after Christmas are also thought to be a nuisance for villagers on the "wrong" side in the middle and lower stretches of the Senqu because their need to cross the river (for travelling, visiting and shopping) are most urgent during this time.

In short, in the view of most people, the negative aspects of flooding clearly outweigh any advantages to be gained.

10.1.3 Positive and negative aspects of low flows

Although low flows do cause some specific problems, most informants clearly preferred a relatively low river. The crucial question remains: **how low a river?** For the vast majority of informants, the ideal water level is around knee deep. Most women prefer it a little below the knee, while many men actually describe the ideal level between the knee and the hip. This difference can be attributed to

the physical ability to cross the river, as well as the gender specificity of river-related activities.

A flow level between knee and hip height enables riverine populations to carry out their daily tasks, such as washing, watering animals, firewood collection, etc. easily and makes crossing the river by foot feasible. However, whilst big animals such as cattle, horses and donkeys can easily cross the river, sheep and goats can't. As the smaller animals roam the valleys more freely, this was appreciated by many informants.

Only a few people in IFR River Sections 5 and 6 opted for a higher river level, stressing the positive impact of a higher water level on a number of riverine resources, while indicating that crossing the river by boat is easy and cheap.

Once the flow of the river falls beyond a certain minimum (*i.e.*, far below knee level; when many pools appear in the riverbed and when the river is flowing too slowly from pool to pool), a number of new problems emerge. If the flow is substantially reduced, the water temperature tends to rise and certain bacteria and algae (*bolele*) are said to grow in the river. Small black insects also appear. Both the algae and insects are said to seriously affect the quality of the water, thereby harming animals and people, or preventing the use of river water for drinking purposes and watering animals. Sheep, especially can acquire a deadly liver disease from drinking water that contains "*maphela*"). In case of a very low flow, other negative aspects mentioned include: difficulties in washing clothes, the inability to conduct certain ceremonies, lost leisure and beauty values, as well as reduced fish stocks.

Large areas of bare mud are considered to be very dangerous, as animals and people can get stuck in them. Some animals die on these occasions. People in IFR River Section 2 complain about the river getting muddier and thus dangerous in a new way. They were furthermore concerned about the increased appearance of poisonous snakes (real ones) on the mud banks of the Malibatso River.

One of the most serious problems perceived to be related to low rivers is the aggressive behaviour of the river snake. It is said that when water becomes scarce in the river, these snakes have to defend their pools. Many cases of drowning are said to be caused by the river snake, which hypnotises its victims and makes them

throw themselves into the river. They are then either never seen again or are found later, their blood having been sucked out and replaced by river sand.

Apart from the river snake, a low river poses a real danger for children. While only strong young men swim in a flooded river, all children will swim in rivers when they are low. Chances of drowning in one of the numerous (and sometimes very deep) pools are high. These cases are then usually explained as the river snake having hypnotised the child.

Although many informants would prefer a knee-deep river the whole year round, they nevertheless acknowledged that this would harm a number of plants growing within the riparian zone. Knowledge about the precise relationship between floods and the regeneration and reproduction of riverine resources is often imprecise and it is highly questionable whether villagers are capable of predicting all the consequences of the anticipated lower flow regimes.

10.2 WASHING CLOTHES

Washing clothes is done by both men and women at most sites for at least part of the year. Even when there is a well functioning water supply system, people often have to save water during the dry season. An activity such as the washing of clothes that uses a great deal of water puts considerable strain on the village water supply systems, as these are not designed for this activity. Furthermore, rivers have rocks where the washing can be done and where the laundry can dry. Basotho women take great pride in clean laundry and use considerable amounts of washing powder to clean their laundry. A low flowing river (which consequently has relatively clear water) is preferred for washing clothes. Flooded rivers with muddy waters are unsuitable for this activity.

Washing clothes is usually started in the morning to make sure that the laundry dries during the day. As the washing of clothes is often combined with some kind of personal hygiene, men and women often have their own separate sites. There is often a social element linked to the washing of clothes. An ideal site in the river is a flat rock on which one can sit, combined with approximately knee-deep, clear, but not too cold, water. The frequency of washing clothes varies a lot, from every day to once a month, depending on the size of the household, the number of children (baby clothing is usually washed at

home) and the desire for clean laundry.

One load consists of a full washing bowl which requires 250 to 500g of "Omo", "Surf" or "Sunlight" washing powder. The run-off goes directly into the river or tributary. If the washing is done at home, the dirty water goes onto the ash-heap. The washing itself takes between 2 and 5 hours, depending on the type of laundry (blankets are time consuming). After the washing is done, the laundry is spread out to dry. This time is used for collecting firewood or wild vegetables, or for bathing in the river.

10.3 PERSONAL HYGIENE

The river is more significant for men and children above the age 5 to 7 than for others for purposes of personal hygiene. Women usually wash themselves in the house, unless they are down at the river to do other things or when the weather is very hot. Babies are never washed in the river as the water is considered to be too cold for them. A flooded river with muddy water is unsuitable for personal hygiene. The water should be clear, reasonably warm and the water level not too high.

10.4 HUNTING (BIRDS, MAMMALS AND OTHER VERTEBRATES)

The hunting of various animals is not an important river use and was thus excluded from the socio-economic survey of Phase 2. The abundance and diversity of wildlife in Lesotho has in most areas been reduced to a degree where it is hardly worth hunting any longer. Meat from wild birds and mammals is eaten very rarely, if ever. Wildlife along the rivers is of greater significance to the riverine communities in relation to traditional medicines. A number of mammals, birds and other vertebrates are still hunted by healers. Wildlife might also have a certain importance to herdboys, who spend some time hunting when it can be combined with herding duties. Hunting is mostly done during winter with the help of dogs, snares and sometimes guns. In the remote sites, where there is a greater dependency on natural resources, more hunting is done. In IFR River Section 6, virtually no wildlife, apart from a few birds was said to be left along the river.

The mammals, birds and other species of vertebrates that are still hunted along the river sections may be seen in Tables 10.1, 10.2 and 10.3 respectively.

Table 10.1 Mammals that are hunted along LHWP-affected rivers.

Sesotho Name	English Name	Scientific Name	Presence	Usage	Flow Dependency
Qibi	Clawless Otter	<i>Aonyx capensis</i>	Rare	Meat / Medicine	High
<i>Pela</i>	Dassie / Hyrax	<i>Procavia capensis</i>	Present	Meat	Low
<i>Mochalla</i>	Mongoose	<i>Galerella pulverulenta</i>	Present	Meat	Low
<i>Noko</i>	Porcupine	<i>Hystrix africaeastalis</i>	Present	???	Low
<i>Qoabi</i>	Wild Cat	???	Present	???	Low
<i>Letsa</i>	Grey Rhebok	<i>Pelea capreolus</i>	Present	Meat	Low
<i>Pokhojoje</i>	Jackal	<i>Canis mesomelas</i>	Many	???	Low
<i>Nakeli</i>	Cape Polecat		Present	???	Low
<i>Mutlanyana</i>	Cape Hare	<i>Lepus capensis</i>	Many	Meat	Low
<i>Qoaqo</i>	Spotted Genet	<i>Genetta genetta</i>	Present	???	Low

Table 10.2 Birds that are hunted along LHWP-affected rivers.

