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TITLE: Methodology for rapid assessment of rural transport services

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1.0 Summary

Rural transport services are often inadequate. Passenger and goods transport needs improving to stimulate rural economies and reduce poverty. Understanding existing rural transport systems and constraining factors is a precondition for appropriate policy action.

The Sub-Saharan African Transport Policy Program (SSATP, managed by the World Bank) commissioned a study to develop and test a methodology for the rapid assessment of rural transport systems. The guidelines specified passenger and freight transport for distances of 5-200 km, encompassing much rural transport, but excluding within-village transport, long-distance national transport and international corridors. Under a contract implemented by Intermediate Technology Consultants (ITC) in 2005, a multidisciplinary team met in Ethiopia to devise the survey methodology. Four National Experts and the Team Leader implemented the methodology in Burkina Faso, Cameroon, Tanzania and Zambia. The team reconvened in Kenya to review the methodological lessons and national findings.

Rural transport systems operate on hub and spoke systems at several levels. Key hubs are provincial towns, market towns and villages. The various spokes and hubs have characteristic combinations of transport, including trucks, buses, minibuses, pickups and intermediate means of transport (IMTs). The methodology surveys transport types, operators, users and regulators at sampled hubs and spokes, stratified by hub hierarchy and remoteness. The methodology requires two months to implement (including planning and reporting) and provides a rapid overview of rural transport systems, highlighting key constraints, stakeholder views and proposals for improvements.

A region, representing about 5% of the country, is chosen where the transport catchment area corresponds approximately to administrative boundaries. Within this area, interviews are held with the regulatory authorities (local government, police) at provincial, district and village levels. Operators, suppliers and repairers of transport devices (motorised and motorised) are interviewed and operating costs and fares recorded. Interviews are conducted with users (and potential users) of transport including farmers, traders, employees, household managers, school authorities, pupils, health service providers, patients and marginalised people. Five interviews (at least two with women) are needed per stakeholder category and are stratified for isolation. Traffic counts (including

pedestrians and IMTs) are carried out on selected provincial, market and village spokes on market and non-market days.

The survey expert (not enumerators) undertakes all the semi-structured ('rapid rural appraisal') interviews. As the survey progresses, information from different sources is triangulated and anomalies investigated. Survey guidelines stress the importance of poverty focus and crosscutting gender, safety and HIV/Aids issues. Complementary national level document reviews and interviews ascertain the positions of key institutional stakeholders, the policy and regulatory frameworks and the availability of relevant data.

Many results can be presented in graphical form and computer-generated maps can be used as models in subsequent planning. The methodology should be repeated in other areas, particularly if the country is ecologically diverse.

Using this methodology, fascinating survey results were obtained in four countries. These included information on transport trends, the costs and frequency of motorised and non-motorised transport, the effects of regulation and private transport agencies, and the views of rural women and men excluded from the national economy due to lack of affordable transport. The conclusions should assist policy formulation.

2.0 Introduction

This paper describes the outcomes of a study undertaken for the Sub Saharan Africa Transport Policy Program (SSATP) administered by the World Bank. It was contracted to ITC (Intermediate Technology Consultants), working with WSP and members of the IFRTD (International Forum for Rural Transport and Development). The author led a team of international consultants, including consultants from Burkina Faso, Cameroon, Tanzania and Zambia where the field work for the study was carried out. The team comprised Paul Starkey (Team Leader, UK), Peter Njenga (IFRTD Kenya), Stephen Newport (WSP), Abdul Awadh (Tanzania), Gnanderman Sirpé (Burkina Faso), Kemtsop Tchinda (Cameroon), Henry Musonda (Zambia), Priyanthi Fernando (WSP), Liz Tapper (ITC) and Paul Murray (ORH Ltd, UK).

The purpose of the study was to develop (and test) a methodology for the rapid assessment of the provision of rural transport services in developing countries. For the purposes of the methodology, 'rural transport services' were defined to include both passenger and freight transport services, limited to a medium range distance of 5-200 km.

