Ground-Truthing:
Mapping Mobility and Access in Rural Lesotho

The World Bank
Lesotho MoPWT

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Introduction

It takes just a few minutes to cross the airspace of Lesotho in a jet, but it can take several days during the harsh winter for a villager to travel out of an isolated settlement in the mountains to a town with basic and administrative services. A snapshot of poverty and transport conditions in the country is stark: Three quarters of the terrain is mountainous with inhabitants living in secluded settlements. Out of a total population of 2.2 million, 85% live in rural areas, 68% of the population is considered poor, and prevalence rates for HIV/AIDS now hover near 30%. There are only 70,000 vehicles in the whole country, but despite the relative lack of motorized vehicles, Lesotho has some of the highest accident statistics in all of Africa with pedestrians making up 50% of road fatalities.

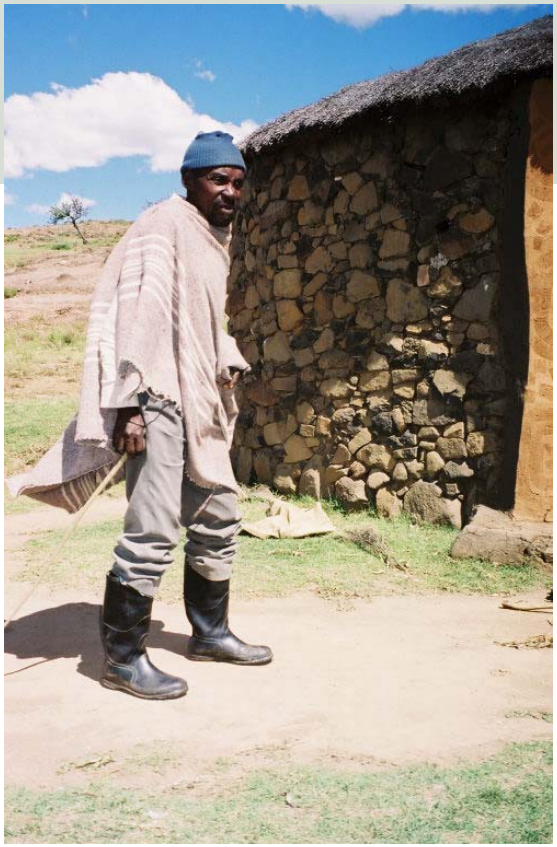
Investments in road transport infrastructure since the mid-1960s have been oriented towards the primary urban transit and import/export corridors of the lowlands, serving the emerging manufacturing sector along the border with South Africa. This emphasis has led to the relative neglect of the basic access needs of populations in the rural highlands and is an important underlying dynamic in the spatial distribution of inequality in the country.[1]

The constraints imposed by both topography and poverty elucidated above combine to pose serious challenges for the transport sector in achieving its goal of providing affordable and available access to basic services and opportunities and helping to achieve the Millennium Development Goals (MDGs). Spatial exclusion, and its gender dimensions, is an important underlying component of social

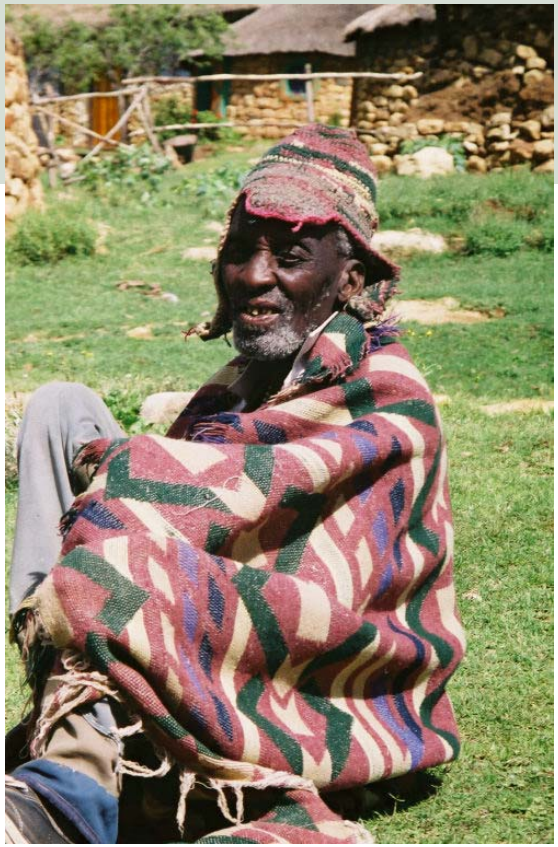
Top: Children playing near local government pitso (meeting) at Ha Lepekola village.

exclusion and vulnerability in the country. It is widely acknowledged in the transport sector that decisions regarding road construction, maintenance and rehabilitation cannot be made solely on economic justifications. However, identifying and accounting for other possible criteria – geography, community, poverty – has proven very difficult. To date no method has been systematically applied. Decision makers have had to rely only on partial knowledge, making it difficult to monitor and evaluate the poverty and social impacts of investments. Capturing the secondary impacts of new infrastructure, including additional transport services operation and changes in access to basic services, has also been difficult.

It is increasingly understood that transport infrastructure and services are embedded in the broader MDGs, but identifying relevant methods to systematically characterize and address implicit multi-sectoral connections is lagging. Participatory frameworks capable of eliciting and communicating local perspectives (communities and local government) on transport plans and their impacts have yet to be methodically integrated into the processes undertaken by Ministries in their development of road sector plans. This has meant that community and local government input



Left: Man walking to interview in Mokopung.



Center: Ha Phafoli village elder.

Right: Woman and children in Mokopung

throughout projects has been haphazard at best, and sometimes missing altogether from the overall process. Failure to integrate local level perspectives means that plans are generated from afar, and do not always meet the needs of those concerned.

As the objectives of the transport sector within the World Bank shift from being "Not just about growth, but equally about poverty reduction and reaching the MDGs" (N.Shafik, Transport Sector Forum, 2004), it is crucial that efforts are made to integrate poverty and social information into analyses. Methodologies and processes to include the MDGs require communication with and participation of stakeholders in analysis, decision making, monitoring, and evaluation.

A Geographical Information System (GIS) is one important tool with the potential to initiate and support such an integration of information, analysis, and communication. The pilot methodology discussed in this report focuses on the potential of "collaborative GIS" and "participatory digital mapping" as tools to enhance communication among stakeholders and to enable analysis of the differential impacts of access and mobility.

Above: View of Ha Leronti village, fields, and rural road from Semonkong.

Goals and Objectives of the Pilot

The objective of this pilot was to create a simple participatory methodology capable of linking local level information and perspectives on mobility and access in the Senqu and Senqunyane River Valleys in southern Lesotho to the enhanced GIS at the Ministry of Public Works and Transport (MoPWT). The results would allow for:

- An understanding of the differential impacts of both existing and proposed transport infrastructures and services on access and mobility in the communities studied
- A system for informing integrated transport and development planning and fostering enhanced service delivery
- Support for decentralized, multi-sectoral, and participatory decision making
- Identification of locally relevant impact indicators for proposed road and bridge construction over the Senqu and Senqunyane Rivers

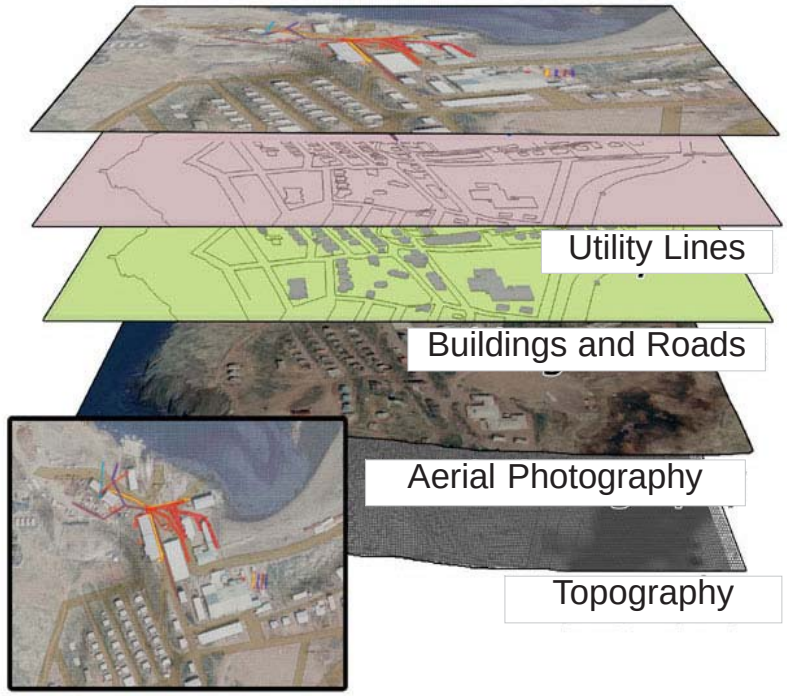
Each of these objectives is discussed further in the context of the methods used in the field and the major results.

GIS at the MoPWT: Creating a Decision Support System

Over the past five years the MoPWT has been developing an interactive GIS database of the national road network. This intense effort resulted in comprehensive base maps of the road infrastructure combined with a series of relevant layers of information including general environmental features, water, topography, airports, bridges and many major footpaths. In addition, other layers such as the location of health centers and villages were integrated into the system. However, use of the resulting maps was limited as many departments in the Ministry were unaware of their existence, unable to update and integrate the maps with new information, or uninformed of the opportunity to link the maps to the Lesotho Roads Management System.

As a consequence of discussions during the appraisal mission for the Lesotho Integrated Transport Program, in November 2003, a team of consultants carried out a needs assessment of the existing GIS with the objective of identifying how to integrate systems[2] and better address the needs of Ministry users. In addition, the team identified existing sources of spatial data in the country that would assist in enhancing the GIS to better identify and address poverty and social issues and linkages to the transport sector (Walker and Lema 2005). The results of the needs assessment and a demonstration of an integrated GIS[3] combining poverty and social information[4] were shared and discussed at two national workshops with stakeholders and potential users in June 2004 (Oddsson, Walker, et al. 2004a, 2004b.)

In Lesotho, the recently completed Poverty Reduction Strategy Paper (PRSP) and the Government of Lesotho Vision 2020 plan call for a shift in approaches within sectors to look beyond their boundaries and promote integrated development planning in the country. The creation of the demonstration model integrating poverty and social



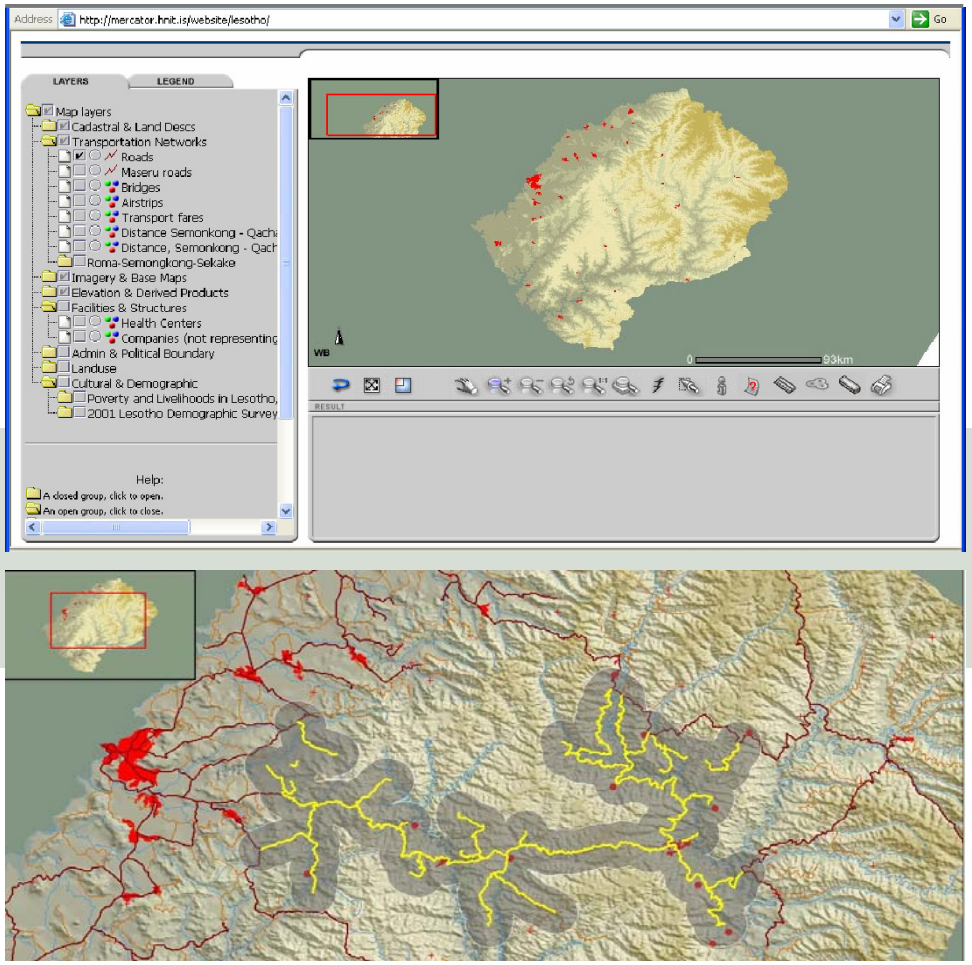
GIS layer example from NOAA (2004). Online Source: http://www.nos.noaa.gov/education/kits/geodesy/media/supp_geo10b.html. Retrieved 31 July

Above: A GIS is a computer system capable of creating, storing, and managing multiple layers of spatial (geo-referenced) data (ESRI, 2005). The graphic above illustrates how a GIS integrates layers of information and acts as a multi-sector clearinghouse for information. Each of the layers in this graphic not only represents a collection of related elements on a map, but also contains a database of associated numerical and text information. For example, the type, width, condition, last maintenance date of a selected road could be input and accessed by clicking on that road.

information at the national and local levels is a step in this direction on the part of the transport sector. The objective is to use GIS as a decision support system that allows the MoPWT to better target investments, achieve poverty reductions, integrate and coordinate data with other sectors and donors (including census and Demographic and Health Survey (DHS) data), monitor indicators and impacts, and facilitate stakeholder communication and participation.[5]

In addition to the analytical capacities of the system, one of the most important uses of the information in the GIS has yet to be fully exploited: namely, its use as a communication tool, facilitating the participation of stakeholders at the local level in analysis and prioritization of road works. As Lesotho moves to decentralize its government, local officials will be increasingly responsible for defining the criteria by which services will be added or sited and rehabilitation or construction projects will be judged. To this end it is essential that the Ministry find ways to systematically communicate and integrate local and community perspectives into its national plans.

This pilot sought to create a participatory methodology that would identify opportunities, barriers, and constraints to mobility and access in the Senqu River Valley. A new World Bank supported project will build two bridges over the Senqu and Senqunyane Rivers, thereby providing year-round access to the valley for the local population. This pilot is part of the social assessment designed for the project to initiate a two-way communication process to help the Ministry and local government better analyze, plan and implement transport projects that support integrated development and address local needs. The methodology can be used at any stage in a project (appraisal, design, implementation, monitoring and evaluation) and can be inserted as a component in existing workplans (i.e., as a social assessment tool, during supervision and monitoring and evaluation).