Sesotho Name	English Name	Scientific Name	Presence	Usage	Flow Dependency
Seinoli	Kingfisher	<i>Ceryle maxima</i>	Present	Medicine	High
<i>Letata</i>	Duck	<i>Anas sparsa</i>	Present	Meat	High
<i>Sephoka</i>	Owl	<i>Bubo africanus</i>	Present	Medicine	Low
<i>Sethoena Moru</i>	Duck	<i>Anas undulata</i>	Present	Meat	High
<i>Mokhotlo</i>	Bald Ibis	<i>Geronticus calvus</i>	Rare	Med. / Meat	Low
<i>Mamasianoke</i>	Hammerhead	<i>Scopus umbretta</i>	Present	Meat	High
<i>Khaka</i>	Guinea Fowl	<i>Numida meleagris</i>	Present	Meat	Low

Table 10.3 Other vertebrates that are hunted along LHWP-affected rivers.

Sesotho Name	English Name	Scientific Name	Presence	Usage	Flow Dependency
Lakabane	Water Monitor	<i>Varanus Niloticus</i>	Rare	Medicine	High
<i>Fito</i>	Water Snake	---	---	Medicine	High

10.5 SANGOMAS AND RIVER SNAKES

Sangomas and traditional healers practice various healing and cleansing rituals in the river. These activities are closely associated with ancestors and spirits, as these come to the sangoma by means of dreams and visions and tell him or her to go and see a particular spot on the river. Sangomas have close relationships with the mythical river snakes and the team was often told that every sangoma has its "own" snake. Snakes help sangomas in the performance of their rituals, while sangomas can prevent river snakes from becoming too dangerous to the river community. One can thus construct a triangular relationship between the sangoma, ancestors and the river snake, as shown in Model 10.1.

Besides conducting rituals, sangomas extract a range of ingredients from the river, most notably a number of herbs, animals, birds, sand, stones etc. The collection of kingfisher faeces from rocks in the river was often mentioned. This is used by sangoma trainees for face decoration, amongst other medicinal purposes.

River snakes are said to be present everywhere in the study reaches. When asked to rank problems related to the river, the river snake often took first place. As mentioned before, river snakes do not like low rivers because first, they do not want to be seen, second, they do not like warm water and third, they have difficulties breathing when the river is low. River snakes do not necessarily live in the river all the time but can also be

found in caves on the slopes, or high up in the mountains. They then go down to the river in the early morning to bathe in the pools. If one crosses the river in the morning and finds the water strangely warm, it is a sign that the river snake has been swimming close to that place. Narratives about river snakes are too numerous to be mentioned here. They include their appearance, their ability to change into other animals, how they drown their victims and suck the blood out of them, etc. Suffice it to say that river snakes are an integral part of everyday life for riverine populations. River snakes are to be taken seriously because the belief in their existence gives meaning to riverine populations on the one hand and guides their actions on the other.

10.6 INITIATION SCHOOLS AND OTHER RITUALS

Another group that uses rivers for certain cultural activities are initiation schools. It has to be emphasised that these are not present everywhere along the rivers. Since these schools want to be isolated and because unexpected contact with these schools can be dangerous, some villages (e.g. IFR River Section 2) decided that initiation schools are no longer allowed along the river. Where they are found along the rivers, members of initiation schools use riverine resources in a number of non-ritual and subsistence ways (drawing water, fishing, hut building etc) as well as for a few culturally significant activities such as the washing of clothes, blankets, red face painting etc. No informant was able to indicate the necessity of a specific flow level for initiation schools' activities. Precise information on initiation schools is very difficult, if not impossible to obtain.

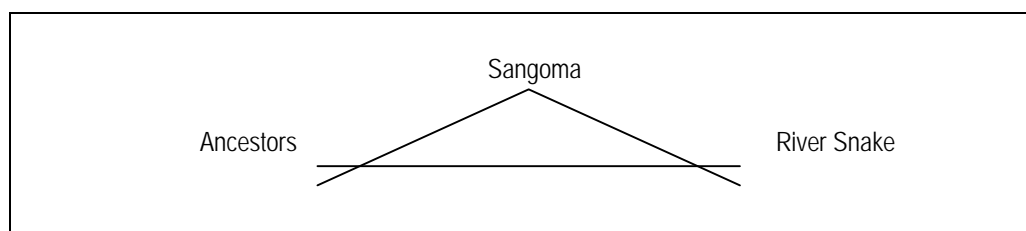
A number of river-related rituals are practised, the most important being the washing of a dead person's clothes in the river. A tributary can also be used for this purpose. There happened to be a funeral in IFR River Section 6 when the team was staying there and it was observed that a relative of the dead person took the clothing in a taxi to the Sebapala river because access to the river is easier there. In the Highland sites, both a rainmaking ritual as well as a ritual against lightning were said to be practised along the rivers. In some areas, people wash themselves in the river after having observed a mourning period. Witches are said to have to wash or cleanse themselves in the river after having thrown lightning at somebody.

10.7 TOURISM

The numbers of tourists travelling on and along the LHWP-affected rivers is negligible. At most sites, tourists have not been seen for years. When they were seen, they usually canoed down the Senqu and Senqunyane Rivers. They would normally pitch a tent, take some photographs, give sweets to the herdboys and leave again the next day.

The natural potential of tourism in the form of canoeing, rafting, fishing and the establishment of 'river-parks' seems to be significant. However, the lack of infrastructure and a relatively unstable political situation in Lesotho keeps most tourists away for the time being. The few successful tourist operations are usually managed by South Africans and only benefit a small number of locals who can find employment there.

Model 10.1 The relationship between sangomas, ancestors and the river snake.



SECTION 11: THE EFFECTS OF DISTANCE FROM, AND ALTITUDE ABOVE THE RIVER

11 QUANTITATIVE ANALYSES OF THE EFFECTS OF DISTANCE AND ALTITUDE ON LEVELS OF RIVER UTILISATION

There is no doubt that altitude above and distance from the river play a significant role in determining river utilisation. In order to conceptualise and quantify these aspects, all villages where interviews were conducted were entered into a database in terms of altitude above river level and distance from the river. Altitude and distance were placed into categories and related to the percentage of households using the particular resource. In other words, the percentages in the columns show how the usage patterns are affected by altitude and distance. It was anticipated that the influence of the river would become gradually less significant as one moves away from the river. However, as Tables 11.1 and 11.2 show, this is only partly the case.

The results confirm the importance and relevance of for conducting the household survey within a 5 km corridor of the river. They appear also to suggest that the corridor should have been even wider. However, the number of villages in the 3000 to 5000m distance category (first row of Table 11.2) is very low, despite the fact that the 3000 to 4000m and 4000 to 5000m categories were merged because the 4000 to 5000 m category only contained four villages which was insufficient for analysis. This suggests that there are even fewer villages outside the 5km corridor. Furthermore, the wider the corridor, the more of the secondary corridor is included, meaning that more people who do not have the right to harvest controlled resources are included.

Both the altitude and distance analyses show that the river still has importance for villagers, even if they live up to 5 kilometre away and high above the river. The overall pattern of the percentages of households using the river as a function of distance from, and altitude above the river is clear and consistent:

- On the one hand, resources which are harvested on

a daily to weekly basis, such as vegetables or shrubs, are clearly more significant to those villagers living closely to the river.