The methodology aims at identifying key indicators and features that allow the system to be described and if possible, 'mapped' (schematically), using participatory, inclusive and gender sensitive data collection that leads to an understanding of the transport system from the perspective of all the key stakeholders. Key stakeholders include the authorities (government, regulators, national and decentralised), the transport operators (passenger, freight, mixed, intermediate means of transport), the supporting services (suppliers, repairers and financial services) and a very wide range of users and potential users.

The methodology is qualitative and facilitates an in-depth understanding of the issues rather than collecting statistically significant data. The latter would require more time and resources. However, the methodology does produce some valuable 'order of magnitude' estimates relating to movement of people and goods in the area, the costs of transport, the transport trends, and the problems and solutions from the point of view of various key stakeholders.

The methodology was developed and tested over a period of six months. The concept and the process were developed at a workshop in Ethiopia, and then applied in-country, in four locations in Burkina Faso, Cameroon, Tanzania and Zambia. The methodology was then reviewed in a workshop in Kenya. The final documentation is currently being completed and the detailed product is likely to be published and disseminated through the SSATP.

3.0 The Methodology: Conceptual Framework

3.1 Concept of Hubs and Spokes

The concept of rural transport hubs and spokes is central to the methodology of rapid assessment of rural transport services.

Figure 1a shows eight unconnected points, while Figure 1b shows the points joined to a hub by spokes. This very simple hub and spoke model can be used for a variety of contexts, including a manufacturer, with retail outlets, a bus station, with routes to different villages, a school, with pupils from the surrounding area or a medical clinic, with patients from the nearby villages.

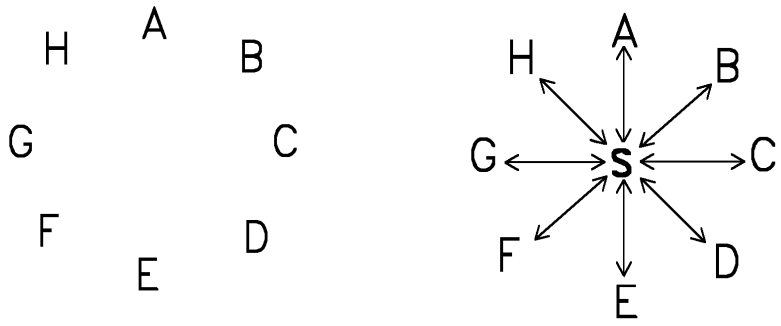

Figure 1a and b. Eight points, connected by a hub and spokes.

Most transport systems have hierarchies of hubs. The central point in the simplified diagram (Figure 1b), would actually be part of another wider network. Similarly, the peripheral points (or nodes) may also be hubs for smaller networks.

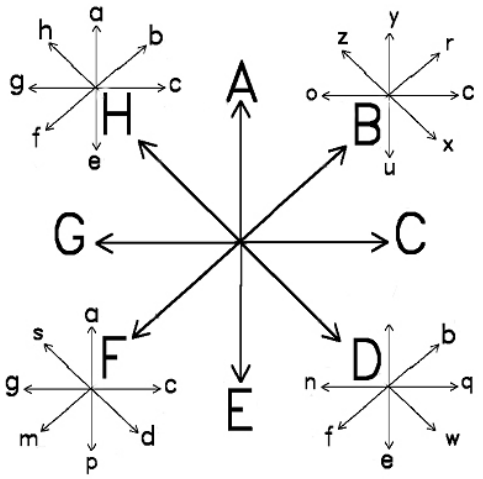

Figure 2. Eight points, forming a hub and spoke network, with sub-networks

To complicate matters further, the hub(s) may be important but not exclusive. It may be possible for there to be some direct relations between the points without going through the hub(s). This is shown schematically in Figure 3. This is true for most road systems.