Above: These two images are both screen captures of the actual MoPWT GIS. The upper graphic shows the organization of the system into a series of layers (on the left) that can be turned on or off depending on the needs of the user, to assemble the map on the right. The space below the map allows for interactive queries of the database and system. This map is a representation of the entire country with layers for topography and the major roads. The zoomed-in image below illustrates the analytical and decision support potential of this tool. This map was developed based on a query to show only those health clinics within a 5km radius of the major roads. This type of spatial analysis has the potential to support the placement of new clinics, the evaluation of access criteria, and the characterization of underserved populations.

Mobility and Access Analysis in the Transport Sector

Currently, in the transport sector, studies on mobility and access generally collect data from individual time and/or activity diaries or household survey questionnaires covering cost, distance, time and mode. While these methodologies retrieve useful information, they are time consuming to implement and, often costly when applied at a large scale. In addition, they reveal little about local perceptions regarding barriers to mobility and access (physical, economic, social) or about how decisions are made for different members within a household. Failure to disaggregate data often leads to a lack of identification of the gender and other relevant social dimensions and which subsequently can lead to the design of inadequate transport infrastructure and services for vulnerable groups.

Social assessments carried out for transport projects have tended to focus on the costs of transport and access to destinations, but they generate little information about residents' mobility and access patterns for areas larger than the specified communities. This larger view is especially important for understanding the gender dimensions of mobility. Many transport options, such as various intermediate modes of transport (IMTs), do not have direct finanacial cost. Because lack of access to cash often limits women's mobility by IMTs or public transport services, their travel becomes invisible in these asessments.

Above: Semonkong Passport Office and out-of-use airstrip.
Below: Panoramic view of Ha Lepekola village.

Above: Photo of an interview in Ha Lepekola, where the only track leading to the village is in serious disrepair (visible along the hillside at the top of this image). Ironically, interviews in Ha Lepekola were conducted with an unusually large group, comprised of individuals from Ha Leronti and several smaller surrounding villages, who had all gathered for a pitso (local government meeting). They had been informed on arrival that the assigned official was unable to cross the river to reach the village for the meeting.

Moreover, studies that rely on household survey information also tend not to disaggregate data or evaluate differential impacts of transport policies. Finally, social assessments are generally carried out at the beginning of a project and often the data is not re-visited until it is time for evaluation.

For example, a rural access indicator (within 2km of an all-weather road) has been identified and is currently being used by many programs; however, this indicator focuses only on one spatial dimension of access and does not include any of the myriad social or economic barriers that could be blocking access at the local level. Because social and cultural barriers are often paramount in determining mobility and access, this methodology seeks to elicit information about all possible barriers to mobility and access and find ways of effectively incorporating this data into planning and design processes.

The World Bank has recently created a transport module for multi-topic household surveys such as the Living Standards Measurement Survey (LSMS) to help address a scarcity of national level data and facilitate analysis of poverty impacts of transport programs (Baker and Denning 2004). However, although geography is cited as an important factor, almost no LSMS to date has geo-referenced its data or survey clusters. Until this is done, important spatial analysis which could help understand regional and social disparities in mobility, differential access to services and destinations, impacts of transport service costs, etc., is not yet possible from these rich sources of data.[6]

Spatial analysis of mobility and access and geo-referenced collection of data is beginning in the sector and generating useful and interesting results. Within the World Bank, the rural roads project in Guatemala has used overlays of road network and poverty maps to help prioritize analysis for rehabilitation of rural roads. The urban mobility study in Mumbai used geo-referencing as an important component for household surveys. Recent work in England has used GIS and spatial analysis to evaluate timely access to transport services and healthcare providers in an urban setting (Lovett, Haynes, et al. 2002). The potential role of GIS to help analyze linkages between social exclusion and mobility is also a growing area of research (Boothby and Dummer 2003).

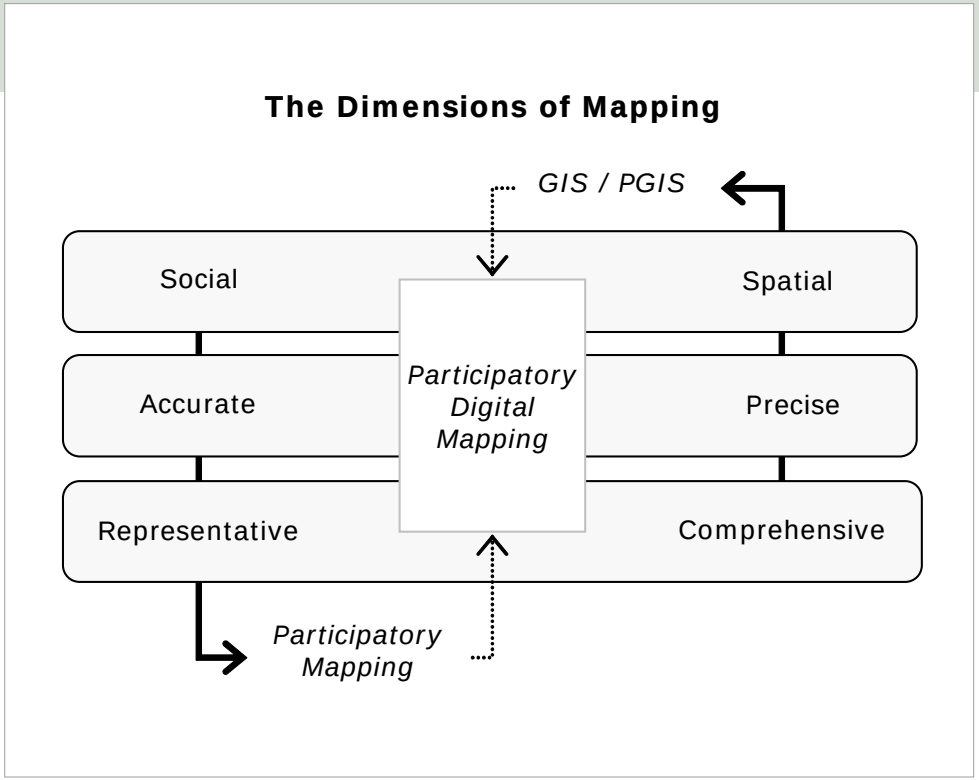
Collaborative GIS and Participatory Digital Mapping

Both transport infrastructures and services and participatory planning are implicit elements within the MDGs, and further underlying these elements is a common association with spatial information. Geographic and spatial data have played increasingly important roles in development planning and environmental decision making across all sectors from top-down management to grassroots participation. As a result, various types of mapping have moved to the forefront of planning efforts. The two most common forms of mapping applied in development projects today are GIS and participatory mapping.[7]

Since its inception, the potential of a GIS to collectively illustrate numerous aspects of a location has been its primary strength; however, with the emphasis on participatory information, this strength of the technology has also become a fundamental weakness of its output. GIS maps with multiple layers of information that include *all of the features* of a selected area are now widely recognized as representing only one possible reality. On the other hand, participatory mapping is widely used as a counterpart to GIS for its ability to capture local perceptions of issues and development efforts. In contrast to GIS, participatory maps describe *how and in what context* people live, but many of these methods are limited in their usefulness.

Often the process of data collection is extremely time-consuming, and the resulting information is difficult to compile and unwieldy for effective use by decision makers (Tripathi and Bhattarya 2004). Participatory mapping used to facilitate ranking of particular projects (such as the choice between clinics or schools in Social Funds) are also of limited value, because once collected, these maps tend to sit on a shelf, never again to be consulted, analyzed, or incorporated into monitoring systems. In these cases, mapping is

Above: Interview at Ha Phafoli. Below: Diagram of the Dimensions of Mapping.



only an exercise, separate from larger planning, communication, and evaluation strategies.

Although the overarching picture offered by both of these types of maps is important, these fragmented views are no longer enough. Effective development, requires the disaggregation of both actual and perceived spatial relationships by gender, age, and income, among other characteristics, to understand and address the differential impacts of development among diverse populations. Individuals' connections with their physical surroundings are, in part, the product of their unique priorities, perceptions, and preferences. In other words, populations are not homogenous, and *where* people live only forms a starting point for *how* they live there.

Given the complementary characteristics of participatory mapping and GIS, this study bridges the gap between spatial information and stakeholder communication in transport planning by integrating the two tools. The combination of mapping media evaluated in this study allows groups to work with familiar hand-drawn participatory maps and mapping techniques, while still taking advantage of the quantities and speed of information exchanged through GIS. The new maps have the appearance of a traditional participatory map, but each icon accesses the database of spatial information typically stored in a GIS and establishes a direct digital interface with other related project information.[8]

Traditionally, there has been little overlap between the users, audiences, and objectives of GIS and participatory mapping; however, with the recent changes in development practices, mapping professionals and projects in these domains have gradually come together (Brodnig and Mayer-Schönberger 2000; Weiner, Harris et al. 2002). Specialists in participatory methods or in GIS have each extended their respective research areas to include aspects of the other; but many of these efforts remain grounded in the strengths and weaknesses of their points of departure. For example, collaborative GIS efforts typically retain the complexity and precision of a GIS, while participatory maps in GIS often remain informal, socially focused, and locally relevant.[9]

The growing movement toward integrating participatory methods and GIS highlights that fact that neither approach alone currently meets society's changing information needs (Weiner, Harris, et al. 2002; Mapedza, Wright, et al. 2003; Mbile, DeGrande, et al. 2003; Robiglio, Mala, et al. 2003; Kienberger, Steinbruch, et al. 2005). Effectively combining participatory mapping methods and GIS requires a clear assessment of their respective strengths and weaknesses for different projects. Avoiding indiscriminate applications of participatory tools, like mapping, necessitates a framework for planning and evaluation.

This pilot balances three key "dimensions" shared by both participatory mapping and GIS. The figure on the previous page (p. 12) illustrates how these elements –

1) spatial and social objectives,
2) accuracy and precision in map displays, and
3) representativeness and comprehensiveness

– collectively define the fundamental attributes of different mapping methods and their resulting maps. Each of the attributes on the left side of the three dimensions focus primarily on the issues surrounding *how* people live and are connected more strongly to participatory mapping, and those on the right side characterize *where* people live and are more strongly associated with GIS. The combination of GIS and participatory maps at the center of the figure seeks to balance these attributes in a dynamic equilibrium across all three dimensions (Vajjhala 2005).

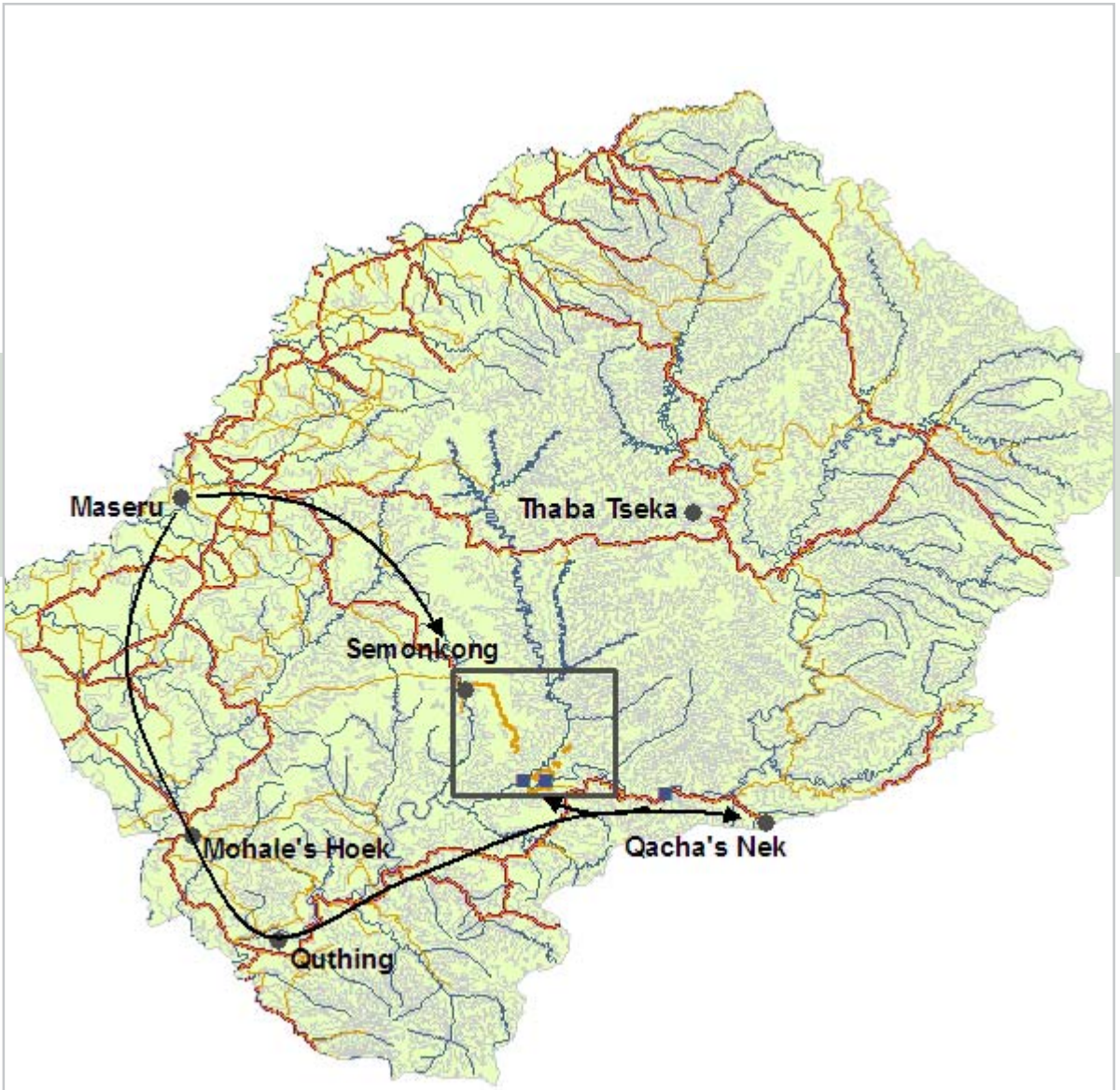
As Lesotho moves toward decentralization, local government will have a central role in planning and managing resources and services. Crucial to these efforts are tools for communicating with local community, civil society, government, and private sector stakeholders.

Pilot Study Area

Fieldwork for the pilot was carried out in the Senqu and Senqunyane Valleys in southern Lesotho – one of the most isolated areas in the country. These valleys lie south of the district town of Semongkong and northwest of the town Qacha's Nek. This area is marked in the box on the context map to the right. As the DRR map [next page] illustrates, there are numerous villages with very limited road access in the selected region. Roads from the north stop before reaching the edge of the escarpment before the Senqu river and tracks from the south end at the opposite side of the Senqunyane river, essentially cutting off the valley completely.