- On the other hand, resources which are used less frequently, such as reeds, thatch or *leloli*, are of equal importance to villagers throughout the entire width of the corridor.

When the above percentages are categorised into three different "decreasing levels" of high, medium and none, they show that there is considerable overlap between the decrease in usage percentages for both altitude and distance. Since many villages that are far away from the river are also high above it, one would have expected such an overlap.

As mentioned above, large decreases in river usage were found regarding the elements of wild vegetable consumption, fishing, all three categories of domestic water from river and leisure. When considering only the distance from the river, one would have to add the collection of shrubs, as well as the watering of animals during the dry season.

A medium decrease in the use of riverine resources was found regarding the elements of shrubs, trees, casual drinking and the watering of animals during the dry season, when considering altitude only. When considering distance from the river, a medium decrease was found in the use trees, medicinal plants and the watering of animals during droughts.

Neither the distance nor the altitude analyses showed a clear pattern in the decrease of river use regarding the elements of reeds, thatch grasses, *leloli*, wild vegetables for sale, sand mining as well as baptism. These are thus clearly the elements of river utilisation which are used only occasionally.

Table 11.1 The percentages of households using various riverine resources in relation to the altitude of their villages above the river

	0-100m	100-200m	200-300m	300-400m	>400m
Number of villages	14.0	28.0	32.0	24.0	20.0
Reeds	12.3	18.6	27.5	1.9	18.9
Thatch grass	19.4	25.9	25.1	23.1	33.4
<i>Leloli</i>	18.1	17.2	19.3	13.4	13.7
Wild vegetable consumption	6.1	46.3	44.3	32.4	29.0
Wild vegetable sale	2.9	3.9	2.4	3.2	6.8
Shrubs / Debris	59.5	46.8	46.8	44.2	41.4
Trees	35.2	19.5	22.2	19.9	24.9
Medicinal plants (humans)	25.9	16.9	16.6	22.3	27.8
Medicinal plants (animals)	13.1	14.6	8.0	15.9	17.7
Agriculture next to river	16.3	12.3	12.0	9.4	20.7
Fishing	33.1	15.9	15.1	18.2	15.9
Casual drinking	56.6	51.8	56.6	53.7	40.8
Domestic water all year	8.9	0.1	0.2	0.2	0.6
Domestic water dry season	13.6	11.5	3.7	5.1	1.6
Domestic water drought	38.4	11.2	19.5	9.6	8.5
Sand mining	8.3	10.1	8.9	9.1	11.8
Animal ownership	49.0	63.7	64.7	64.8	56.3
Animal watering dry season	43.5	28.0	25.5	42.3	37.5
Animal watering drought	63.9	55.0	52.4	66.2	56.0
Baptism	10.7	14.6	11.1	13.1	9.2
Leisure	41.6	35.1	29.8	36.2	21.5

Table 11.2 The percentages of households using various riverine resources in relation to the distance of their villages from the river.

	0-500 m	500-1000m	1000-2000m	2000-3000m	3000-5000m
Number of villages	15.0	24.0	42.0	26.0	12.0
Reeds	15.7	19.6	15.0	25.1	38.2
Thatch grass	19.0	38.5	28.3	19.5	9.7
<i>Leloli</i>	16.6	26.5	16.3	11.4	17.3
Wild vegetable consumption	57.1	61.4	39.4	33.8	32.3
Wild vegetable sale	2.3	6.7	2.2	3.1	3.5
Shrubs / Debris	56.0	66.9	47.7	36.2	24.8
Trees	26.6	28.3	23.7	18.4	14.0
Medicinal plants (humans)	23.9	23.8	18.7	17.0	17.7
Medicinal plants (animals)	14.4	18.3	10.6	9.2	11.0
Agriculture next to river	16.2	16.6	12.4	12.4	6.5
Fishing	34.0	21.2	15.0	10.4	19.2
Casual drinking	41.7	67.1	55.9	41.0	60.1
Domestic water all year	7.3	0.9	---	0.4	0.1
Domestic water dry season	27.4	4.5	1.4	8.7	---
Domestic water drought	41.3	11.7	16.6	9.5	14.6
Sand mining	7.6	13.3	7.7	9.2	10.9
Animal ownership	60.3	62.6	66.7	54.6	65.2
Animal watering dry season	48.4	43.3	34.5	18.8	17.2
Animal watering drought	66.6	65.9	54.8	51.2	46.7
Baptism	20.6	8.8	10.6	8.7	18.7
Leisure	37.6	54.1	32.0	21.6	15.0

SECTION 12: POVERTY INDICATORS

12 POVERTY INDICATORS AND RIVER UTILISATION

Low flows and the associated reduction of certain resources in the riparian zone will almost certainly affect the poorer part of the population harder than those who are better off. In order to give the reader a picture of the demographic structure and socio-economic characteristics of the statistical population in the 5 km corridor, a few findings are presented below:

Sex

- 50,1% are male and 49,9% are female;

Age

- 13% are below the age of six;
- 37,7% are between six and twenty years old;
- 29,2% are between twenty one and forty five years of age;
- 17,1% are between forty six and seventy years old;
- 3,4% are seventy one years or older;

Marital status (only for age >18 years)

- 25% are unmarried;
- 56,7% are married or cohabiting;
- 18,4% are separated, divorced, abandoned or widowed;

Schooling (only for age >6 years)

- 20,5% have never been to school;
- 23,5% have had 1-3 years of schooling;
- 42,3% have had 4-7 years of schooling;
- 10,2% have had 8-10 years of schooling;
- 3,5% have had 10 or more years of schooling;

Occupation (only for age >18years)

- 39,2% have no occupation;
- 19,5% reported to be farmers;
- 4,1% work in the mines and are usually away for 10 months;
- 2,1% are wage workers;
- 4,4% are scholars;
- 5,7% do casual labour;
- 4,0% work as shepherds;
- 7,9% are self employed;

Association membership (only for age >18 years)

- 69,5% are not members of any association;
- 1,4% are members of the church;
- 24,8% are members of burial associations;
- 1,9% are members of sports groups;

It was assumed that households without any reliable source of cash income or financial capital are more dependent on the output and sustainability of their various rural livelihoods, amongst others the riparian zone. For the purpose of quantifying this assumption, households were categorised into three groups based on the reliability of income of the household member with the highest and most reliable income.

The findings (Table 12.1) are very interesting, as a clear and consistent pattern reveals that the river is less important to those with no income at all than to those with an income. This surprising fact may be explained by the smaller family size of the very poor and destitute households (means of household sizes are given in the second row in Table 12.1). Apparently, the surplus energy and time, which is needed to go to the river, is not as available in households with no income. Furthermore, households with elderly people often have to be placed in the category of small households without any source of cash income. As already noted in the pilot study, old people often find the walk to the river too long and strenuous.

Although the number of households using the river is smaller, the above analysis does not include any information on the quantities of resources that the poor households extract. The impact of a reduction in certain resources may well have a much more profound impact on the poor and destitute than on households with a reliable source of income.

In order to confirm the relationship between household size and river utilisation, another analysis was conducted, which aimed to examining the relationship between the mean household size and the utilisation of various riverine plant species. The results of the analysis may be seen in Table 12.2.

Table 12.1 River utilisation and the socio-economic status of the household.