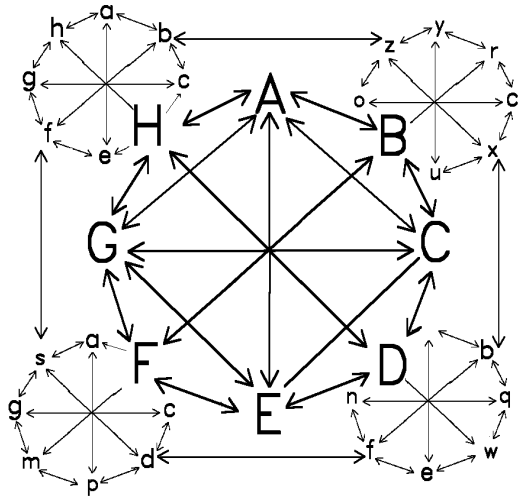

Figure 3. Eight points in a hub and spoke network, with additional peripheral links and sub-networks

3.2 Rural Transport Hubs and Spokes

National Transport Systems tend to operate from hubs of different size and scale as illustrated in Figure 4. These include:

- City hub (with university, large hospital, industrial area and possibly central government), with spokes leading to . . .

- Regional or provincial towns (with college, hospital, commercial area trading centre and probably regional/provincial authorities) with spokes leading to . . .
- Market towns (with secondary school, large health centre, large market and possibly district level government), with spokes leading to . . .
- Large villages (with primary school, small health centre, small market) – with 'spokes' to outlying small villages, homesteads and fields.

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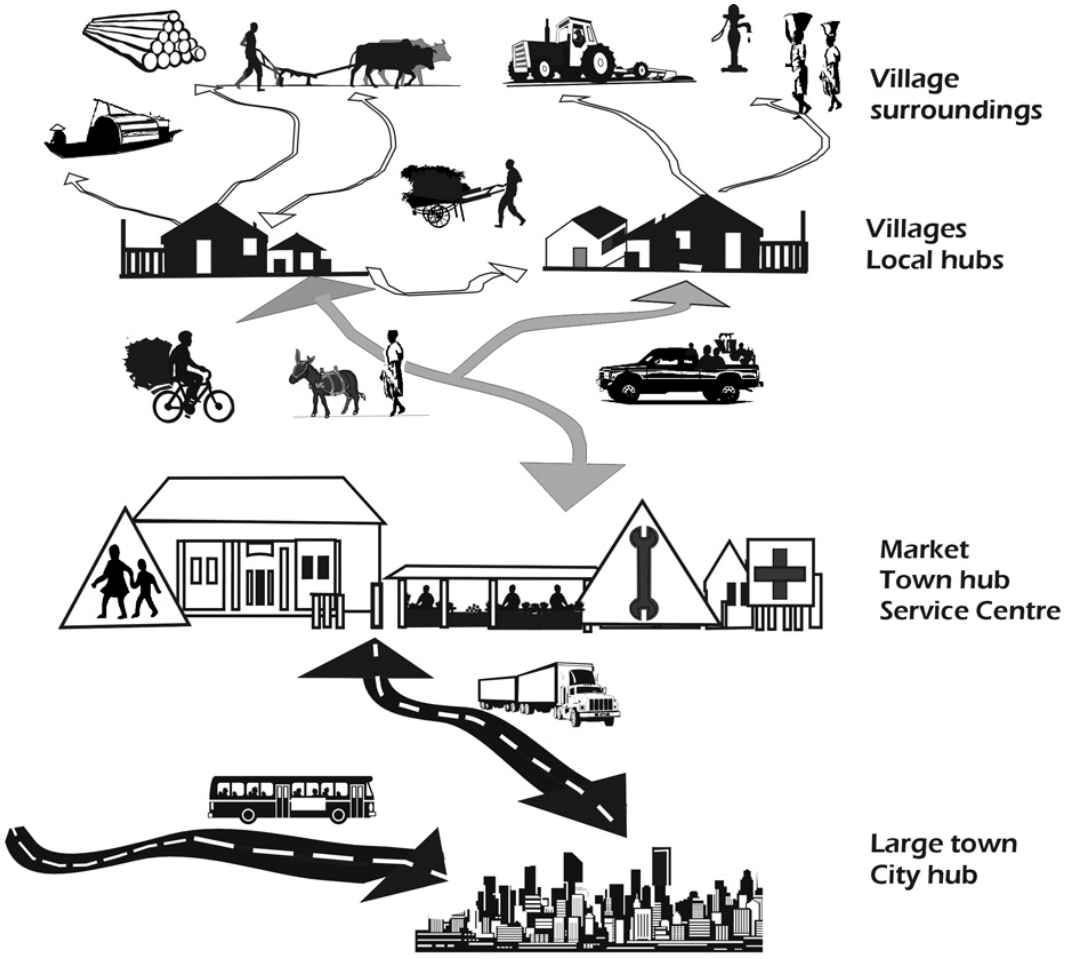