Traveling south from Semongkong a DRR-maintained road gradually turns into a track after ~20km to the final village of Ha Lepekola at the edge of an escarpment over-looking the Senqu River. Taxi service from Semongkong is supposed to go all the way to Ha Lepekola, but it is erratic and had only run as far as Ha Tumo for the four months prior to the team's visit. Many villagers reported traveling to Semongkong by horse or taking shortcuts on footpaths.

River crossings are made by small government supplied metal row boats at established ferry points. The government ferries each have a captain who rows people across for free. However, participants noted that these men



Above: Map of Lesotho with team travel routes and study area (box) in Senqu and Senqunyane Valleys. Interviews on either side of the valley were conducted during two separate trips from Maseru.

are frequently absent and several ferry operators interviewed complained about not having received their wages for some months. A private ferry crossing has been established at Hloahloeng (where the existing road now comes to a stop at the rivers edge). It costs 2 maloti/person/crossing (6 Maloti = ~$1.00) and runs from around 7 am until dusk. The distance across the river at this point is only about 40 meters, but when the river is high, it is too dangerous to row across. Many people interviewed reported not knowing how to swim, and the dangers of crossing the river at times of the year when there are heavy rains are multiplied. In the dry season, it is possible to cross the Senqu river at Hloahloeng by foot or horse. It is also possible to cross the Senqunyane river by foot or on horseback when it is low at a passage near Mokopung (see photos on p. 3 for examples of high and low river levels).

Villages located west of the crossing in the Senqunyane Valley can be reached by taking the ferry boat and traveling on horseback or by foot up the valley. The track has been maintained by adjacent communities and intermittently by a businessman living in Ha Phafoli. There are no regular transport services in this valley. All movements are accomplished on foot, by horse and donkey or by occasional private vehicle. About 500 meters from the Hloahloeng river-crossing is a shop and small hotel of five bungalows. This outpost is the last stop for taxis coming from Sekake and also serves as a World Food Programme (WFP) drop site designated for villagers in the valley.

Above: DRR Map of Hloahloeng District showing all main and rural roads in black, and tracks in gray, with points marking all villages and airstrips / airports in the valleys and pilot study area.

The World Bank has been discussing constructing two bridges across the Senqu and Senqunyane rivers thereby providing a necessary component to ensuring year-round motorized access into the valleys. Both rivers flood seasonally and isolate populations from important basic service centers. Although quite fertile and viewed as a potential bread-basket area for the country, the lack of access to services, limited opportunities, and poor farm prices have led to high out-migration and made this one of the highest female headed household regions in the country (Hall and Adams (no date)).

The bridges and road construction will eventually serve to link the villages south of Semongkong and those in the Senqunyane Valley to the road to Qacha's Nek. Today, although only about 45 km in distance from one another, there is no road linking Semongkong directly to Qacha's Nek. Travelers wanting to go to the south of the country must either drive completely around the western edge of the country (about a 10-hour drive) or through Thaba Tseka in the central part of the country and down to Qacha's Nek (also about 10-hours).

Methodology

The idea for creating this methodology was generated by a conversation with DRR engineers during preparations for the project social assessment about how local governments and communities make decisions regarding rehabilitation and construction of new roads. They wanted to understand the logic by which decisions are made, what criteria are locally used and valued, and who will be most affected. This methodology seeks to illuminate these perspectives and to bring communities and local government into decision making processes about the road network. Fieldwork was carried out in seven villages as follows:

Semongkong – Ha Topa Corridor:

- Ha Matlosa
- Ha Lepekola
- Ha Tumo

Hloahloeng – Senqu/Senqunyane Valley Corridor:

- Ha Reli
- Ha Phafoli
- Mokopung
- Ha Nkau

In addition to the village focus groups, interviews were also carried out with relevant service providers, such as operators of grinding mills, taxi drivers, ferry drivers, health clinic providers, police, pension administrators, shop owners and the manager of the Fraser's store in Semongkong. The fieldwork team was composed of the social development specialist for the World Bank team, a participatory GIS specialist, the MoPWT GIS specialist, a DRR planning engineer, a member from Roads Branch responsible for environmental and social safeguards, and a member from the MoPWT economic planning unit. The pilot was treated as a training opportunity by the Ministry and the resulting collaboration was excellent.

During the fieldwork the team held open-ended interviews with the village elders or chiefs, and then with focus groups of men, women, elderly and youth. This was followed by a participatory mapping exercise with each focus group. Later, the information from interviews and maps was consolidated first as paper sketch maps to allow for team dialogue and then "case study" maps were created focusing on analysis of key issues raised in the interviews. Finally, these maps were then layered onto the base maps of the existing MoPWT GIS, thereby integrating the perspectives and issues into the Ministry decision-support system. Village maps that specifically focused on analyzing the gender differences in mobility and access were also created in this way. The methods and resulting maps are described in the next sections.

Right: Villagers from Ha Nkau overlooking the Senqu River.

Focus Group Interviews

Qualitative open-ended focus group interviews were held with villagers in each of the seven villages. The focus groups (averaging 8-20 participants) were divided by gender and age, where possible. Interviews focused on eliciting existing mobility patterns, constraints and barriers to access. The open-ended interview guide was tested during the fieldwork and modified as the pilot progressed. A general interview detailing the history of settlement, existing population, major resources and services in the area and ideas for new developments was held with the village chief or group of elders in each village. The interviews provided the basis for understanding gender differences in access and mobility at the community level, key barriers (physical, financial and social) for mobility and access to basic services, and relevant local level indicators for success which may be considered by the forthcoming bridges project. Sections of the interviews concentrated on:

- Access to services (cost, time, distance, mode)
- Gendered dimensions of mobility and access
- Transport constraints (seasons, infrastructure, security)
- Ownership and use of intermediary modes of transport (IMTs)
- Indicators for monitoring and impact assessment

The images in the next sections show different stages of the process in various villages.

Above: Grannies describing their lack of mobility in Ha Reli.
Below: Man arriving at interview in Mokopung.

Participatory Mobility and Access Mapping

Each of the focus group interviews also included participatory mapping of mobility patterns, use of footpaths and identification of links to the road network, locations of key resources and services and constraints and barriers to access. These maps, which can be viewed as "narrative maps" of mobility and access in the area also included information about transport service costs, distance and time for different modes of transport and seasonal variations in access.

Above: Young women mapping in Ha Matlosa.

It is important to note that the team found these maps could be produced in a variety of ways. Individuals in the focus groups could sketch maps themselves gathering input from the group, or the group could narrate for one of the fieldwork team key features in the landscape, locations of services, important destinations, and the team member would produce the sketch. Either way, the sessions were very interactive and enormous amounts of information and important distinctions in mobility and access by gender, age, wealth levels, services, etc. was gathered.

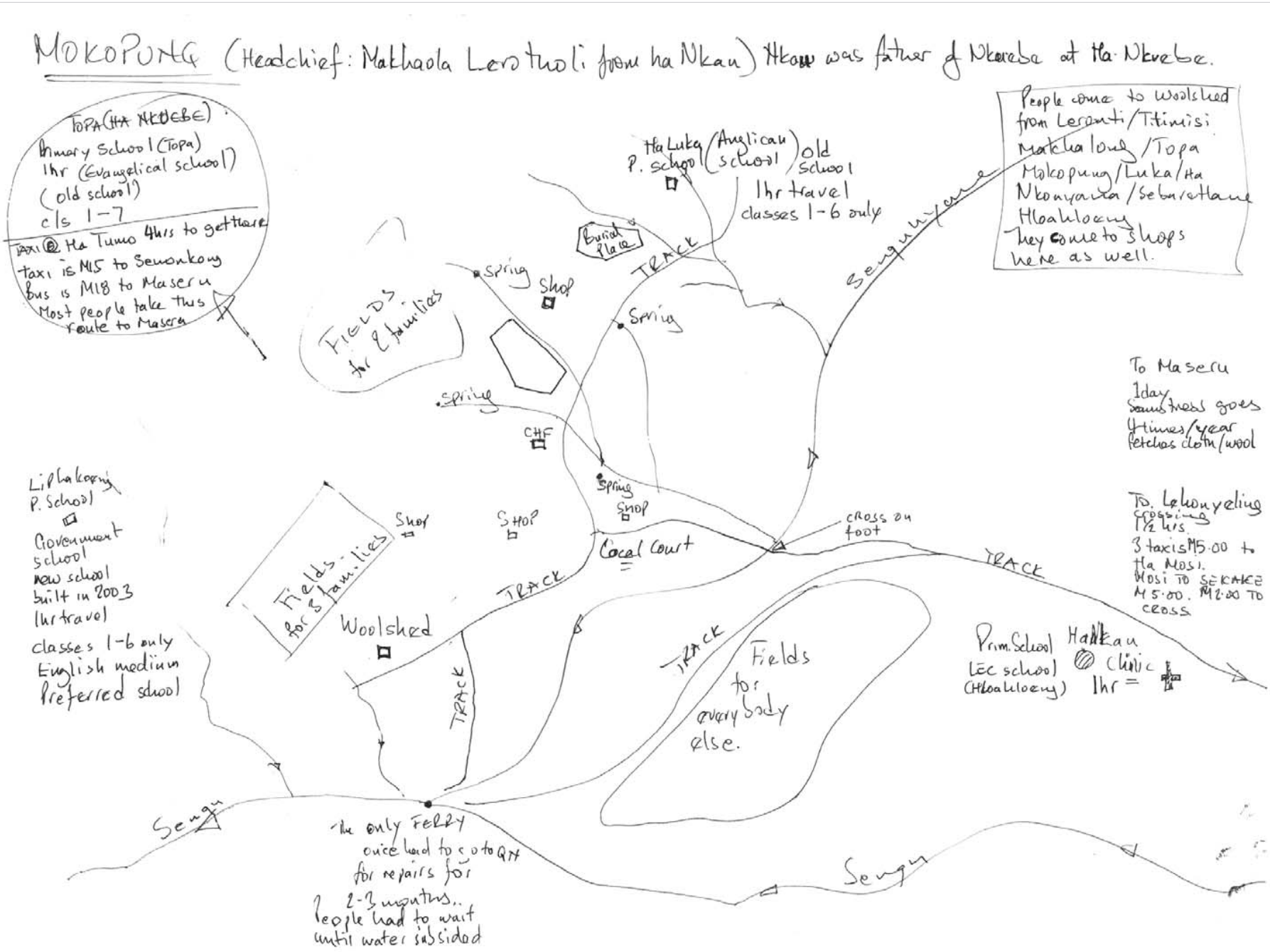
The map on the next page is a map of Mokopung created by all participating villagers working with the team's MoPWT GIS specialist as a scribe. The map includes important services provided by the village for the region, including the district court and grinding mill; and highlights the locations of schools, clinics, fields, grazing areas, transport service with comments on the distance and travel times, availability and quality of services, such as the local ferry. In specific cases, this and the other participatory maps identified key locations that were later marked using a GPS for accurate integration into the GIS.

The two maps on page 22 are also participatory maps developed during focus group interviews. The map at the top of the page is a map created by a team member from the DRR working with young women in Ha Matlosa. This map is a linear time-map describing the places women frequent during course of a day, week, month, etc., and serves as an important counter-part to typical spatial depictions of mobility. The second map on page 22 was drawn independently by young women from Ha Tumo. Interestingly, this map marks both the women's horizontal and vertical movements, illustrating the changes in

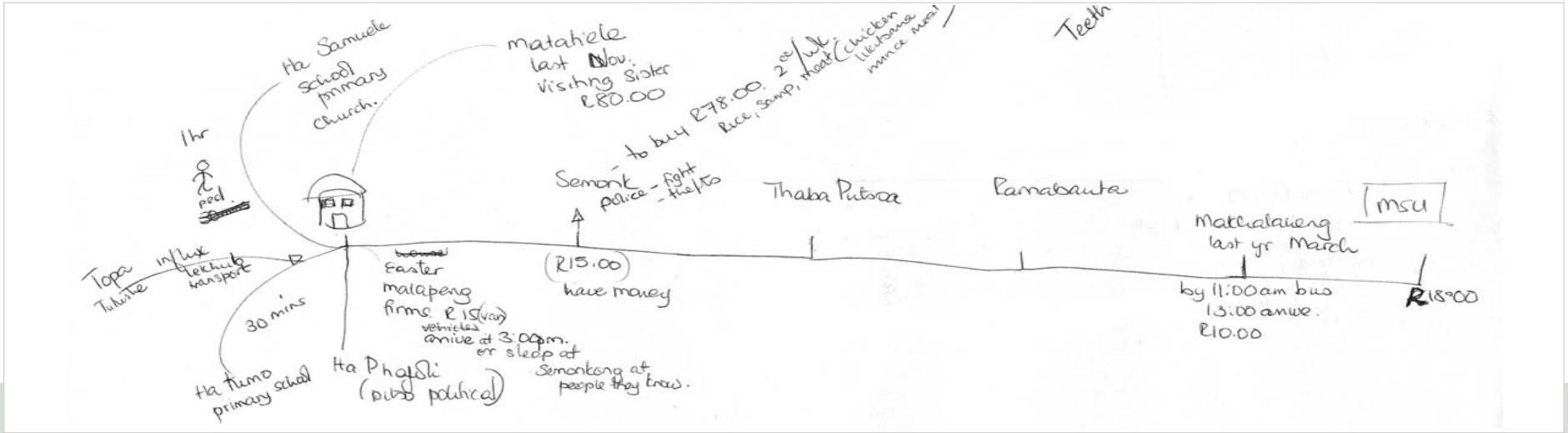
Above: A child carrying a child in Ha Matlosa.

elevation as barriers to mobility and access along the frequently traveled paths to Semonkong. This drawing was complemented by the women's focus group interview where they commented on the dangerous and slippery footpaths as important factors limiting women's mobility, especially when traveling with children to Semongkong for services such as healthcare.