	No income (farmers, shepherds, job seekers)	Unreliable income (scholars, casual labour, informal business, etc.)	Reliable income (miners, construction, civil servants, wage workers, teachers, health work, etc.)
Ave. no. of family members	2.96	5,10	5,39
Reeds	14.8	24.9	17.7
Thatch grass	20.4	29.8	17.9
<i>Leloli</i>	11.8	19.0	17.2
Wild vegetable consumption	34.0	47.0	42.1
Shrubs / Debris	35.7	51.0	47.8
Trees	15.9	26.5	20.7
Medicinal plants (humans)	19.3	19.5	20.8
Fishing	10.2	20.2	17.4
Casual drinking	47.9	53.8	55.4

Table 12.2 River utilisation and household size.

	Mean number of household members among those using the resource	Mean number of household members among those not using the resource
Reeds	5.17	4.62
Thatch grass	5.28	4.56
<i>Leloli</i>	5.23	4.63
Wild vegetable consumption	5.15	4.43
Shrubs / Debris	5.01	4.48
Trees	5.28	4.58

Table 12.2 demonstrates that households using these riverine plants are, as a rule, bigger than those not using them. Again, it may be a question of surplus time, energy or manpower, which allows bigger households to utilise these riverine resources more frequently than smaller households.

In order to further explore internal household dynamics in relation to river utilisation, it was decided to look at the relationship between the gender of the present (de facto) heads of the households and the use of certain riverine resources. The results are presented in Table 12.3.

The results show that, apart from the resources which are collected on an almost daily basis, such as shrubs and wild vegetables (and casual drinking from the river, which is linked to these two activities), men appear to be the driving force behind the utilisation of riparian resources that are used on an occasional basis. Thatch grasses, *leloli*, trees, medicinal plants and fish are all used more extensively by households where the de-facto head of household is male. Whether this is due to an increased awareness of riparian resources or rather to an increase in time and energy within households headed by men remains to be investigated.

Table 12.3 River utilisation and gender.

	Male head of household at home (de facto)	Male head of household absent (de jure)	Female head of household
Thatch Grass	27.2	13.8	23.3
<i>Leloli</i>	19.0	11.1	15.2
Wild Veg. Consumption	43.2	38.5	43.2
Shrubs / Debris	47.4	49.0	45.7
Trees	24.8	20.7	18.9
Medicinal Plants (Humans)	21.8	14.3	16.3
Fishing	19.1	13.9	13.5
Casual Drinking	54.9	54.1	48.9