Figure 4. Illustration of rural transport system with different levels of hubs

This model is illustrative. Transport networks almost never follow 'perfect' hierarchies. Villages connect to other villages; some villages connect directly to provincial towns. Transport 'watersheds' also exist, with some towns and villages 'looking both ways'.

3.3 Transport corridors

Rural hubs and spokes transport systems need to be distinguished from national and international hub and spoke systems. The main cities within a country are joined by

intercity transport links (main roads and perhaps rail and air links). The cities may be linked to ports and to neighbouring countries. These national and international intercity transport connections, the spokes of national or international transport systems, are often described as transport corridors. These corridors pass through rural areas with relatively high levels transport services, for passengers and freight. While the corridor roads are used by rural transport services, most of the traffic is intercity transport, rather than rural transport. The passing corridor traffic can significantly affect rural communities, and all along the corridors, villages and towns tend to develop as local transport hubs with transport services linking with towns and villages in the surrounding hinterland.

3.4 Invisible spokes and hubs

Some rural transport spokes may not be immediately obvious, even though they are important. These include footpaths, cart tracks, cycle tracks, small bridges unsuitable for motorised bridges, waterways and informal cross-border trade. Similarly there could be 'invisible hubs' such as temporary markets, road/water interchanges and cross-border towns.

With transport corridors, 'imperfect' hierarchies, multiple hub systems and invisible spokes, the underlying hub and spoke systems may not be immediately obvious from looking at a road map. However, with careful assessment, it should be possible to understand the various components of any rural transport network and appreciate the hub and spoke patterns embedded within it.

4.0 The Methodology

The methodology comprises four main processes. The first involves selecting one or more suitable study area(s) and an appropriate researcher or research team. The second involves learning about the legal and policy environment, through literature review and interviews with relevant national-level organisations and authorities. The third, which overlaps with the second, involves the main survey work, gaining information through stratified, semi-structured interviews involving all key groups of stakeholders. From the outset, survey information from different sources is triangulated and linked to field observations and some strategic traffic counts undertaken around different hubs. The final process involves sharing the results with key stakeholders, and, it would be hoped, initiating debate of the issues raised.

4.1 Selection of survey area

The selection of the study area may be strongly influenced by the agenda of the organisation that is carrying out or commissioning the study. The study will be primarily qualitative, providing *indications* of issues and characteristics that are 'typical' of the survey area, rather than accurate statistics.

Transport systems vary significantly with topography, ecological zones, farming systems, population density, economic development, remoteness, ethnicity, settlement patterns etc. In developing and testing the methodology it was recognised that many Sub Saharan African countries have diverse climatic and ecological zones and that specific transport types are often linked to particular ecosystems and/or geographical characteristics. For example, donkey carts are found in semi-arid regions and water transport requires coasts, lakes, rivers or canals. In countries that are particularly diverse, selecting one survey area that is representative of the entire country may not be feasible, in which case it may be appropriate to repeat the methodology in two or more areas.

The links between the lack of improved access and poverty are becoming increasingly evident and if the aim of a study is to understand the links between rural poverty and transport services, then it maybe important to study an area that is '*atypical'* of the country, but which is likely to contain some of the poorest and most disadvantaged rural communities. There could also be an interest in choosing areas that are representative of particular transport systems, technologies or groups of people (very remote regions or areas near cities, frontiers, transport corridors or mountain ranges, coastal areas or areas with navigable waterways).

Whatever the agenda influencing the study, the use of the concept of transport hubs, provides a framework with which a study area with an identifiable transport system can be defined. Using the concept, the study area can be selected for the existence of one clear transport 'catchment area' (comprising one regional hub, several market town hubs and many village hubs) that can be studied and understood in detail.