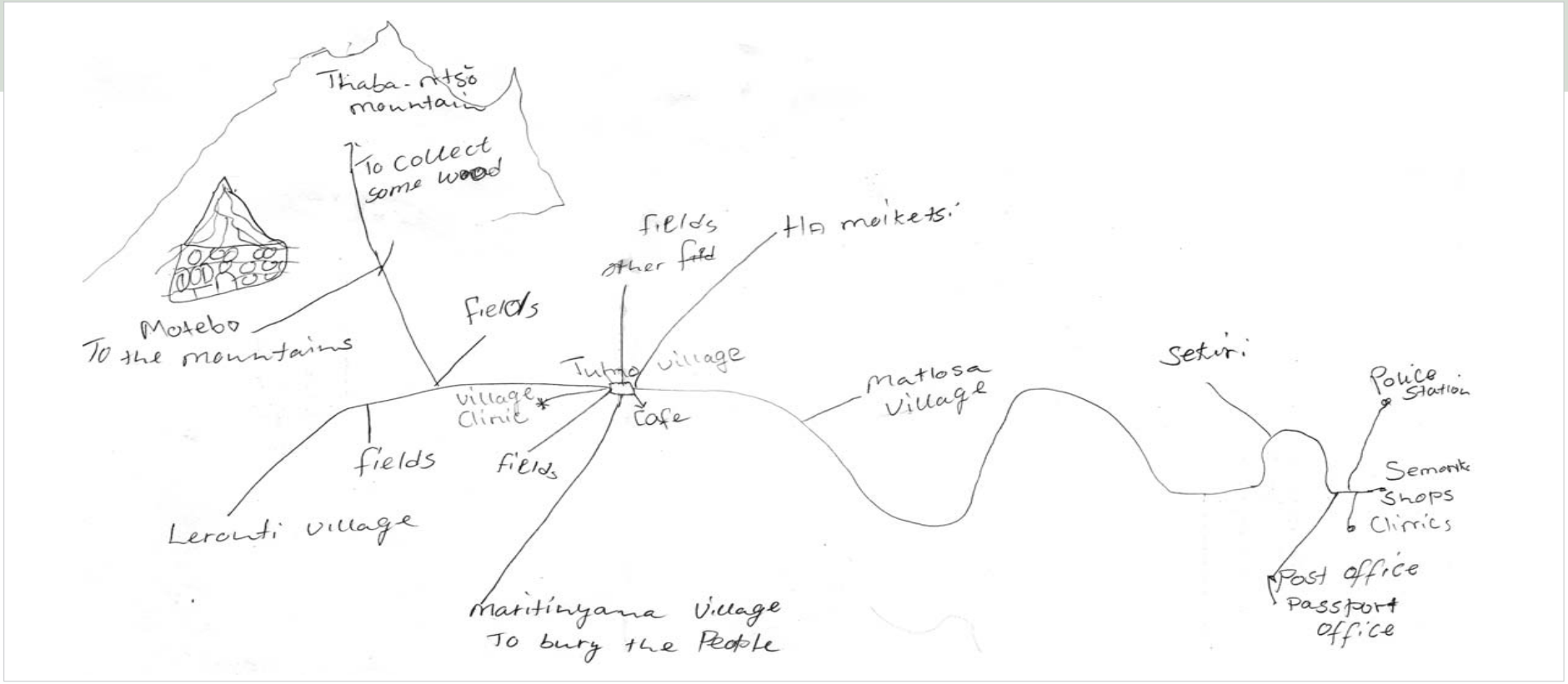
What is important in both of these examples is that the formats were developed by participants themselves to capture the dimensions of mobility (e.g. time, elevation, etc.) that they found most important. This illustrates how the methods described here can integrate diverse perspectives in a variety of formats.



Above: Participatory map of Mokopung (see text on p. 20).



Above: Participatory time-based map drawn by Ha Matlosa women with scribe. Below: Map drawn by Ha Tumo women showing elevations (see text on p. 20).



Creating Case Study Maps and Integrating Participatory Maps into the National GIS

From the participatory maps collected in each village and the related interview notes, the team worked together to assemble case study maps on large-format printed base-maps. Working with colored markers, information about issues (health care, education, emergency transport, etc.) was consolidated from the various participatory maps and checked with the national GIS to mark the actual geographic locations of key points, paths, and ranges of movement.

Above: Team participatory map elicitation.

These maps were specifically developed by hand to allow for a discussion with all team members about issues raised during specific focus group interviews. In a sense, this team participatory mapping and planning dialogue served as counterpart to the village participatory mapping interviews in the field.

From these hand-drawn case study discussion maps, the sketch geo-referenced information was entered more precisely into GIS. Where possible, when underlying base maps were available, the point, path and polygon data was digitized and organized onto layers in the system based on GPS locations. In cases where this data was unavailable, participatory information was added as graphic elements and organized onto related village layers and classes

Above: Team case study map development.

(sub-layers). Several examples of the resulting GIS maps are illustrated in the next section.

Because these maps use both graphic elements and geo-referenced data, they do not require extremely precise underlying GIS information for the purposes of participatory information integration and communication. This hybrid approach adds an important degree of flexibility in the process as a whole, while still allowing various types and levels of information to co-exist meaningfully in a GIS.

Overall, features entered from the participatory maps into the GIS were also linked to data attribute tables to allow for further analysis. The differences in the types of maps and data collected (discussed on page 20), also support the need for a flexible approach.

Above: Case study map transfer process to GIS.

The next sections describe in detail selected village maps and issue-based case study maps created in GIS using this methodology.

Mapping the Gender Dimensions of Mobility

Using the process of spatial and qualitative information elicitation, compilation, and integration described above, a series of village and case study (issue) maps were generated in GIS. This section describes two sets of village maps: Ha Tumo and Ha Phafoli, and the gender dimensions of mobility and access in each of these villages.

Ha Tumo

The maps on the following pages are participatory digital maps generated from information gathered during focus group interviews in the village of Ha Tumo. A participatory map created by a group of young women from Ha Tumo was shown earlier as part of the general discussion of participatory mapping. This map and additional maps, drawn by other groups of men and children, were each used to develop GIS village mobility maps. Individually, these maps cover the mobility patterns for men, women and children and identify (with symbols) the key destinations (social and productive) for each group.

Along with these maps, additional information covering the frequency of trips to common destinations (i.e. Semonkong) and along specific routes was also collected for eventual integration into the GIS. Ha Tumo is an unusual village in the Semonkong-Ha Topa corridor, because it houses several amenities including a local school/church and three small stores run by shop owners from Semonkong.

Men's map

The men from Ha Tumo, as in many of the villages in the study area, narrated that their mobility patterns revolved primarily around the care of livestock and fields. Because most men move large distances to fertile fields, cattle posts, grinding mills and woolsheds, where possible, men travel frequently by horseback instead of walking.

Above: Ha Tumo shop with store employees unloading beer from Semonkong from a donkey.

As a result of their access to horses, the men's map follows a vertical pattern closely tied to the existing track and road. Moreover, men are responsible for buying and selling products in Semongkong and are frequent visitors to the town. Although the village has some goods for sale in a village shop, the availability is limited and prices are prohibitive compared to shops in Semonkong.

The Ha Tumo cattle grazing lands are not far from the village, and men participate in traditional racing competitions with villages to the south. Because they are on horseback, men have access to the clinic at Ha Nkau which is much closer than the clinic in Semongkong; however, even the men report difficulties in seasonal access and barriers to service delivery.

Interestingly, when men described their travel times along select routes they provided times for travel by foot and horse with heavy loads. Typical loads include grain allotments and WFP supplies, and transport of the allotted grains to grinding mills in either Mokopung or Semonkong.

Women's map

In contrast to the men, women described their activities as occurring within a specific radius of the village. Their major tasks of collecting water and firewood, grinding

grains at home when necessary, cooking and caring for the children, and working in the fields as necessary require far less travel than the routine activities of the men.

Because women are forbidden by tradition to enter kraal sites (livestock pens), their interactions with any livestock related activities are minimal. As a reflection of these constraints, the women's map follows a horizontal pattern of movement (perpendicular to the main road), closely tied to their productive and social activities (water or firewood gathering and singing associations) and the footpath network. When traveling to Semongkong, they travel almost entirely on footpaths, only joining the existing road for the final hour of the journey. Many women cited safety concerns as major barriers to mobility and access, where footpaths were often frequented by shepherds who posed a threat to young girls and women.

One important distinction heard repeatedly in the interviews came from the grannies – or elderly women in the villages. These women often live alone, or close to a son and daughter-in-law. After years of working, walking and carrying heavy loads, many no longer are able to climb the steep slopes or negotiate the slippery footpaths. They are the most constrained members of the community, taking care of chores just adjacent to their huts. Elderly women's immobility has important impacts on their lives. One issue is that they are no longer able to attend churches in nearby villages. Cut off from their social networks, they

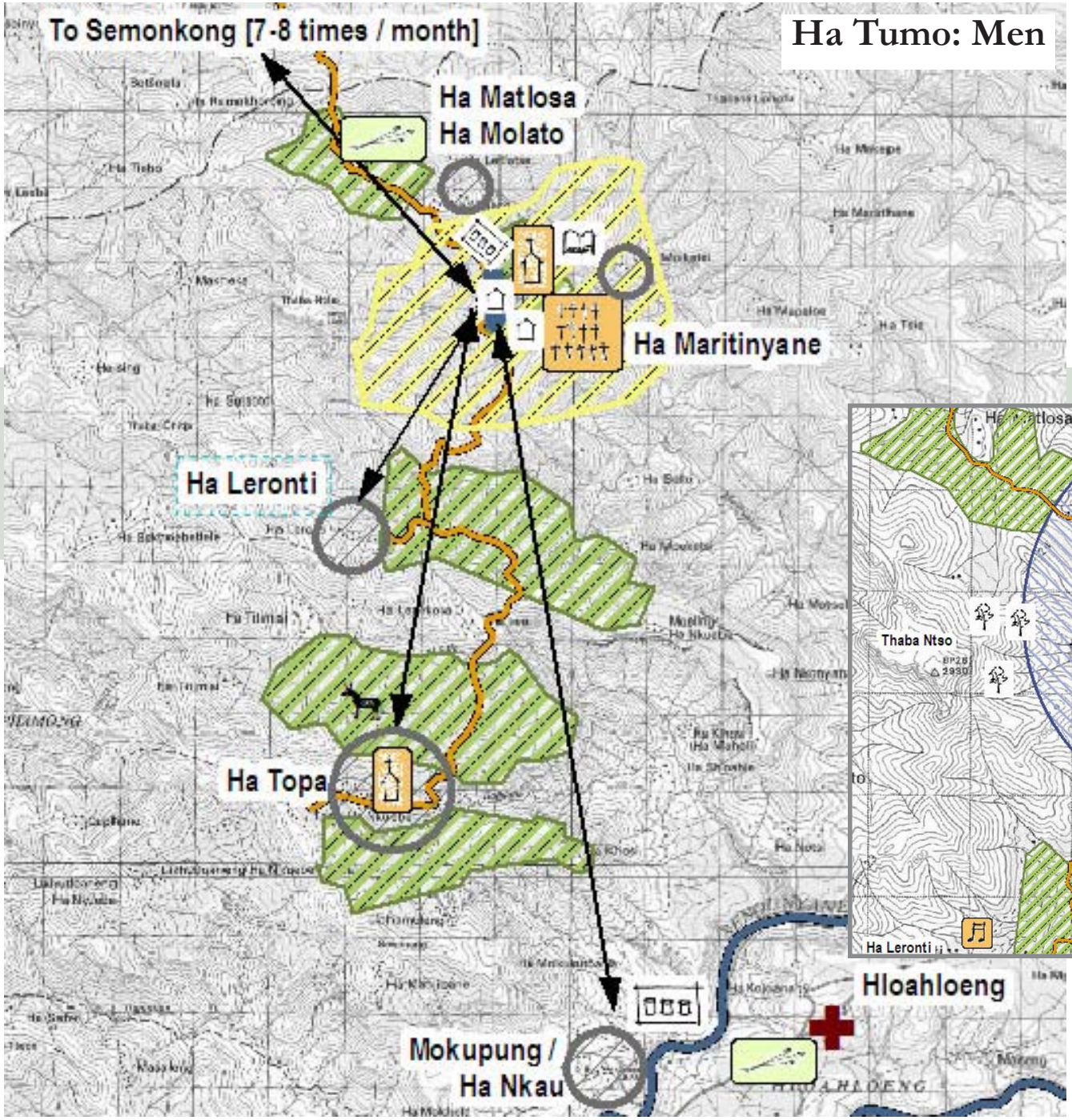
Above: A mother from Ha Tumo with her son.

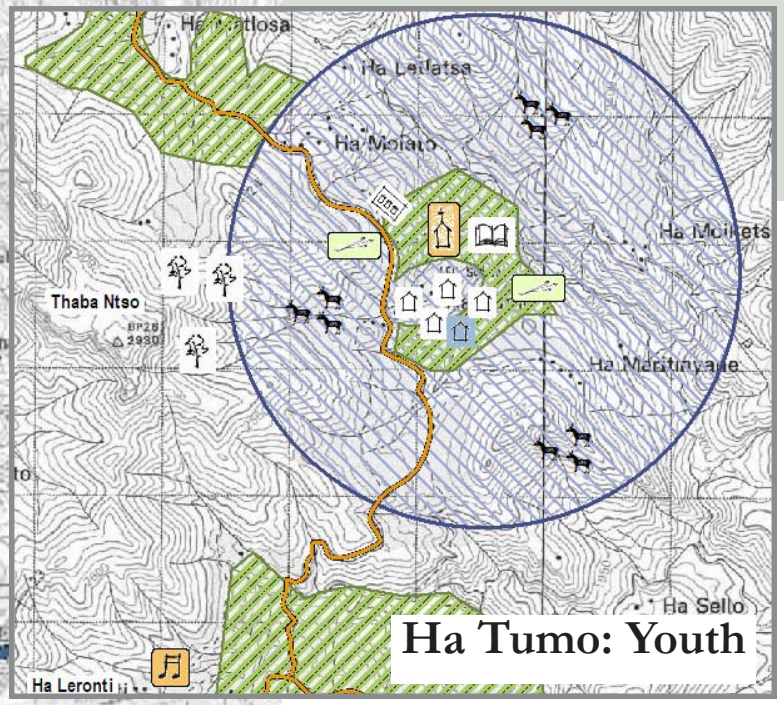
are quite literally bored and lonely. Elderly men noted that they are less affected since they are able to continue on horses for a much longer period of time.

This isolation has important impacts and ramifications regarding access to the pension scheme recently setup by the government. Pensions are distributed monthly at the administrative office in Semongkong. Beneficiaries (all of whom have to be above 70 years of age) come from around the entire district. This means that once a month, there is a huge line of elderly, many of whom have to wait for several days (or queue days in advance) to get their allotments. Not only is this time consuming and costly to pay for lodging and food while away from home, but for those who literally cannot make it, such as elderly women, they have to send a proxy in their place. Proxy's often charge a percentage of the monthly pension for the service of retrieving it. Elderly women, who already have very little wealth, are further penalized on their pensions by their lack of mobility.