SECTION 13: APPENDICES
APPENDIX A1: MAPS OF THE DAMS, RIVERS, SITES AND VILLAGES MENTIONED
IN CONTRACT LHDA 648

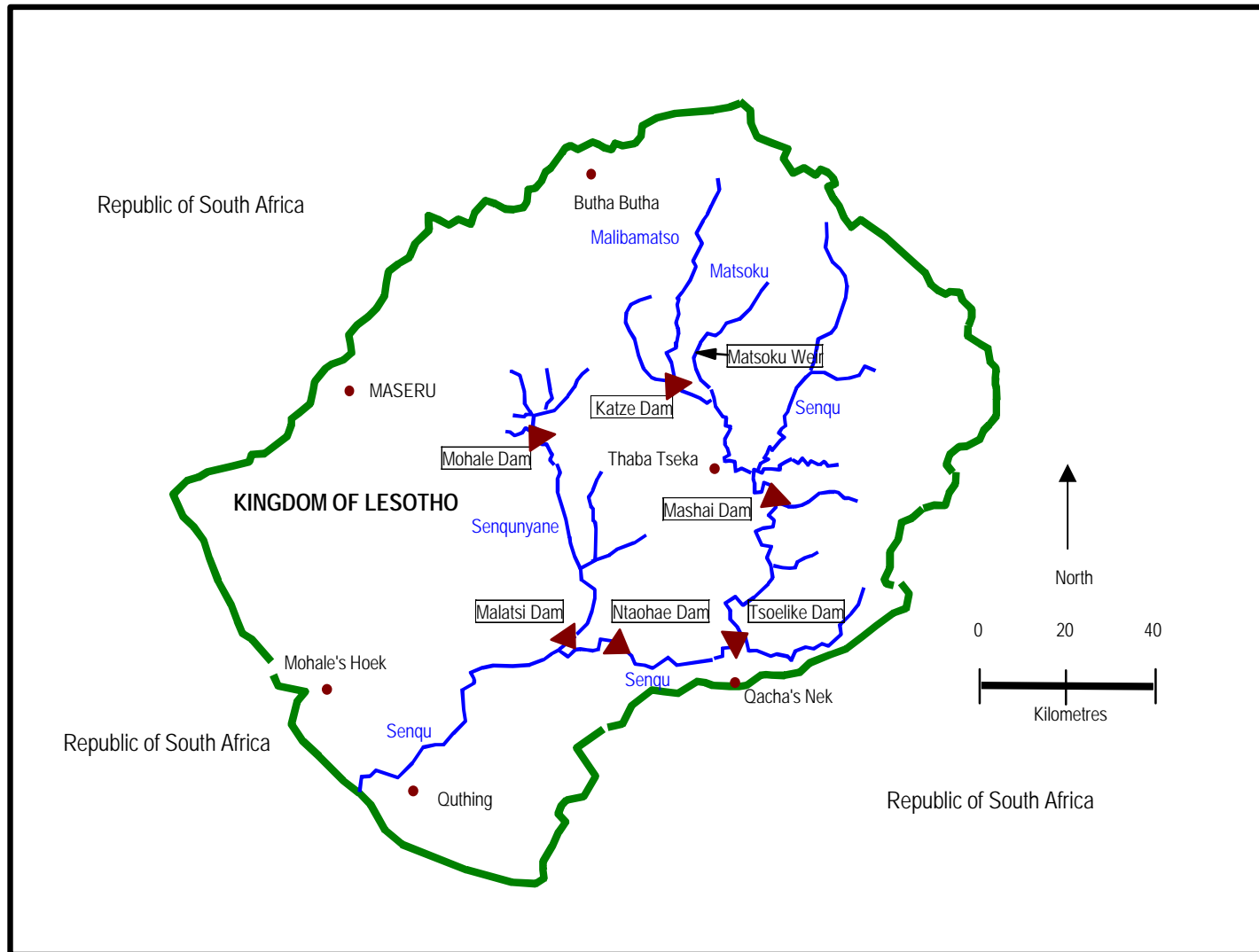


Figure 1.1 Location of the proposed and extant LHWP dams

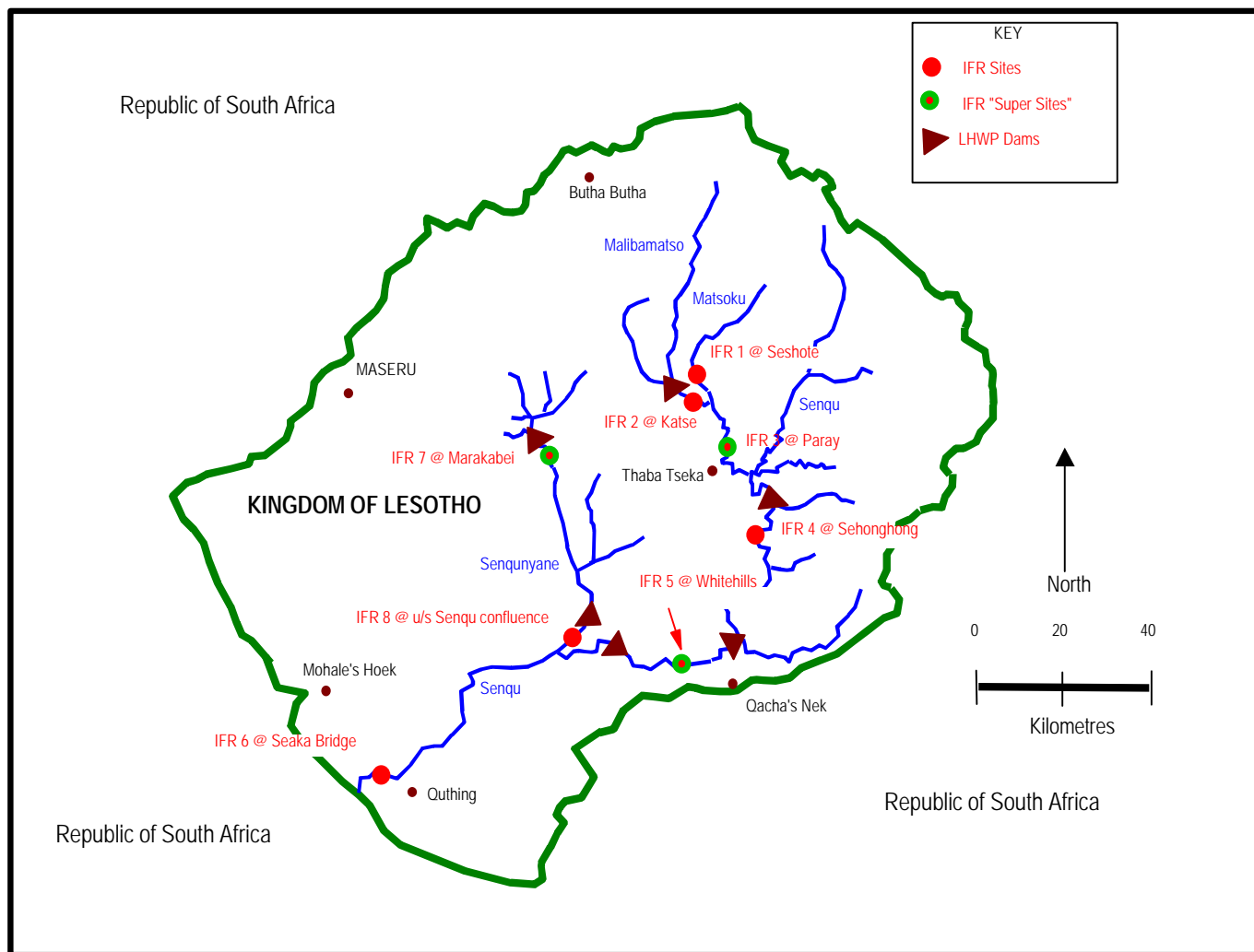


Figure 2.1 Location of the study rivers and the IFR Sites for Contract LHDA 648

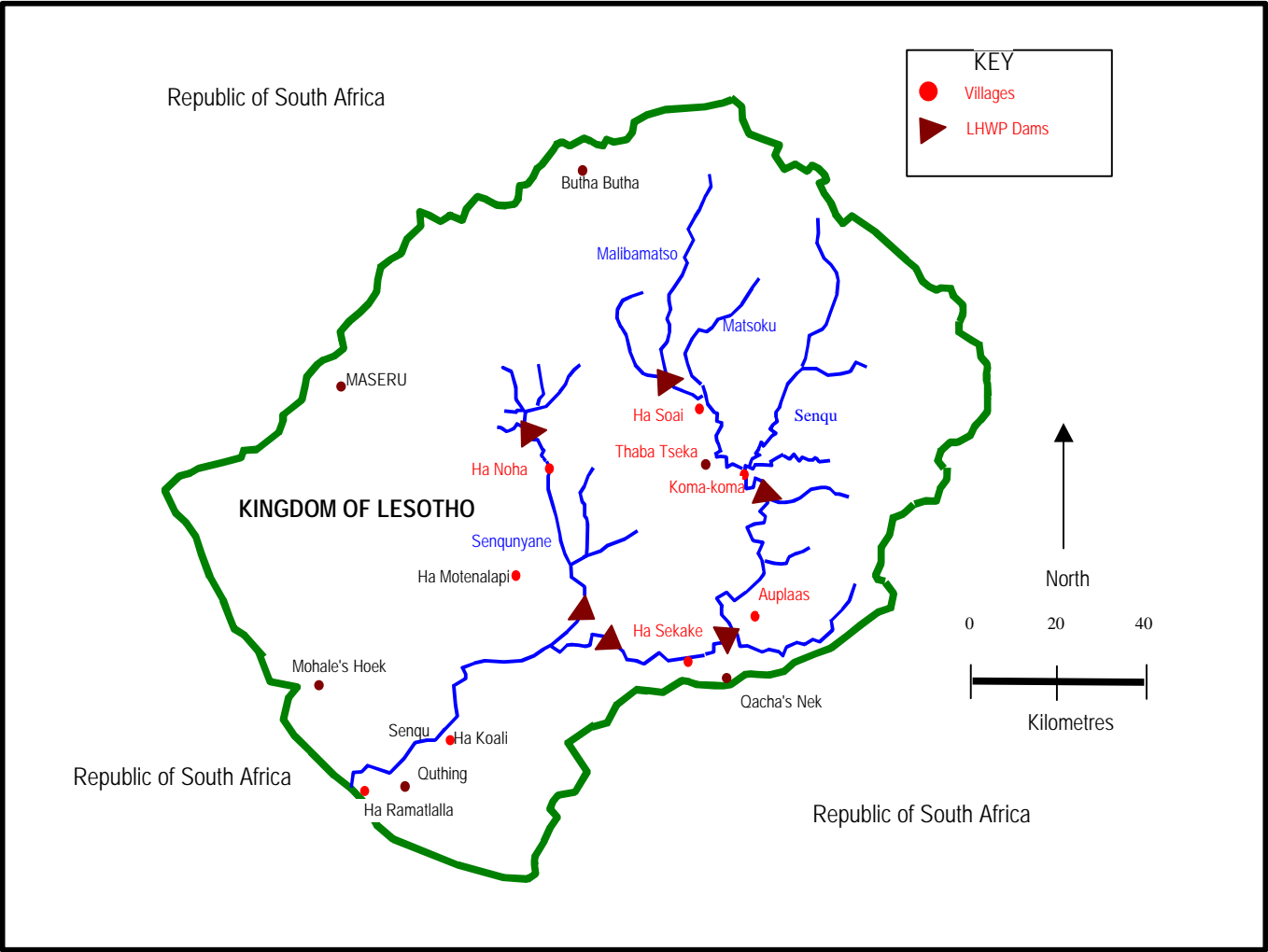


Figure 2.2 Location of the villages visited as part of the pilot social survey (Contract LHDA 648)

APPENDIX A2: QUESTIONNAIRES (TOOLS) USED IN THE SOCIOLOGICAL STUDY

QUESTIONNAIRE FOR IFR STUDY 1999

River Section _____ Village _____ Name of Head _____
 Interviewee _____ Interviewer _____ Date _____
 Field Check _____ Supervisor _____ DE _____

River Section: 1=Matsoku River
 2=Malibamatso River (Katse – Matsoku Confl.)
 3=Malibamatso River (Matsoku – Senqu Confls.)
 4=Senqu River (Malibamatso – Tsoelike Confls.)
 5=Senqu (Tsoelike Confl. – Senqunyane Confl.)
 6=Senqu (Senqunyane Confl. – RSA border)
 7=Senqunyane (Mohale – Lesobeng Confl.)
 8=Senqunyane (Lesobeng . – Senqu Confls.)