To make it easy to relate secondary data (transport and household statistics) with the rural transport area being studied, it would be easiest if the transport catchment area corresponded approximately to one or more political area (region, province or district). This will also make it easier see how administrative hubs (government, health, education) relate to the transport hubs.

Suitable study areas are therefore clear transport 'catchment areas' that correspond (approximately) to local political boundaries that are not unduly influenced by long-distance transport corridors or large cities. The areas should also be reasonably 'typical' of the wider context, with a selection of transport types. Within the study area, the process of stratification provides an opportunity to select and study areas with different ecological conditions and degrees of remoteness.

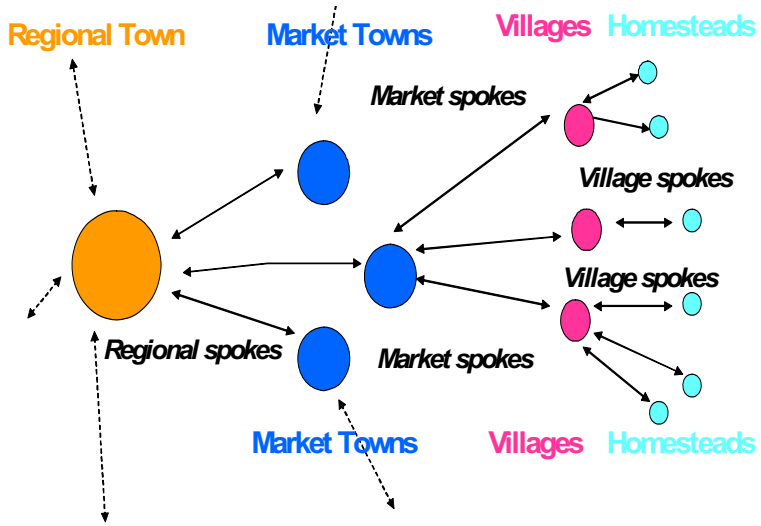

Figure 5. Schematic representation of a rural transport system with different levels of hubs

Within the selected study area, three 'market towns' hubs are identified for the survey interviews relating to market town services (transport, education, health, etc). The market towns should be in different parts of the region (with variation in terrain, farming systems, transport modes, etc) and should represent three levels of separation or isolation from the regional town (in terms of distance and/or road quality) with one of the market towns considered relatively 'remote'. The selection of these three towns is one of the crucial decision points of the survey, and will normally be made after initial discussions with the regional transport authorities and also with some poverty-focused development organisations.

Five villages can then be selected for the surveys, each within the hub-and-spoke system of one of the selected market towns. Thus two market towns will have two outlying villages, and one will have a single village surveyed. These selected villages should be large enough to have a primary school and a small health centre. It is assumed that there will be homesteads and smaller settlements (without schools) in the surrounding areas. An important criterion for selecting the villages is the degree of 'remoteness' from the market towns, using five degrees of remoteness. Depending on the type of area, these might be 10 km, 20 km, 30 km 40 km and 50 km from the nearest market town (or in lower density areas, perhaps, 20 km, 40 km, 60 km, 80 km and 100 km away).

The most remote village should be a village with poor access, at least among the 10% of the most remote. It is therefore quite likely that this village will not have access to motorised transport, and the researcher(s) may have to walk for several hours to reach it (or possibly travel by boat for several hours).

4.2 Transport types

The methodology focuses on regional movements. Very localised, village based transport such as the collection of domestic water and field-to-village transport of harvests, is

excluded from this methodology, even where the distances are greater than 5 km. At the other end of the scale, the methodology excludes transport over 200 km, which is generally 'corridor' transport, linking towns to cities, ports and other countries. Intercity transport that is part of a national or international hub and spoke system is not included, even though it may be passing through the area surveyed.

However the limit of 200 km is only indicative, and if in a large region, some links between villages, towns and the local regional capital exceed 200 km, they should definitely not be excluded.