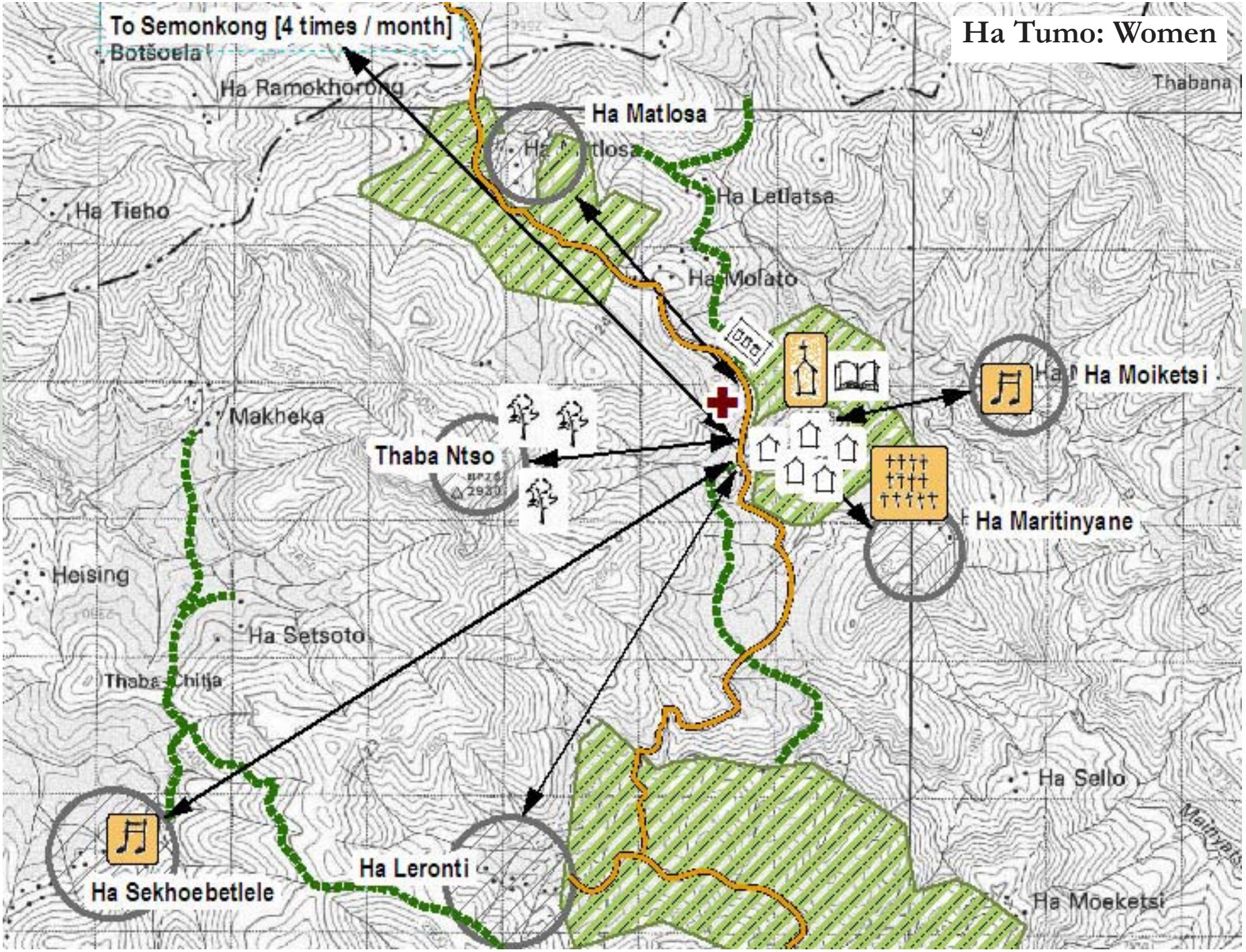
Children's map

The children's map is essentially limited in scope. They travel by foot and most activities take place in the village. Girls move laterally to gather firewood, and boys go into the hills to find nearby grazing areas for small livestock, cattle and sheep. Many of the children's activities are tied to the women's mobility, such as visits to clinics, churches, and singing associations. Children's mobility is also seasonally limited, and school attendance (at distant schools) drops during winter, when snow makes footpaths treacherous.





Ha Tumo Maps- Left: Men's map.
Above: Children's map.
Right: Women's map.

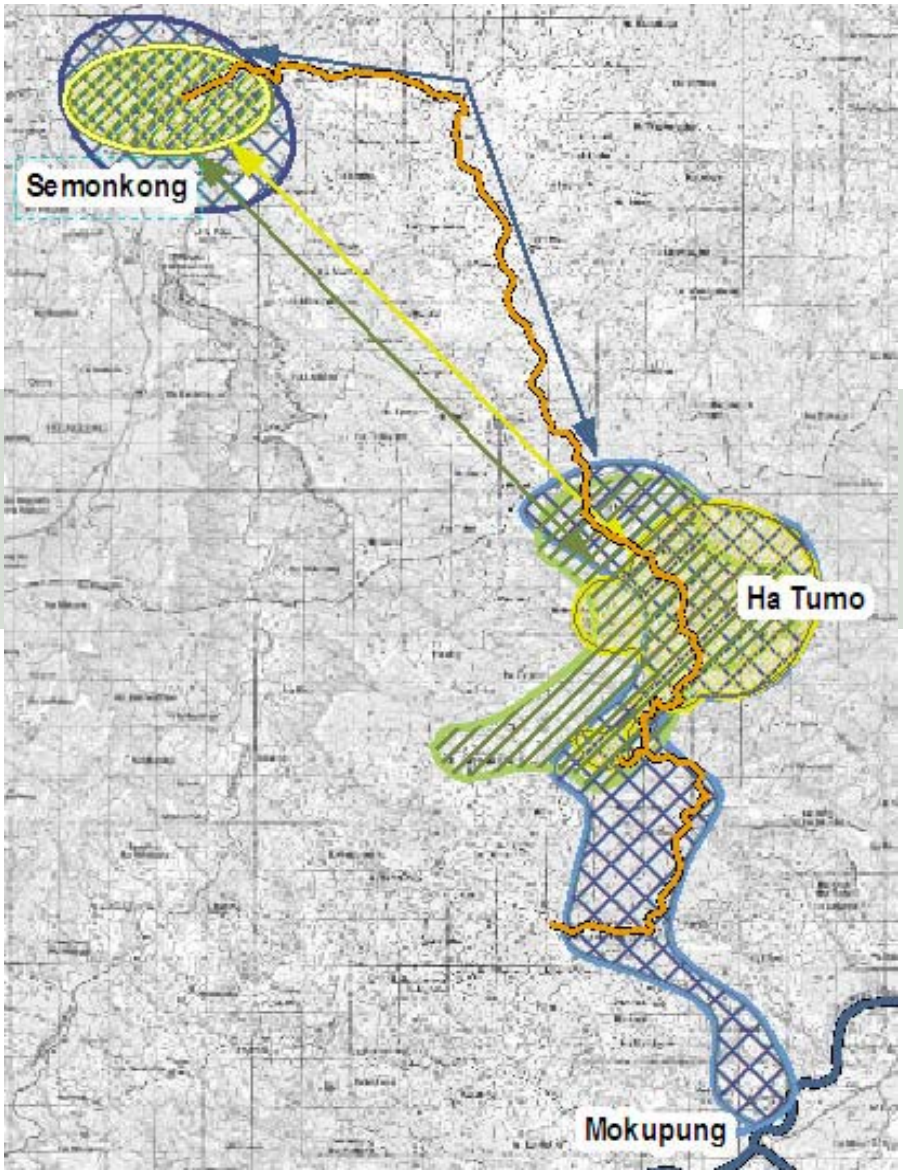

Ha Tumo: Women
To Semonkong [4 times / month]
Botšoela
Ha Ramokhoromg
Thabana
Ha Matlosa
Ha Letlatsa
Ha Tieho
Ha Molato
Ha Moiketsi
Makheka
Thaba Ntso
Ha Maritinyane
Heising
Ha Setsoto
Thaba Chitja
Ha Sello
Ha Leronti
Ha Sekhoebetlele
Ha Moeketsi

Overlay map

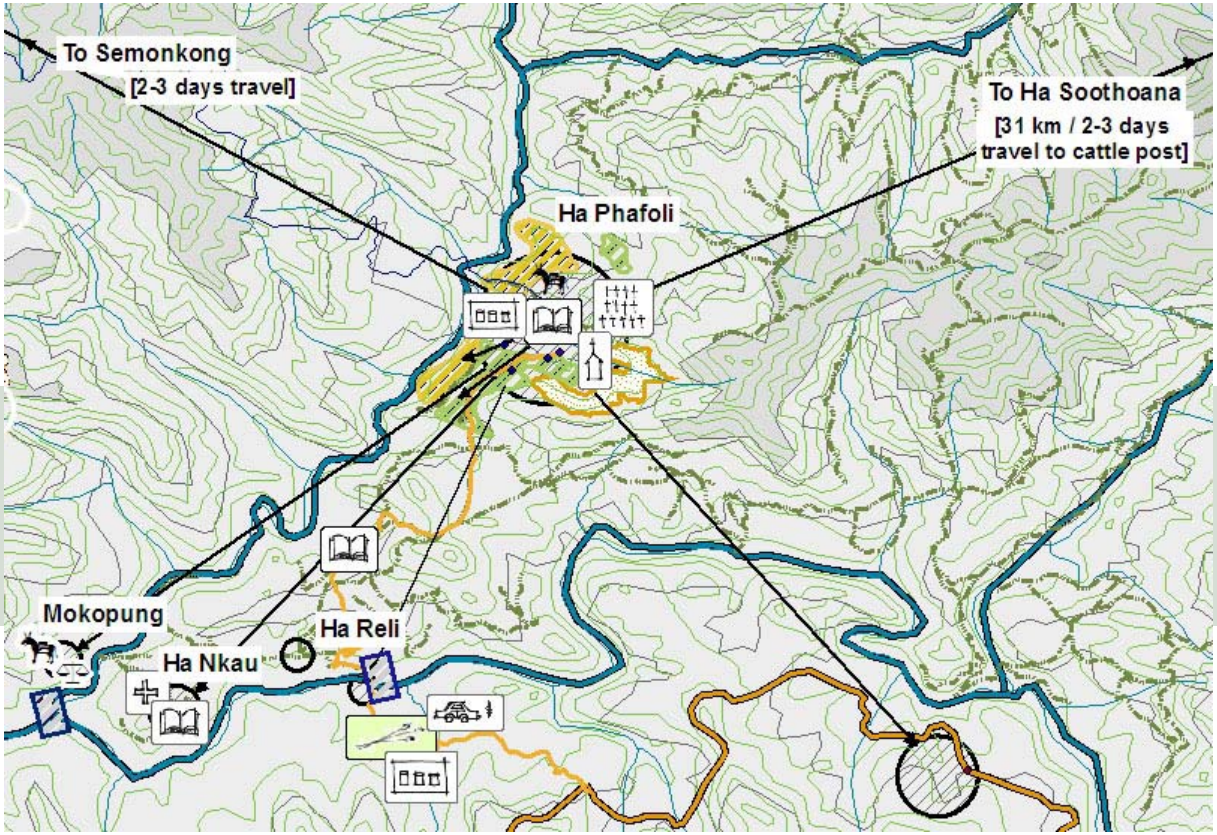
The overlay map brings all three maps- the men's, women's and children's- together and illustrates the gender dimensions of mobility and access to destinations and services. Men have the largest and most linear range of mobility and travel, while women range of travel is more compressed, and on footpaths perpendicular to the main roads. In addition, women's travel times were much longer than those of men, especially when traveling with children. Nobody travels long distances at night. People who travel to Semongkong from distant villages often mentioned places where they stopped to spend the night along the way with family or friends.

It is clear from the maps and interviews that mobility is determined in part, by access to transport (be it intermediate modes of transport (IMT), taxi, or otherwise) and that in turn has an impact on access to basic services. The maps graphically illustrate that the gender dimensions of mobility translate directly into gender differences in access to services. Identifying and addressing those differences (i.e., more attention to the rehabilitation of footpaths and their connections to existing roads, attention to transport service regularity and costs, attention to facilitating access to and ownership of IMTs such as donkeys and horses, making some services such as pensions and healthcare mobile, etc.) would have enormous gender impacts in the area, and fundamentally transform not where people live – but how they live and how they move. Such a focus would also enhance the equity of the transport investments in terms of their gender impacts.

Attention to the gender dimensions of mobility is also important when planning for construction activities. Participants noted that, if given a choice, women would prefer that construction along the Semongkong – Ha Lepekola route begin in Semongkong, thus facilitating their access to services in the district center. Alternatively, men preferred that construction start from the south with the bridges and head north to Semongkong, facilitating their access by horse to Ha Nkau and the larger town of Sekake.



Above: This overlay map was developed by drawing a boundary or extent around each group's primary routes and destinations. Men's mobility footprint is shown in blue, women's in green, and children's in yellow. Only the areas immediately surrounding the village and central Semonkong are covered by all three maps.



Above: Participatory map for Ha Phafoli. Below: Ferry crossing near Ha Reli and track to Ha Phafoli.

Ha Phafoli

In contrast to Ha Tumo, which is a central village in the Semonkong-Ha Topa corridor, Ha Phafoli is the most isolated village at the end of a privately constructed track in the Hloahloeng district. As the last major outpost accessible by truck, the village contains a grinding mill, shop, orphanage, and burial association. However, villagers from Ha Phafoli are still required to travel extensively to other destinations, such as clinics, woolsheds, and cattle posts, and administrative service centers.

As the map shows, men travel approximately 31km twice a year with their cattle to a government sited cattle post to the north. Many men or boys remain at the cattle post through the season to tend the livestock, and as a result the population of the village varies seasonally. In addition to its relative isolation, Ha Phafoli is also particularly cut off during the rainy season where the nearest ferry crossing (also unsafe in high water) is close to Mokopung. Because the rivers narrow on either side of the hills surrounding the village, crossings are particularly difficult, and drowning and loss of livestock are frequent. Overall, this map highlights the vast distances covered by all villagers in this region for basic services, and illustrates the importance of identifying the priorities of underserved communities.

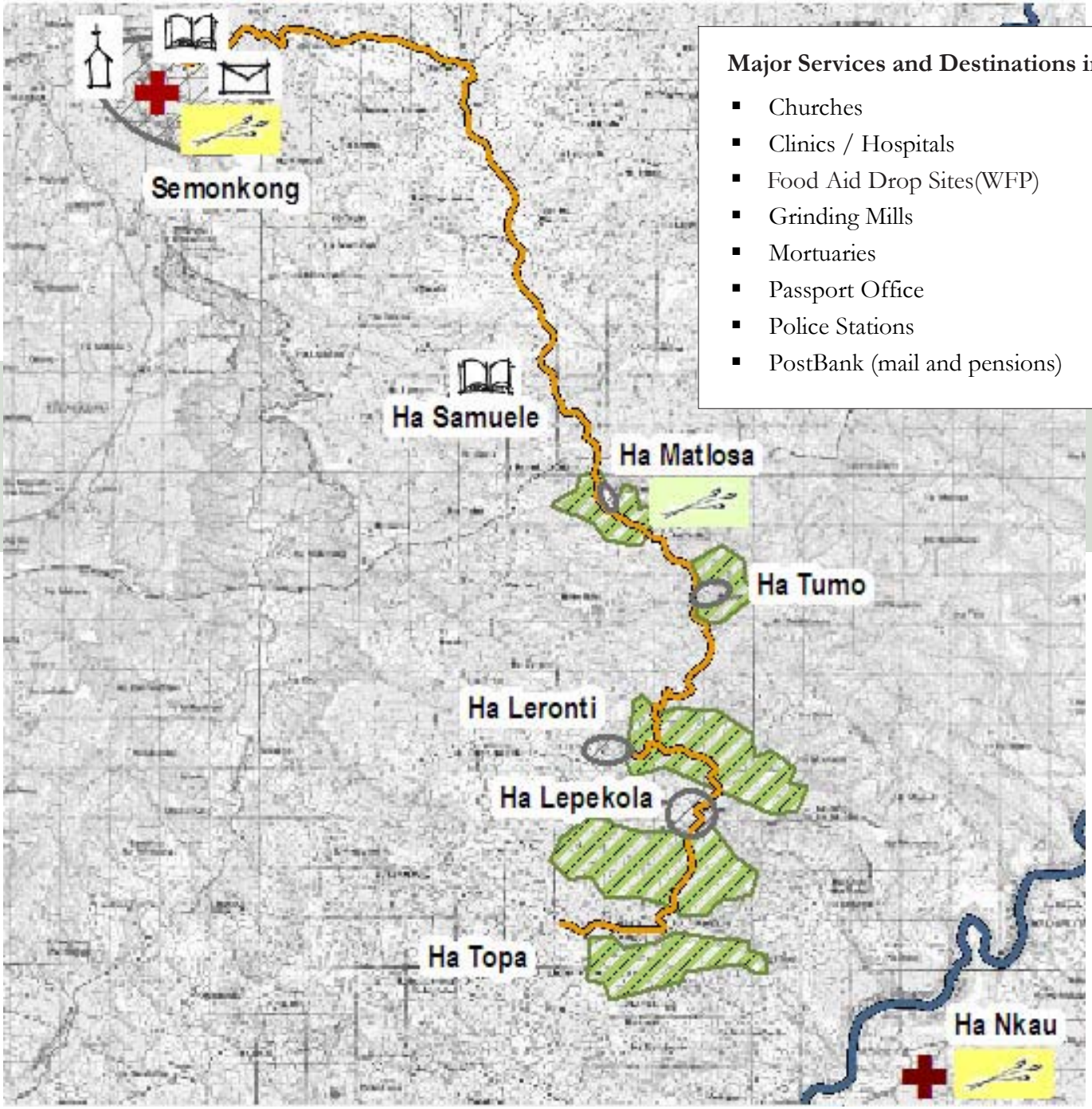
Access Case Study Maps

Given the variability of mobility patterns village by village, effective planning requires a consolidation of information to address major issues and problems of service delivery across multiple sectors. For example, a few of the major services in Semonkong include a passport office, post office, and the recently opened PostBank which manages pension payments. Although these services are consolidated in a single town, thereby avoiding the problem of service fragmentation across different villages as discussed earlier, many services in Semonkong are still inter-dependent and require repeated trips to the same places.