HHD	Sex	Age	Rel. to Head	Marital Status	Years in School	Income Status	Occupation	Where working	Months away	Place living	Group member
Head											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

Codes	RELATION TO HEAD	MARITAL STATUS	INCOME STATUS	OCCUPATION	PLACE LIVING OR WORKING	GROUP MEMBER
SEX						
1=Male	0=None	0=Unmarried	0=None	0=None	1=This Household	0=None
2=Female	1=Head	1=Married	1=Own Income	1=Scholar	2=This Village	1=Church
	2=Spouse	2=Cohabiting	2=Mines	10=Farmer	3=Nearby Village	2=Burial Society
	3=Child	3=Divorced	3=Other RSA	11=On Pension	4=Maseru	3=Stokfele
	4=Grandchild	4=Separated	4=Construction	12=Casual Labour	5=Other Lesotho	4=Farmers' Group
	5=In-Law	5=Abandoned	5=Civil Servant	13=Shepard	6=RSA	5=Sports Group
	7=Parents	6=Widowed	6=Wage Worker	14=Job Seeker	7=Other	6=Youth Group
	8=Grandparent	7=Other	7=Teacher	15=Self Employed		7=VDC
	9=Sibling		8=Health Work	16=Servant		8=Womens Gr.
	10=Other		9=Shop Work	17=Informal Business		9=Com. Saving
			10=Other	18=Other		10=Other

Type of Housing:

1=Rondave
 2=Heisi
 3=Optak
 4=Polata

Type of Roofing:

1=Thatch
 2=Tile / Iron

Type of Fencing:

1=Poles
 2=Shrubs

Source of Water for Domestic Use:

(Phumano ea metsi a sebelisoang lapeng):

Water Supply	Dry Season	Wet Season	Drought	Never
Taps				
Spring covered				
Spring uncovered.				
Borehole / Pump				
River				
Tributary				
Dam				
Rainwater Tank				

All questions relate to the "riparian zone". This includes the river itself as well as the area next to the river, which is below the maximum flood line. Amounts within the household are needed.

(Lipotso tsena li a ikamahantse le tse fumanehang hofihlela mabopong a noka. Ho kenyelelitsoe le noka ka bo eona le sebaka se e leng se ka haase ho sebaka sa ho qetela sa ho tlala ha noka. Lipalo/bongata hotsoa ka lapeng lia hlokeha.)

A. PLANT QUESTIONS

1. Has any household member harvested reeds from the riparian zone in the last 5 years? Yes. ____ No. ____
(Na hona le setho se seng sa lelapa se kileng sa hela lekhaka nokeng, nakong ea lilemo tse 5 tse fetileng?)
 If yes, when were reeds harvested for the last time? _____
(Le qetetse neng ho hela lekhaka?)
 State amount for private use. _____
(Ho sebelisitso le lakae?)
 State amount sold. _____ Price / bundle. _____
(Ho rekisitsoe le lakae? Theko / Ngata?)

2. Has any household member harvested thatch grass from the riparian zone in the last 5 years?
(Na hona se setho se seng sa lelapa se kileng sa hela joang ba ho rulela nokeng nakong ea lilemo tse 5 tse fetileng?)
 Yes. ____ No. ____ If yes, when was thatch grass harvested for the last time? _____
(Le qetetse ho bo hela neng?)
 State amount for private use. _____
(Ho sebelisitsoe bo bokae?)
 State amount sold. _____ Price / bundle. _____
(Ho rekisitsoe bo bokae?)
 State types of thatch grass harvested. _____
(Ke majoang a mofuta ofe a hetsoeng?)

3. Has any household member harvested leloli from the riparian zone in the last 12 months? Yes. ____ No. ____
(Na hona le setho se seng sa lelapa se kileng sa hela leloli nokeng, nakong ea likheling tse 12 tse fetileng?)
 If yes, how many bundles of leloli were harvested? _____ Used for what? _____
(Ke mangata a makae a leloli a hetsoeng? A sebelisoa ho etsang?)
 If sold, state price per bundle. _____
(Ha a rekisitsoe, ngata ke bokae.)

4. Has any household member collected wild vegetables from the riparian zone for household consumption in the last 12 months? Yes. ____ No. ____
(Na hona le emong oa lelapa ea kileng a kha moroho nokeng, ele o tlo jeoa ke lelapa nakong likhoeli tse 12 tse fetileng?)
 If yes, please state the number of handfuls (lefupu) or plastic bags per week for summer and winter.
(Ke mafupu kapa mekotlana ea polastiki e makae ka beke hlabula le mariha.)

All types of vegetables	Summer	Winter
Handfuls per week		
Plastic bags per week		

Please state the proportions of the single vegetable species (*use stones or beans*).
(Ke karolo e kae, ea mofuto oa moroho ka ngoe?)

Vegetable Species	Used? Tick	Summer %	Winter %
Paspasane			
Seruo			
Theepe			
Sepaile			
Qhela			
Manolo			
Leshoabe			
Selaie			
Tenane			
Lerotho			
Other:			

5. Has any household member collected wild vegetables from the riparian zone for sale in the last 12 months?

Yes. ____ No. ____

(Nakong ea likoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kileng a kha moroho nokeng ele o tlang ho rekisoa?)

If yes, please list and quantify per week in below table.

(Bolela bongata ba ona ka beke lebokoseng tafoleng e ka tlaase.)

Plant Name	Units per Month	Units	Price per Unit	Months available
Selae				
Tenane				
Sepaile				
Other:				
Other:				

6. Of total amount of wild vegetables harvested, please state proportion sold, proportion consumed by household members of age 0-5 and proportion consumed by household members of age 6 and above.

(Ho moroho kaofela, bontsa bongata ba o rekisitsoeng, o jeloeng ke bana ba lilemo tse 0-5 le batho ba lilemo tse 6 ho ea holimo ba lelapa.)

Proportion sold in %	Proportion consumed by 0-5	Proportion consumed by 6 and above

7. Has any household member harvested shrubs and debris for fuel from the riparian zone in the last 12 months?

Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le ea kileng a roalla patsi ea lihlahla le mahoholi nokeng?)

If yes, state number of bundles per week and price (if available) for summer and winter in table below.

(Ke mangata a makae ka beke hlabula? Mariha teng? Theko ea ngata ke bokae?)

Shrubs and Debris			
Summer		Winter	
Bundles per Week	Price per Bundle	Bundles per Week	Price per Bundle

8. Has any household member harvested trees from the riparian zone in the last 12 months? Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kileng sakha lifate nokeng?)

If yes, please list type, amount, price per tree and usage in table below.

(Ke tsa mofuta ofe theko ea sefate ke bokae? Se sebelisoa joang? Tafoleng a latehang.)