The exact profile of the transport types to be studied will depend on the country and the area. The main forms of land transport are likely to be:

- Trucks (light, less than 3 tonnes and heavy)
- Buses (more than 20 seats)
- Rural 'taxis' (mini buses, pickups, cars, 4x4s)
- Private, government and NGO cars, pickups and trucks
- Motorcycles
- Bicycles
- Animal-drawn carts
- Animals carrying loads or being ridden
- Pedestrians (out of village journeys exceeding 5 km).

In some areas, water transport will be important. The different forms of water transport tend to mirror road transport, but with great passenger or freight capacity than their land equivalents.

- Large-scale commercial boats with capacity of more than 30 passengers
- Medium scale vessels, equivalent to rural taxis, often carrying 4-30 passengers
- Small craft such as canoes and small pirogues, carrying 1-4 passengers, with a comparable niche to land-based intermediate means of transport.

The methodology can be adapted to local circumstances. Where there are other transport types that play an important role in medium-distance rural transport, additional survey categories may be added. Examples could include tractors, tricycles and specialised vehicles (such as logging trucks) that local stakeholders use as transport services. Rail services can be included if they contribute significantly to rural transport (as they do in some countries). While air services are primarily intercity connections, they may be considered if local stakeholders (such as rural medical services) mention their importance.

The various modes of transport tend to work with different but comparable hierarchies of hubs. Some interchanges between the transport modes develop as significant transport hubs (eg, railways stations, river ports, airports and freight and bus terminals along transport corridors). Where such inter-modal links exist in the survey areas, they should be visited and their importance assessed.

4.3 People to be interviewed

The main instrument for obtaining information will be a series of about one hundred semi-structured interviews. The actual numbers and descriptions of the people contacted will depend on the country and the circumstances, but it is envisaged that a good picture of the rural transport services could be gained by interviewing about:

- 20 people in the public sector and development aid, at national and local levels
- 60 users of transport in the rural areas (specific types of users to be identified)
- 10 operators of different types of transport
- 10 supporting services (supply, repairs, finance).

A list of potential stakeholders is given in the checklist on this page.

Many transport surveys tend to be biased towards active, male respondents in accessible areas. Gender and other biases are addressed by specifying that

- At least 40% (two out of five) of people in the user categories should be female
- At least one market town should be relatively remote
- At least one village will have very poor access (eg, no motorable road)
- At least five 'excluded' people (old, handicapped, socially marginalized) will be interviewed and their transport concerns noted

Checklist of potential stakeholders to be interviewed
(numbers refer to minimum suggested interviews)

National level

- National transport authorities (4)
- National authority responsible for PRSP (1)
- Donors / World Bank (1)
- Importer of motorised transport (2)
- Importer of bicycles (1)
- Other (university, statistics office, etc)

Regional administration level

- Regional Authority (1)
- Police (might be at other levels too) (1)
- Transport Associations (might be at other levels too) (1)
- Financial organisation (might be at other levels too) (1)
- NGO / programmes (might be at other levels too) (1)
- Regional repairer of motorised transport (1)
- Passengers on a bus (regional spoke) (5)

Market town/District level

- District Authority (3)
- Health Managers (3)
- Education - Head teachers (3)
- Transport Associations (might be at other levels too) (1)
- Financial organisation (might be at other levels too) (1)
- NGO / programmes (might be at other levels too) (1)
- Passengers in a rural taxi (market spoke) (5)
- Operator of main mode of transport, eg, rural taxi (3)
- Operator of main mode of transport, eg, truck / bus (3)
- Market town repairer of motorised transport (1)
- Seller of bicycles (market town) (1)

Village level

- Village Authority (3)
- Farmers (5)
- Traders (5)
- Employees (travelling to work over 5 km) (5)
- Financial services users (5)
- Students (5)
- Health users (5)
- Household managers (housewives) (5)
- Transport for socio-cultural reasons (5)
- Excluded people - old, handicapped, socially marginalized (5)
- Operator of main mode of transport, eg, bicycle / cart (3)
- Repairer of bicycles (village level, if possible) (1)
- Manufacturer/repairer of carts (if available) (1)

This list of village-based users contains several overlapping categories. For example, a woman may be a housewife, farmer and a trader, who uses health services, financial services and travels for socio-cultural reasons. The reason why these are given as separate categories is that some of the questions relate to specific types of usage for which discrete information is required. The survey requires that information is obtained from five informants about how they access health services, from five informants about how they access financial services (credit, pensions, salaries) and from five informants travelling to school. This will ensure that sufficient discrete information is available on each of these (and other) reasons to travel.