For any citizen to open a bank account and be able to retrieve money, he/she needs to have a passport. In order to receive a passport, an application (in person for signature and fingerprinting) must be made in Semonkong, and then the application is sent to Maseru for approval and printing, before it is returned to Semonkong by mail for pick-up. Passports take anywhere from 3-6 months to be processed and delivered, and there is little in the way of notification when documents are finally ready. Even when basic services are available and in close proximity to one another, the conditions determining access and requiring transport are still not addressed, thereby creating differential impacts on those who are able and can afford to be mobile, and those who cannot.

To illustrate these problems, the following sections describe a series of case study maps on access to services which were compiled from information derived in the interviews and mapping sessions. These maps, unlike the village maps in the previous section, focus on specific issues instead of selected locations. As a result, they allow for a better understanding of the implicit role of transport in access to basic services and a spatial analysis of the possible differential impacts of specific services across communities, villages, and vulnerable populations.

Above: Boy carrying wood beams. Below: Children walking near Ha Phafoli.



Major Services and Destinations in Study Area

- Churches
- Clinics / Hospitals
- Food Aid Drop Sites(WFP)
- Grinding Mills
- Mortuaries
- Passport Office
- Police Stations
- PostBank (mail and pensions)
- Schools
- Shops and Stores
  - Building materials
  - Clothing / shoes
  - Foodstuffs
  - Household supplies
- Taxi and Bus Stands
- Woolsheds

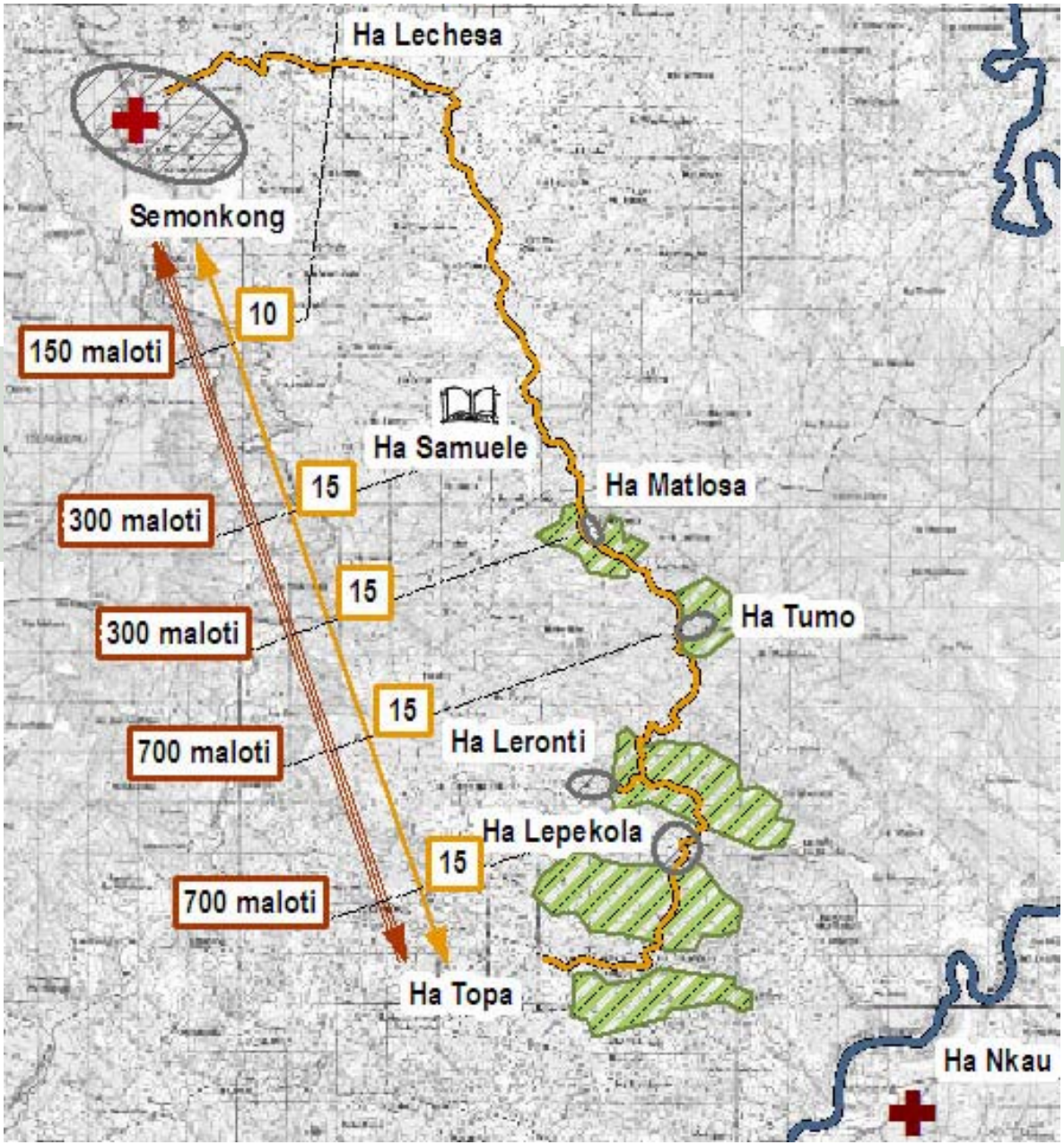
Left: Partial map of study area with examples of some major services.

Transport Service and Emergency Access

The map to the right shows the area south of Semongkong to the end of the existing track in Ha Topa. The road from Semongkong to Ha Matlosa is well maintained, but from this point on the track begins to deteriorate and road conditions progressively worsen. The entire distance is only about 30 km, but while the first 12 km take about an hour to travel, the remaining distance takes about 3-5 hours in a four wheel drive vehicle. In some seasons and weather conditions, roads are completely impassable.

The arrow on the right represents typical transport costs for services provided by taxis and vans in Semongkong to each of the villages along the main track. Although the route and standard prices have been assigned by the Department of Traffic and Transport (DTT) in Maseru, their existence on paper does not promise regular services in reality.

For example, the red arrow on the left represents prices charged by taxi drivers for emergency access services to and from the same villages. This means that while a regular trip from Ha Lepekola to Semongkong costs 15 maloti – under emergency conditions it can cost up to 700 maloti – almost 47 times the normal price. Calling an emergency taxi requires that someone from the village must first travel for several hours by horse



Above: Map of standard taxi rates (in orange on right) and average emergency service costs (in red on left).

Above: Village elder in Ha Reli. Below: Horse path to Ha Nkau.

to Semongkong, locate a willing driver, and then return for the patient. Taxi drivers insist on cash payment up front regardless of whether the patient is alive or dead.

Interviews revealed that people are forced to borrow from family and friends (sometimes at very high interest rates), to sell important assets at low prices, or as some participants noted, even to sell their labor and harvests for periods of as long as two years into the future. Moreover, horses, the main IMT for facilitating emergency access, cost between 1,800 and 2,000 maloti each. Even under normal circumstances, few women own or have regular access to horses or donkeys, and many older women cannot use them at all. As a result, women are especially affected when local midwives cannot deal with complicated deliveries at home and they need to be quickly evacuated.

In interviews with taxi service providers, drivers noted that they increase rates because they are not regularly paid by local car owners. Regulation of the transport services, enforcement of the tariffs established by the DTT, and greater focus on the extreme costs of emergency service could help to alleviate unnecessary burdens on local communities. Together high transport costs and irregular access have an immediate impact on other factors underlying key health related MDGs. Delayed access to healthcare during obstructed labor and limited neo-natal care affect both the maternal mortality and child health. Previous rapid qualitative interviews in Lesotho also found that villagers are charged for transporting HIV/AIDS patients to clinics and their corpses to mortuaries. Taxi drivers said that high prices were necessary to cover the costs of purifying their vehicles afterwards. This suggests that there could also be higher transport costs associated even with routine access to HIV/AIDS treatment.[10]

> *Transport for health services is very bad here. People from the mountains come carrying sick people by lempara (stretcher) or on horses to go to Ha Nkau. To hire a taxi or local vehicle costs 100-150 maloti. People often cannot pay. Some offer payment of a cattle or payment of labor to farm 2 hectares of their own fields for 2 years (pay in grain). These are all promises, and sometimes people are not able to pay. They borrow from other villagers, or cannot pay at all.*
>
> *-Interview with villager in Ha Phafoli*

Education and School Access

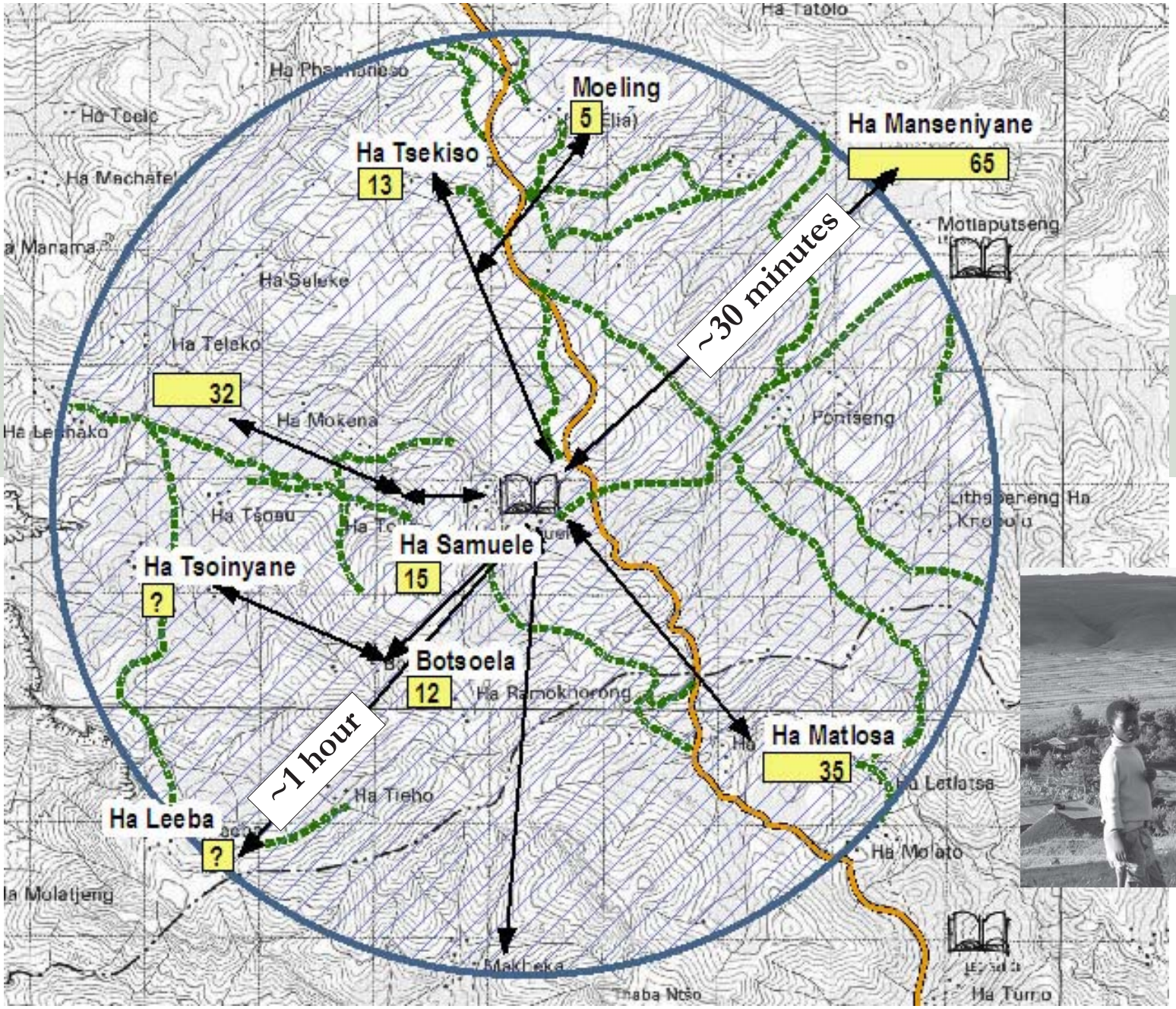
The map on the opposite page illustrates the transport issues and multi-sectoral connections underlying access to school for children attending Ha Samuele school. The Ministry of Education decides on the locations of schools based on defined catchment areas.[11] This means that many schools are not located within actual villages, rather planners attempt to site schools equidistant to the largest number of students possible. The Ha Samuele school has 210 students in grades 1-7, 4 paid teachers, and 2 volunteers.

Two of the teachers commute from Semongkong on Mondays, and stay for the week in the teacher housing at the school. The remaining 4 teachers live in and around the village of Ha Samuele which is 1.5 hours walking distance from the actual school. Teachers go to Semongkong for banking, shopping and health services. They must go by bus to Roma or Maseru (3-6 hours from Semongkong) to make phone calls. Students who continue their education past the 7th grade must go on to boarding school in Semongkong on Sekake.