Tree Type	Amount harvested	Price per Tree	Usage
Willow			
Poplar			
Other:			
Other:			
Other:			

Code

1=firewood 2=housing construction 3=sledges & yokes 4=Other _____

9. Has any household member collect medicinal plants from riparian zone in the last 12 months? Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kileng a cheka litlhane nokeng?)

If yes, please fill in table below.

(Tlatsa tafole e latelang.)

Plant name	Used? Tick	Amount harvested during last 12 months	Unit harvested	Price per unit
Kuena				
Lengana				
Loli				
Qobo				
Phonyaka				
Mosika Noka				
Moriri oa Matlapa				
Keketsa/Mositsane				
Phefo				
Pakisane				
Mohloare				
Seletjane				
Tsikilane				
Other:				

10. Has any household member collected medicinal plants for curing animals from riparian zone in the last 12 months?

Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kileng a cheka litlhane tse phekolang liphoofoo nokeng?)

If yes, please fill in table below.

(Tlatsa tafole e latelang.)

Plant name	Used? Tick	Amount harvested during last 12 months	Unit harvested	Price per unit
Sehalahala Sa Matlaka				
Khama Khamane				
Mofifi				
Khoara				
Mositsane				
Mosali Mofubelu				

Table (continued)

Hloenya				
Moherane				
Other:				

11. Has the household fields right next to the river? 1 = Yes 2 = No

(Na lelapa le na le masimo hanfi ufi le noka?)

If yes, please state yields in 50 kg bags, 80 kg bags or tins for last two seasons in table below.

(Lihleng tse 2 tse fetileng bontsa kotulo kg mekotla ea li – 50 kg, 80 kg kapa makopo-kopo.)

	Bags cereals '98	Bags cereals '97	Pulses '98	Pulses '97
Yield in 50 kg bags				
Yield in 80 kg bags				
Tins				

State field size in Sesotho Acres. _____ Proportion of field threatened by flooding. _____

(Bontsa boholo ba tsimo ka liakere tsa sesotho. Ke karolo e kae ea tsimo e kotsing ea ho koaheloa ke metsi.)

How are the fields ploughed? _____

(Masimo aa a lengoa joang/ka eng?)

B. FISH QUESTIONS

1. Has any household member caught fish from the river in the last 12 months? Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kilenga tsoasa lithlapi nokeng?)

If yes, please give information on species, amounts caught per month and sizes for summer and winter in table below.

(Bontsa mefuta, bongata bo tsoasitsoeng ka khoeli, boholo nakong ea hlabula le mariha, tafoleng e latelang.)

Species	Summer			Winter		
	Large	Medium	Small	Large	Medium	Small
Chelefisi / Sesotho						
Ramahetlana / Letsoala						
Trout / Sekhoa						
Other:						
Other:						

Please state the prices for fish in table below.

(Theko ea tlhapi ke bokae? Tafoleng e latelang.)

Species	Large	Medium	Small
Chelefisi / Sesotho			
Ramahetlana / Letsoala			
Trout / Sekhoa			
Other:			

2. For overall amount of fish caught, please state proportion sold, proportion consumed by household members of age 0-5 and proportion consumed by household members over age of 6.

(Ho lenane la lithlapi koafela, ke karolo e kae e rekisitsoeng, e jeloeng ke bana ba lilenno tse 0-5 le batho ba lilemo tse 6 ho ea holimo ba lelapa.)

% Proportion sold	% Proportion consumed by 0-5	% Proportion consumed by 6 and above

3. Where are the fish sold? _____
(Tlhapi e rekisoa ho kae?)
4. How many dead fish (found along the riverbank) has the household eaten within the last 12 months? _____
(Nakong ea likhoeli tse 12 tse fetileng, ke lithapi tse kae tse fumanoeng nokeng li shoele tseo lelapa le li jeleng?)

C. PUBLIC HEALTH QUESTIONS

1. Has any household member used the river for casual drinking while collecting firewood, vegetables, doing washing, etc?
Yes. ____ No. ____
(Na hone le emong oa lelapa ea kileng a noa nokeng nakong ea a roallang, a khang moroho kapa a hlatsoang?)
If yes, please state frequency of drinking for summer and winter in table below.
(Ke ha ngata ha kae a noeleng teng hlabula? Mariha teng?)

	Summer	Winter
Drinking Frequency per Month		

2. In which periods do you draw water from the river for domestic purposes?
(Ke linakong life le khang metsi nokeng, e le a sebelisoang lapeng?)
All Year ____ Never. ____ During dry season. ____ Every second dry season. ____ Every fifth dry season. ____
3. Family Health (List all diseases, accidents or disabilities suffered within the last two months)
(Bophelo ba lelapa. Bontsa, lethathamo la mafu, likotsi kapa bokooa bo bileng teng nakong ea likhoeli tse 2 tse fetileng.)

HHD member	Problem	How many days ill	Where / Who treated	Total charge	If none, why not treated

Code

PROBLEMS

1=Respiratory 11=Measels 21=Injury
2=Diarrhea 12=Hepatitis 22=Assault
3=Malnutrition 13=Kidney 23=Blind
4=Skin&Tissue 14=Liver 24=Deaf
5=Viral Disease 15=Stroke 25=Crippled
6=Burn 16=Cancer 26=Retarded
7=Tuberculosis 17=Diabetes 27=Mental Probl.
8=Asthma 18=HIV/AIDS 28=Other _____
9=Heart Disease 19=Other STD
10=High Blood 20=Cold/Flu/Fever

WHERE TREATED

1= Not at all
2=Family/Friend
3=Trad. Healer
4=Drug Seller
5=Village Health W.
6=Clinic
7=Private Doctor
8=Hospital
9=Chief
10=Other _____

WHY NOT

1=No need / desire
2=Too expensive
3=Too far
4=transport too expensive
5=Hours not convenient
6=Did not know where
7=Too many waiting
8=Too sick
9=Due to work
10=Other _____

4. Information on Children under 6 years of age.
(Litaba ka bana ba lilemo tse ka tlaase bo 6.)

Member No.	Age in Months	Height in cm	Weight in kg	Diarrhoea in last 4 weeks (at least 3 loose stools per day)

Code

Diarrhoea: Yes=1 No=2

D. ANIMAL HEALTH QUESTIONS:

1. Has the household any animals at present? Yes. ____ No. ____

(Na lelapa lena le liphoofole?)

If yes, please give information on number, type, disease pattern, riparian grazing pattern and mortality of domestic animals within household.

(Bontsa manane a liphoofole tsa lelapa mefuta, mafu, nako le mekhoe ea phuliso le hoshoe ha tsona.)

Type	Diseases in last 12 Months			Months present along river	Hours/Day	Deaths in last 12 months	Death Reason
	No.	No.	When				
Cattle (0-6 months)							
Cattle (>6 months)							
Sheep (0-4 months)							
Sheep (>4 months)							
Goats							
Horses and Donkeys							
Pigs							
Fowl							

Code

Diseases & Death Reasons:

1=Linta	10=Letsoella	1=Summer
2=Bluelongue	11=Maphela	2=Winter
3=Hlooaana (Horsesickn.)	12=Kuidi (Insect)	3=All Year
4=Papisi	13=Mankukunyane (Insect)	
5=Seterefe	14=Thalaboloba (Insect)	
6=Matsetse / Lekhoekhoe	15=Bolele (Algae)	
7=Nyooko	16=Stuck in Mud	
8=Manyooa	17=Starvation	
9=Monyekane		

Disease when:

2. Is the river the only water source for livestock during dry season or during severe drought?

(Na noka ke seboka sa liphoofole sa honoa, sehleng sa komello kapa nakong ea komello e kholo?)