4.4 Information collected from the surveys

The study collects information on a number of issues, mainly through interviews with the different stakeholders described in the previous section, but also through observation, collection of secondary data and traffic counts.

Information on relevant policy or regulation and the legal framework within transport systems operate is obtained through semi-structured but open-ended interviews with those responsible for transport policy and transport regulation at national, regional and local levels. A simple checklist provides the opportunity to indicate whether or not relevant policy or regulation is in place and whether or not is implemented (or having any impact) at national level or in the surveyed area. Since the existence and implementation of policies is not always a clear case of yes/no, a five point star system has been used to provide more information. A line of five stars clearly illustrates fully implemented policies, while regulations that do exist but are not actually enforced may receive only a single star. The research team will also, where possible, collect documentation on the relevant policies and regulations.

In addition there could be various issues that emerge in the course of the survey that should be discussed with the various stakeholders concerned with regulation. These might include the role of transport in the poverty reduction programme, import regulations affecting prices, incentives (eg, de-taxing public transport vehicles or bicycles) and possible legal backing for transport cartels. The actual and potential roles of transport associations should be explored with the regulators (as well as with the operators and users). The existence and enforcement (or lack of enforcement) of safety regulations should also be raised at all levels. The role of formal or informal traffic control barriers and their actual impact on safety and transport costs should also be explored at all levels. This may be a delicate topic and a sensitive issue in countries were bribes are regularly demanded at barriers.

Transport operators (of motorised and non-motorised modes) provide information about loads/passengers carried, distances travelled and vehicle operating and maintenance costs. There will also be questions relating to regulation, safety, competition, and transport associations. Experience from the pilot survey interviews suggested that it is difficult to obtained information that fits in with ‘conventional’ models of vehicle operating costs since often operators do not keep reliable records, do not want to share

their information and because many of the operating costs occur through informal transactions that do not have easily traceable financial transactions. Information from operators can also be triangulated with the information provided by people responsible for servicing and maintaining transport, such as garages (in towns) and bicycle repairers (in villages or at smaller hubs).

Suppliers of transport vehicles including some importers of motorised vehicles, importers and assemblers of bicycles and the builders of carts provide information relating to costs, demand (and seasonality), competition, regulation and how the market could be expanded. Experiences from the pilot studies suggest that many of the larger motorised vehicles (cars, minibuses, trucks and buses) used in rural areas are not obtained from formal sector importing franchises. They are generally purchased second hand within the country or directly imported (second hand). However, importers of new Asian motorcycles are increasingly influential, with imports of Chinese motorcycles expanding rapidly in several countries.

Information on the purpose, origin, destination and duration of journeys being made at the time of the survey can be gathered from people using intermediate means of transport or rural taxis in remote areas at the roadside on market and village spokes. On the regional spokes, where some traffic may be fast-moving, interviews may be made where there are natural breaks in the journey, such as at fuel stations, refreshment stops or roadblocks. People on buses on the regional spokes could be interview while waiting at the terminal, or even on the bus itself.

Other questions should relate to the main requirements for transport for particular purposes, including marketing produce, employment, trading, education, health, accessing financial services and social, cultural and political activities. People should be asked about the types of transport used, their ownership, the frequency of trips, and the affordability and reliability of the transport, from the users' perspective. The seasonality of their transport requirements should also be assessed. Additional questions may relate to multi-modal travel (using more than one type of transport to reach a destination), the potential for consolidating loads and whether telephones are playing a role in accessing transport.

The survey also aims to gather information on access to education and health services from both service providers and users. The user surveys target five students (at least two female) travelling over 5 km to access secondary school or college and five people (at least two female) travelling over 5 km to access health care. In addition, interviews should be held with the managers of district (market town) health centres and with the Principals of three secondary schools or colleges.