Children attending the school walk up to 3 hours each way, each day. Teachers interviewed noted that distance is an important factor in absenteeism. Other factors affecting attendance include weather, safety, and tradition. For example, boys of the appropriate age stay at home from March until August to wait for enrollment in village circumcision schools.

The number of students attending the school is located under each village. The circle illustrates that all villages are roughly equidistant, but this is "as the crow flies" and does not reflect actual access times and mobility constraints. Large

Above: Outhouses at Ha Samuele. Below: Paths to Sebaretlane school (left) and shepherd boy.


Moeling
5
Ha Manseniyane
65
Ha Tsekiso
13
~30 minutes
Motlaputseng
Ha Teleko
32
Ha Mokena
Pontseng
Ha Samuele
15
Ha Tsoinyane
?
Botsoela
12
Ha Ramokhorong
~1 hour
Ha Matlosa
35
Ha Leeba
?
Ha Tieho
Ha Molato
Ha Turro

numbers of children (65) are able to attend from Ha Masienyane, while far fewer children come from Ha Botsoela and Ha Leeba.

One of the reasons for these differences is that footpath access (shown in green) from Ha Masienyane is much better than that from the villages to the south and west. This map illustrates the importance of multi-sectoral collaboration in ensuring school access for all children. The transport sector could count footpath access to schools as one of the important prioritization criteria in their work plan. Likewise, the education sector could select footpath access, instead of distance, as one of the important criteria in school location and site selection.

Other transport related difficulties in access were also identified in the teacher interviews. Large numbers of children are absent during the harsh winters because of difficulties in access.Teachers did note that if a school bus could pick kids up at set places along the existing road, it would help with attendance. Families often send only one child per day to a school, meaning that individual children have frequent absences. Security concerns, especially regarding young girls being accosted by shepherds were constantly cited. Transporting supplies for the school and transport for the teachers were also highlighted as serious constraints.

Finally, parents make decisions about schools based on more than simple proximity. The village Ha Masienyane is located much closer to another school, but many parents send their children further to Ha Samuele, where all instruction is in English and from where children will have a better chance of going on to attend the high school in Semongkong. Both quality of education and access to schools were identified by participants as important factors affecting rates of attendance and successful completion.

Above: Children playing in Ha Nkau. Below: Children near orphanage in Ha Phafoli.

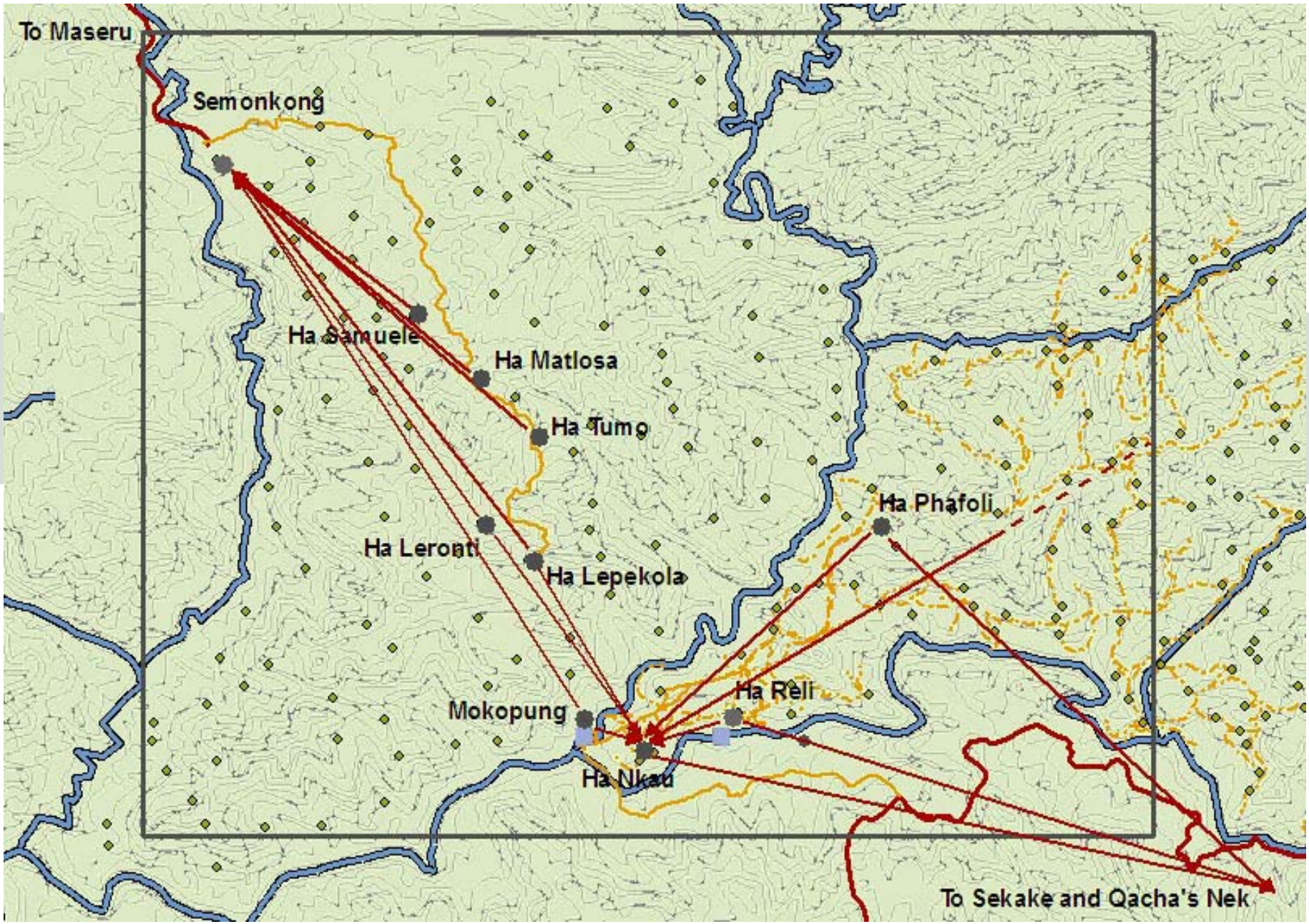
Clinic and Healthcare Access Web

The map on the following page illustrates a "mobility web" of access to healthcare in the study area. By this we mean, each line from a village shows where people go for healthcare access and the distances needing to be covered. As can be seen in the village maps from previous sections, there are important gender dimensions of mobility in the area, which in turn affect access to healthcare. As stated before, men use horses, but few women own or use them. This is especially true for elderly women. Women walk and use footpaths, and children walk as well. Therefore, women in the villages along the track to Ha Lepekola walk, or if they can afford it take a taxi or ride with their husband, to the clinic in Semongkong.

It can take almost a full day traveling with a small child just to get to Semonkong. Men, on horseback, have the alternate choice of going to the clinic at Ha Nkau, which is much closer for southern villages. However, the Ha Nkau clinic had been closed for the past several months due to lack of staff. This was precipitated, in part, by lack of a working water system at the clinic. There is, however, still a working radio at the clinic that villagers say can be used to call the hospital at Qacha's Nek and request a flying doctor. There is an airstrip near the clinic for the flying doctors to evacuate patients to Maseru. Due to the closure of the clinic in Ha Nkau, villagers in the Senqunyane valley, now must go to Sekake or Qacha's Nek for health services.

There is no close department of health services, only Ha Nkau. If a condition is very serious, you can call a flying doctor from Ha Nkau. It is very bad though. Villagers bring a sick person on horse in bad conditions and it is dangerous. The horse can slip and cause further injury. If the rivers are too high, people on foot and even horse can be carried off by the current. People downstream say they see bodies on the river or find blankets on the banks. Relatives then have to take (hire) vehicles to go find the bodies and confirm.

Above: Sign in Maseru. Below: Herbs of a traditional healer in Maseru.



Above: Clinic and healthcare access mobility web. Arrows from each village show each clinic used by the village and their relative distances from one another.

Cumulative Costs of Healthcare Access

What the health mobility web begins to illustrate is the cumulative costs (clinic costs plus transport) of healthcare access for populations in the study area. This was one of the issues most raised by participants in the study. Simply getting to the district clinic, never mind Maseru, is time consuming, often costly and sometimes dangerous because of needing to cross the rivers.

The Semongkong District Clinic has three workers: A resident nurse from the Ministry of Health and two health care workers nominated by the villagers. It is open from 8:00 am to 6:00pm Mondays through Fridays. Periodic visits are made by a dentist and doctor. Drugs and medical supplies arrive from Maseru once or twice a month. There is no toilet or beds for patients requiring an overnight stay. Pregnant women seeking to have their deliveries in a clinic are encouraged to go to the Roman Catholic Mission Clinic which is also in town. Local midwives attend to births in villages. Healthcare workers have almost no outreach because of a lack of transport services at their disposal. Women, in particular, must make frequent visits to the clinic when they have to bring different children.

Although the actual distances covered for patients is not far, the mode of access is time consuming. Women reported frequent visits to the clinic to take care of individual children. Women's focus group interviews also noted that they traveled to Semongkong up to four times a month, mainly for clinic access.

Healthcare fees	**Adults**	**Children**
Clinic registration fee (per visit?)	5 Maloti	2.50 Maloti
Medical history books	10 Maloti	6 Maloti
Roman Catholic Mission clinic – child delivery fees	500 Maloti	

A random consultation of patients' village of origin and transport to the clinic revealed:

Village	*Mode/time each way*	*Cost*
Ha Leronti	*Donkey (leave sunrise, arrive sunset or sleep on the way)* *taxi*	*20 Maloti each way* *Luggage: 5 Maloti/piece* *Children: 5 Maloti each*
Setuamajoe	*Walking – 3 hrs*	
Ha Tsunyane	*Walking – 3 hours*	
Ha Faralane *Ha Mosothoane*	*Walking – 3.5 hours* *Walking – 4 hours* *Horseback – 3 hours*	
La Letsabe	*Walking 2.5 hours*	
Ha Masienyane	*Walking 3-4 hours*	

Other Basic Services and Destinations

Many basic and other essential services for the district are concentrated in the district capital of Semongkong. The town is the main service and trading center providing commodities, agricultural supplies, and pharmaceuticals for the surrounding populations. Any needs that extend beyond its capacity (i.e., health emergencies, security and administrative needs of the police, etc.) must be dealt with in the capital city of Maseru which is approximately 3-6 hours away by bus.

Basic communication is also greatly constrained as there is no telephone or cell phone service to the town. The only communication with Maseru is via three radios owned by the police, the Catholic Mission and Fraser's store, but they are not normally available to the public. The road network surrounding Semongkong is limited. The major constraints on mobility and access to the town for surrounding villages are a combination of a lack of reliable and affordable transport services and insufficient networks of rural roads. Transport of supplies, such as roofing or furniture, necessitates hiring a private car which is very costly.

The major challenges facing the transport sector, then, range from maintaining the road and transport services to the capital of Maseru, to enhancing the rural network and facilitating affordable and regular services to the countryside. Similar challenges face the road network to Sekake / Qacha's Nek in the south.

The next sections outline the issues surrounding access to several major destinations highlighted in interviews with local service providers at grinding mills, woolsheds, stores, police stations and other administrative posts.

Grinding Mills

Grinding mills are seen as an important time burden savings by women, but they are not located in every village. The further the mill is from easy access to petrol and parts, the more expensive the service becomes. Families who cannot afford to grind their harvested grains at a mill are forced to do so each day at home by hand. The team found prices at mills ranging from 5-10 maloti for 20kg in the study area.

Above: Grinding Mill at Ha Phafoli.

Above: Primary School at Ha Samuele.

Above: Health Clinic at Ha Nkau.

People come from far away to this mill because of its central location. Most come walking with 12.5 kg of meal on their backs or heads. They start as early as 3am to arrive by 8am and queue at the mill. Sometimes there are people who come with donkeys carrying 50kg. Transport to the mill is very difficult in the rain. No one comes here by vehicle, at most they use horses. Both men and women bring grain, and often they send kids less than 12 years old, who leave school to come here for meal.

The mill charges 5 maloti for grinding 25 kg; and 3 maloti for 12.5 kg. We grind corn (maize), wheat and sorghum.

The number of people who come in a day depends on the harvest. At the mill they make a minimum of 350 maloti per day, and a maximum of 500 maloti in a day. During the winter, the lines are so long that I work from 8am until 4am the next day to service the entire line.

The mill owner goes for petrol which they bring back by taxi. The owner deals with all the required servicing of the mill and machinery. But bad roads, the slopes, and erosion during heavy rains make it very difficult to maintain the equipment. The use of the road by vehicles and also animals, like ox carts, ruins the roads. People also walk on the roads with their ploughs and cause more damage. Now there is no bridge from this village and it is not possible to cross when the river is flooded. "In the spring and the summer, you must wait a few days, and then hope."

Many people live in the valley beyond this track. They come here carrying sacks of grain. During the rains, rocks fall in the roads and tear people's sacks, and they lose food along the way. If they are not carrying a needle (to repair the sack) they improvise, and experience shortage. –Interview with *grinding mill operator at Ha Phafoli*

Above: Grinding mill workers at Mokopung packaging flour for delivery by donkey. Below: Ha Phafoli mill operator.

PostBank

A new PostBank office opened in Semonkong in late February, 2005. Semonkong was only recently established as a town, and as a result its new bank and other amenities are now central to many other districts. The PostBank services an extremely large area, with customers traveling all the way from the Mohale's Hoek and the Thaba Tseka districts.

Previously all post was delivered by air, but since the closing of the airstrips in many remote areas, mail now arrives by truck once a week from Maseru, and is then delivered from Semonkong by donkey to villages in the area later in the week. The post office is combined with the bank. There is a vault/safe in the back for holding pension payments, and other monies for mills, woolsheds, and shops.

The bank manager noted that in an effort to better address the transport constraints that they and their customers suffer from, surveys will be conducted in the field of their service area to categorize pension and post deliveries by village, and see if there is a possible mobile system or pension delivery option that could be implemented. This commendable action would be further enhanced if MoPWT was a part of the survey process and was also made aware of the outcomes.

Police

Police in the Semongkong district office have eight horses and a vehicle to carryout their work. Most of their administrative needs must be taken care of in Maseru – about 3 hours away by private car. There is no prison in the town, but the holding cell can hold up to five offenders (single sex) for a limited period.

Police raised two issues regarding transport. The first is that some of the van/taxi drivers serving the rural areas do not have insurance. While the police are aware of this, to take away their licenses or carryout other sanctions would mean an end to rural transport service. Police therefore feel "forced to compromise" and let the offenders pass.

A second concern is regarding the lack of maps of the area. New police are constantly rotated through the district. When they are summoned to respond to emergencies or complaints, they are sometimes unclear about where a village or community is located. Having to stop for directions and getting mixed messages about distance is a waste of valuable time under these circumstances.

Woolsheds

Distance from a woolshed affects the prices that people are able to command for their wool. Communities that live adjacent to woolsheds are responsible for taking care of them. As a consequence, they also have the privilege of being the first in line to shear and sell their wool each season.

Shearing is done once a year. Government owned woolsheds shear and weigh the wool, but payments are sent out by check up to six months later. The woolshed at the Fraser's store in Semongkong pays in cash at the time of shearing. The manager noted that this access to immediate cash payments attracts villagers from further distances.