	Yes	No
Dry Season	_____	_____
Severe Drought	_____	_____

E. SAND MINING

1. Has any member of the household mined sand from the riparian zone within the last 12 months? Yes. ____ No. ____

(Nakong ea likhoeli tse 12 tse fetileng, na hona le emong oa lelapa ea kileng a rafa lehlabathe nokeng?)

If yes, please give information on sand type, amount and unit of mining.

(Bolela mofuta oa lehlabathe, bongata le hore na le methoa ka eng.)

Sand type	Number	Units
Fine Sand		
Rough Sand		

Code

1=Bucket 3=Bakkie load 5=Other _____
2=Wheelbarrow 4=Truckload

F. QUESTIONS CONCERNING RELIGIOUS OR LEISURE SITES

- Has any member of the household used the river for baptism purposes? Yes. ____ No. ____
(Na hona le emong oa lelapa ea kileng a sebelisa noka bakeng sa kolobetso?)
 If yes, is there any alternative baptism site outside the main river? Yes. ____ No. ____
(Na hona le sebaka se seng se ka sebelisetsoang ho kolobetsa kantle ho noka?)
 If yes, what is the anticipated cost of reaching this alternative site? _____
(Ho ka lebelloa litsengyehelo tse kae ho fihla sebakeng seo?)
 What additional time is needed to reach this alternative site? _____
(Ekaba nako e kae ho fihla sebakeng seo?)
- Has any member of the household used the river for leisure purposes (swimming, exercising, etc.)?
(Na hona le emong oa lelapa ea kileng a sebelisa noka ho ithapolla? Ha sesa. Ho ikoetlisa.)
 Yes. ____ No. ____ If yes, is there any alternative leisure site outside the main river? Yes. ____ No. ____
(Ka ntle ho noka, na hona le sebaka se seng sa boithapollo?)
 If yes, what are the costs of reaching this alternative site? _____
(Ekaba litsenyehelo tse kae ho fihla moo?)
 What additional time is needed to reach this alternative site? _____
(Ekaba nako e kae ho fihla sebakeng seo?)

IFR-INTERVIEW GUIDE FOR SPECIFIC RIVER USERS

A. FISHERMEN:

Name: _____ River Section: _____ Cluster: _____ Village: _____
Date: _____

1. Please state type, amount, size and value of fish caught during last 12 months for sale per month for summer and winter.

Species	Summer			Winter		
	Large	Medium	Small	Large	Medium	Small
Chelefisi / Sesotho						
Ramahetlana / Letsoala						
Trout / Sekhoa						
Other:						

2. Please state the prices for fish in table below.

Species	Large	Medium	Small
Chelefisi / Sesotho			
Ramahetlana/Letsoala			
Trout / Sekhoa			
Other:			

3. Please state time used for fishing activities per week during wet season and dry season.

Summer _____
Winter _____

4. Please state amount earned on selling fish per month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Income												

5. Where and when is fish sold? _____

B. HERBALISTS:

Name: _____ River Section: _____ Cluster: _____ Village: _____
Date: _____

1. Please list names, amounts, units and prices of the important medicinal plants used during last 12 months for both people and animals which you collect within the riparian zone.

Plant Name	Amount harvested	Unit harvested	Price per Unit

--	--	--	--

2. Please state amount earned on selling herbs per month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Income												

3. Where and when are herbs sold? _____

4. Have you used any wild animals, birds or reptiles from the river for medicinal purposes? Yes. No.
If yes, please state species, amount used in last 12 months and price per unit _____

C. SAND MINERS / BRICK MAKERS:

Name: _____ River Section: _____ Cluster: _____ Village: _____

Date: _____

1. Where do you go for sand mining? _____

2. Are there alternative sand mining sites available? Yes. ____ No. ____ If yes, where? _____

Sand type	Unit	Price / Unit	Months harvested	Amount / Month
Rough Sand				
Fine Sand				

Code

1=Bucket 3=Bakkiload 5=Other _____
2=Wheelbarrow 4=Truckload

Please state % values of unit produced:

____ % Sand; ____ % Cement; ____ % Labor; ____ % Water; ____ % Other _____;

D. BOAT OPERATORS:

Name: _____ River Section: _____ Cluster: _____ Village: _____

Date: _____

For both state-owned and privately owned boats:

1. Please give information on number of months operating, number of passengers and income generated by operating boat crossing during last 12 months.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crossing Operated												
No. of Passengers												
Income/Month												

2. Please state the price per crossing. _____

E. FOREST OWNERS

Name: _____ River Section: _____ Cluster: _____ Village: _____

Date: _____

1. Please give information on types, amounts and prices of trees sold within the last 12 months.

Tree Type	Amount sold	Price per Tree
Willow		
Poplar		
Other:		
Other:		
Other:		

2. Please state amount earned on selling trees per month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Income												

F. HERDBOYS

Name: _____ River Section: _____ Cluster: _____ Village: _____

Date: _____

1. Please state months present along river.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Present along River												

2. Please state amount of wild vegetables (handfuls or plastic bags) collected in the riparian zone for summer and winter.

All types of vegetables	Summer	Winter
Handfuls per week		
Plastic bags per week		

3. Please state amount and size of fish caught in the river for summer and winter.

Species	Summer			Winter		
	Large	Medium	Small	Large	Medium	Small
Chelefisi / Sesotho						
Ramahetlana / Letsoala						
Trout / Sekhoa						
Other:						
Other:						

4. How often per month do you drink directly from the river in summer and winter?

	Summer	Winter
Drinking Frequency per Month		

5. Have you eaten dead fish found along the riverbank within the last 12 months? Yes. ____ No. ____
If yes, how many in total? _____

GUIDELINES FOR CHIEF / HEADMAN INTERVIEW

1. Determination of Primary and Secondary Corridor on the 1:50 000 maps.
Which villages fall under the jurisdiction of the chiefs in the area?
Draw borderlines on the map!
Which villages have the right of access to riverine resources?
Which villages in the area have no access to riverine resources?
Are villages across the river under a different chief?
2. Information of village water supply system and its reliability (good, medium, poor)
Information on tributaries. How strong and how reliable (strong, medium, poor)?
Do the tributaries dry out during dry season?
Do tributaries dry out during drought?
Time to walk to river?
Time to walk to tributary?
3. How many semi-professional fishermen (sell more fish than they consume) are in the village? Contact!
4. How many brickmakers are in the village? Contact!
5. How many herbalists / sangomas are in the village? Contact!
6. How many forest owners are in the village? Contact!
7. How many boat operators are in the village? Contact!
8. Make arrangements to meet herdboys separately (interview individually)!
9. Please determine the degree of availability and community utilisation of riparian resources in table below. Please tick!

River Section: ___ Cluster: ___ Village: _____ Name: _____ Date: _____

Amount Utilised / Resource	All of what is available	Some of what is available	Little of what is available	Not available
Reeds				
Thatch Grass				
Leloli				
Wild Vegetables				
Medicinal Plants				
Shrubs & Debris				
Trees				
Fish				
Drinking Water				
Grazing Area				
Sand				
Other:				