Communities in the study area noted that villagers that had to take their sheep across one of the rivers to access the woolshed and 'dip' their sheep. They said this was a futile exercise since walking the sheep back across the river rapidly washed away the dip. Nonetheless, they continue to do so because of regulations requiring that sheep be dipped.

Stores

Semongkong is host to several shops and a large Fraser's General Store, which also runs a woolshed, grinding mill, the only petrol pumps in the area. Fraser's has been there since the 1940's. Most of the products at Fraser's are brought in from South Africa – only flour still comes from the Lesotho Flour Mills.

The cost of trucking their supplies keeps prices high. Many newer shops in the town are more flexible in their hours of operation, and can utilize public transportation to bring more frequent deliveries. Shop owners speculated that improvements to the road from Maseru to Semongkong would help to reduce costs and keep prices low for consumers.

Public Transport

There is regular bus service from Semongkong to Roma and Maseru which costs 18 maloti and takes approximately 3-5 hours. For local transport needs in the surrounding villages, taxis, or rather small pickups or mini-buses provide service.

Each car holds about 15 people with a small bag. Extra luggage and children are charged at approximately 5 maloti/trip, and there are different charges

Above: Shop in Semonkong. Below: Semonkong Frazer's grinding mill, store, woolshed and petrol station.

for varying weights and sizes of loads. Heading south from Semongkong there are two main taxi routes as shown in the table to the right.

Owners are assigned routes by the Department of Traffic and Transport (DTT), and fees are based on government regulations that are in turn set nationally, based on vehicle operating costs generated from the MoPWT LRMS. Drivers are required to report for work at 5am, even though the first bus from Maseru doesn't arrive before 8am. They work 6-7 days/week. There are two buses every day arriving and departing (early morning and late afternoon respectively) from Maseru.

The owners keep a log of all payments, but drivers said they are rarely paid what they should be. They also reported that damage to the car, maintenance, and other services are deducted from their salaries.

Route 1 (1 driver)	Cost (maloti) / Distance (km) / Time (hrs)	**Route 2 (2 drivers/1 car)**	Cost (maloti) / Distance (km) / Time (hrs)
Semonkong	-	Semonkong	-
Leteketa	10	Leteketa	10
Lechesa	10	Lechesa	10
Ha Mapitsi	15	Ha Mapitsi	15
Ha Elia	15	Moeling	15
Motse Mocha	15	Tsekiso	15
Masaleng	15	Ha Samuele	15
Sethamahane	15	Ha Ralemati	15
Masiamoking	15	Ha Setene	15
Moeling	15	Ha Matlosa	15
Ha Tsei (clinic)	18 / 14.5 / 1.5	Ha Tumo	15
-	-	Ha Leronti	15
-	-	Ha Lepekola	15
-	-	Ha Titimisi	15
-	-	Ha Topa	15 / ~28? / 3.0

Above: A Ha Phafoli granny with her grandson.

Above: Mokopung elder.

Above: Young grinding mill worker in Mokopung.

Conclusions

It is clear from the interviews, mapping exercises, and analyses in this study that, despite many barriers and difficulties (physical, economic, social), residents of rural Lesotho are highly mobile- because they have to be. As a result of variations in individual mobility patterns, there could be significant differential impacts of transport investments and services within rural communities on access to other basic and administrative services . These differential impacts need to be identified and addressed.

The participatory methodology piloted here combined with the national GIS facilitates a transformation of local level perspectives into information that can be more effectively incorporating into and utilized during planning and implementation processes. Involvement of local communities (or in the future, local government) in identification of the access and mobility issues, characterization of barriers and constraints, as well as prioritization of specific areas (either investments or policies) for improvement, will help MoPWT better address the needs of the citizens of Lesotho and provide improved access for all.

Taken as a whole, the results of this pilot study and the methodology developed here have implications for several areas of transport development, management, and participatory planning, including spatial analysis, definitions of access, quality of services, integrated planning, and stakeholder communication. In addition, this work also makes a step toward defining critical local-level transport indicators for future projects and assessments, and identifies the central role that transport infrastructures and services play in implementing and achieving the Millennium Development Goals (MDGs). Each of these contributions is discussed below.

1. The Value of Spatial Analysis for Understanding Differential Impacts on Access:

- It is clear from the village mobility maps that there are important gender differences in mobility at the local level. Causes for this range from access to and control of IMTs and cash, to the underlying gender roles and subsequent responsibilities that men, women and children play in Lesotho. It is important that the MoPWT understand these differences and the perceived barriers and constraints to mobility at the local level. Then, planning for transport improvements that assist whole communities, not just segments of the population, can be put into place.
- Access to services is, in part, determined by the mobility constraints and barriers and therefore, there are differential impacts on who is most affected in a community and how. These differences must also be addressed.

2. The Implications of Incompatible Sectoral Definitions of Access:

Access to services is also affected by differing definitions of access in a variety of sectors. Both the GIS Needs Assessment and this study found that current approaches to siting investments are different for each major sector. School siting is defined by catchment areas of a set number of students, while health clinic siting is based on a defined number of hours walking distance from the nearest clinic. These varying definitions of access have resulted in a disaggregation of service locations and destinations where individuals are forced to make separate and repeated trips to multiple locations. Distributing services widely to promote equitable access has resulted in a scattering of important destinations across villages to the point where it is impossible to combine tasks. For example, travel to a court (Mokopung), the clinic (Ha Nkau), the grinding mill (Ha Phafoli) for villagers in the study area could require three separate, extended trips. This fragmentation of services is perhaps one explanation for why individuals on the north side of the valley make very frequent trips to a place as far as Semonkong, and similarly for travel to Sekake for the other side of the valley, to seek consolidated services of higher-quality.

3. The Relationships between Access and Quality of Services

In general, the quality of services in many remote villages is low not only because of the lack of accessibility for local users, but also because of the limited access for service providers and professionals. For example, the clinic at Ha Nkau was not operational during this study, because there were problems with repairing broken equipment and as a result qualified professionals from Maseru and other large towns were unwilling to live or even spend extended amounts of time under such harsh and isolated conditions.[12] Similarly, as mentioned earlier, the local government official scheduled to meet with the villagers in Ha Lepekola was unable to reach the village. Mobility of services versus mobility of individuals was a suggestion from several of the participants. This was especially true for banking and pension services, which currently necessitate monthly trips.

4. The Implementation of Integrated Planning

In addition to evaluating the definitions of access in terms of other proximate services, spatial analysis also allows for improved integrated planning. Given the cross-sector differences in planning priorities, agendas, timelines, and information needs, there is frequently little in common in the planning processes across Ministries and Departments and between local government and Ministries. Establishing a basis in shared spatial data, provides a common point for dialogue across different sectors, domains, and projects. The spatial analytical capacity of GIS also brings the implicit elements of transport and geographic information to the center of the discussion on implementing the MDGs within and across sectors.

Above: View of Ha Lepekola from the end of the track. Right: Ha Lepekola villagers.

Stakeholders	Benefits
DRR	Participatory Framework Communication Tool Integrated Planning and Prioritization Monitoring and Evaluation
Local Government	Communication Tool Integrated Planning and Prioritization Variations by Constituency
Roads Branch	Communication Integrated Planning and Prioritization Monitoring and Evaluation
DTT	Regulation and enforcement
Civil Aviation	Prioritization Integrated Service Delivery
Local Communities	Communication Participation Integrated Planning
Other Sectors	Communication Integrated Planning

5. The Coordination of Multiple Stakeholders and Audiences

A final implication of this study is the potential for mobility mapping and GIS to serve as a tool for communication and coordination of multiple stakeholders. With the growing need for effective integrated planning, spatial information has emerged as a common reference point for communities and planners alike. Individuals and agencies at all levels interact with spatial information in three primary ways, as map-makers, map-users, and map-viewers. For example, this pilot connected map-makers from the MoPWT (who developed GIS base maps) with those in rural villages (who created participatory maps) to transform both groups into the users and viewers of each others' maps to support participatory decision making in the case of map-users, and communication in the case of map-viewers.

Understanding the interactions between the roles that different stakeholders and audiences play at various project phases is central to timely and relevant information gathering and dissemination. The table of transport stakeholders in Lesotho (to the left) outlines the potential benefits that could be realized through the tested participatory methodology. Because, in many cases each stakeholder group acts in all three of these capacities at different moments in a project cycle, it is vital that a clear and replicable process for coordinating stakeholders develop in parallel with any new strategies for integrated planning, monitoring, and evaluation.

Local-level Indicators

During the course of the interviews and mapping sessions, many suggestions for local level indicators for the project were gathered from participants that can be considered for use in future projects and social assessments.

1. *Reliability:* Participants noted that they would value frequency of transport service access over cost. Right now, while costs are set, services are very infrequent and unreliable. This is not to say that participants' willingness to pay is without limit. It is simply to emphasize that the current lack of reliable transport services in the area is so severe that it forces people to use other less viable modes of transportation (i.e., walking, horse, etc.) for extremely long distances.

2. *Specificity:* Access to particular destinations (i.e., key service centers) were valued over generalized access to a broad area. This is especially clear from the health mobility web.

3. *Security:* In the village maps, one of the important issues repeatedly raised was of security. Parents fear for young girls walking home from school on isolated footpaths and being accosted by shepherds. Travel in the evenings is rare because of security concerns. Similarly, the river crossings are also feared as dangerous locations both because of frequent theft and high water levels.[13]

4. *Seasonality:* Participants also emphasized their current inability to move and travel easily year round. Currently, mobility during the winter and rainy seasons is very limited. For example, it is one of the primary reasons for children's absences from school in the winter. Participants suggested all-weather access and performance in bad weather as important project indicators.

5. *Community:* Many trips by rural villagers are for social purposes (i.e, church, initiation schools, burial societies, singing associations, horse racing, etc.). These trips help to maintain social relationships and obligations, and are important components in establishing and ensuring social safety nets- especially for the most vulnerable members of communities, such as the elderly. Facilitating access (rehabilitation of footpaths and bridges, bus services, etc.) specifically to support these activities for those who are least mobile and therefore socially isolated (grannies, etc.), is also of high value.

These indicators are only a few of the possible suggestions that came out of the focus group interviews; however, they provide an important counterpart to the typical indicators based on monetary values and bring local perspectives into high-level planning processes.

Transport and the MDGs

In conclusion, this pilot study and fieldwork highlight the importance of efficient and affordable transport infrastructure and services as implicit but essential components toward achieving the Millennium Development Goals (MDGs). More specifically, the case study access maps on emergency transport and school access illustrate the important underlying connections among transport, healthcare, and education agendas. It is also clear that the answers to providing better access are not just a transport responsibility. Rather, the evidence points to the need for integrated planning across a variety of sectors, where transport professionals can collaborate with other sectors and help provide comprehensive access solutions for communities in Lesotho and around the world.

Right: Woman carrying sack on road at night.

Endnotes

[1] "The Gini coefficient, which measures the degree of unequal distribution of income, for Lesotho is calculated as .60, exceeded by very few countries. Sierra Leone is said to have the world's highest Gini coefficient, at .63 while South Africa trails behind at .58." (Sechaba Consultants, 2000).

[2] Main Roads Branch and Department of Rural Roads had each created separate systems and Road Safety was initiating discussions on investing in a third. The needs assessment and demonstration model brought the two systems into one and identified the institutional barriers to sharing information.

[3] The integrated GIS is a useful tool for many units of MoPWT. For engineers, it provides context for design alignments and is useful for scheduling and tracking maintenance. For the planning unit, the GIS is invaluable for helping to visualize and analyze options for construction and rehabilitation. The various layers of poverty and social data provide necessary context and alternative rationale and criteria for investments beyond purely economic factors. Other units such as Road Safety, Department of Traffic and Transport and the Civil Aviation emergency response teams have expressed interest in using the GIS to support decisions and plans in their sub-sectors as well. The needs assessment and user workshops helped to create awareness and interest in sustaining and enhancing the GIS so that it best serves as a decision support system for the entire Ministry.

[4] New layers of information, such as costs of taxi and bus services, location of private sector enterprises, poverty data generated from the Census, shifting administrative boundaries, etc., have all been integrated in the demonstration model along with various analytical capacities.

[5] This work represents one of the innovative efforts on mainstreaming social development in transport carried out in AFTTR for the past four years.

[6] Demographic and Health Surveys (DHS) surveys done in many countries currently have the capacity to geo-reference and analyze cluster data. The Lesotho Transport program has taken advantage of this and worked with DHS and Ministry of Health personnel to include transport related questions in the survey. When the data is available, it will be integrated in the MoPWT GIS making analysis of the cumulative costs of healthcare (clinic access plus transport) and particular blockages to access across the country possible.

[7] The term participatory mapping, as it is used here, is defined broadly as any combination of participatory methods for eliciting and recording spatial data. Examples include sketch and scale mapping, and transect walking, among others.

[8] In general, research combining participatory mapping and GIS is in its early stages. In recent cases where the two tools have been used jointly, the methods and results have been largely project-specific. Although these studies provide important and detailed applied examples, they do not, individually or collectively, establish any over-arching strategy for adapting the approach to projects with different needs and objectives. Similarly, these efforts concentrate on specialized aspects of participation, namely data collection or integration, in contrast to the work here, which addresses participation throughout a planning process.

[9] Participatory specialists have begun to examine the power dimensions of PGIS methodologies, outlining their potential pitfalls, and the ethics of using the technology to capture and display contested terrains and alternative perspectives for issues such as indigenous land tenure, etc.

[10] In a unique collaboration between the transport and health sectors, five transport-related questions were inserted into the 2004-2005 DHS focusing on cost, distance, time, and access. These results can be dissagregated by gender and all clusters are geo-referenced so data can be directly input into the MoPWT GIS. Results will help to understand the cumulative costs of healthcare access and the multitude of barriers individuals must overcome before receiving care. Analysis of the data will be carried out in FY07 under a collaboration between AFTTR and AFTSD. Similar data gathering and analysis could be done for other sectors seeking to understand the multi-sectoral impacts of their work.

[11] The Ministry of Health definition of access is within 2 hours walking distance to a clinic. This means that rural clinics are often placed outside of communities. The isolation can create problems for: patients and family members who need to stay overnight, ensuring the security of staff and facilities, maintaining personnel who are living alone in isolated areas and the regular provisioning of pharmaceuticals and supplies.

[12] Interviews carried out in a return visit to the field site revealed that on average, when it is functioning, the Ha Nkau clinic services ~1,000 patients per month - some coming from as far away as 35km up the valley. Loss of this critical service for six months due to interrupted water supply undoubtedly had a serious impact on health status in the area.

[13] The main WFP food drop site for the Senqunyane River is at Hlaohloeng – about 500 meters up from the river. Young boys and men travel down the valley with donkeys to pick up the grain. They leave the donkeys on one side, cross, and rent a wheelbarrow to take the grain from the storage house back to the ferry crossing. During the time that they return the wheelbarrow to the storage house, the grain is left alone at the river. Several participants complained that in that brief interim, several bags go missing.

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