In addition to health and education, there are other rural services that depend on transport, including agricultural extension, communications systems, credit provision, religious, sporting and political activities. These issues may well emerge during interviews with national and local authorities, transport users and key informants in financial

organisations and NGOs. Interesting leads should be followed up, and additional interviews undertaken where appropriate.

Information from the interviews will be triangulated with observations of people and technologies on all hub and spoke systems.

4.5 Traffic Counts

Specific traffic counts should be conducted in several areas in order to assess the quantity of traffic moving, how much vehicles (and people) are loaded and the relative importance of the different transport types, in terms of overall numbers, frequency and loading. New counts will be necessary as it is extremely unlikely that any existing systems by transport authorities for counting traffic will include all the types of road and types of transport being studied in this survey. Traffic counts should be carried out on ten sites on selected spokes associated with the selected hubs.

- Two regional spokes
  (roads between the regional centre and two of the market towns)
- Three market spokes
  (for each market town, on a road linking with one of the survey villages)
- Five village spokes
  (for each main village, on a path or track linking with outlying homesteads)

The selection of the traffic count spokes should be based on acquiring data that is interesting and representative. A diversity of traffic count situations is likely to be most valuable. Logistical considerations will also be important, as the traffic counts require enumerators to be on site for one or two long days. To provide an example, the traffic count locations selected for a survey in Burkina Faso are illustrated in Figure 6.

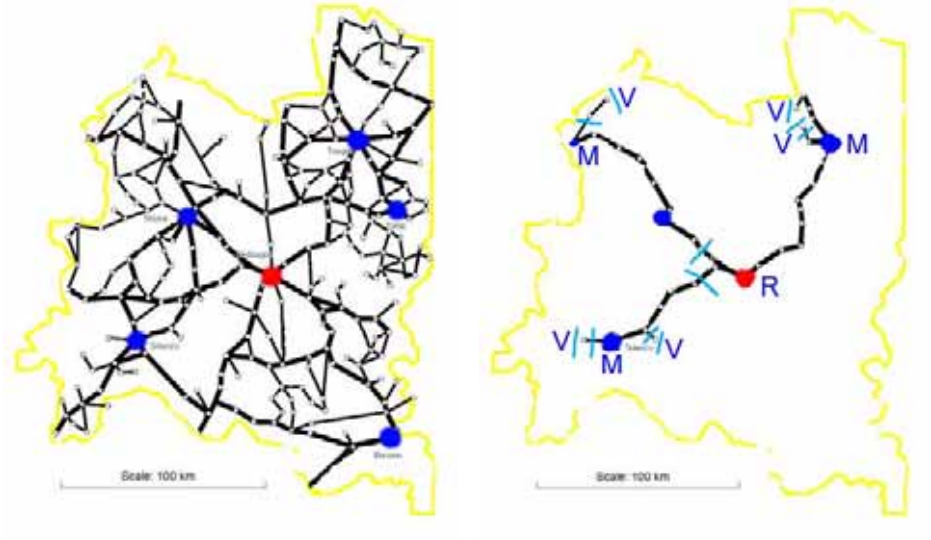

Figure 6. Example of market hub and village hub selection in Burkina Faso
Fig 6a (left) is a schematic map of the Boucle du Mouhoun region and Fig 6b (right) shows the market towns (M) and village (V) hubs selected for surveying. The lines show where traffic counts were made.

5.0 Time Frame, team and costs

The purpose of this methodology is to be able to make *a rapid* assessment of rural transport services in an area, at *relatively low cost*. The suggested time frame is eight weeks work in three months. This includes one week of preparation, two 2-week surveys and three weeks for reporting.

The methodology has been designed to be implemented by a very small, close-knit research team or a single researcher. The team needs to work closely together in the field and share experiences daily, so that information from different sources is triangulated immediately. For example, operators and passengers may quote different fares, and local regulators and operators may provide contradictory descriptions of what really happens at control barriers.

It is important that the same person who visits the remote villages, and talks to marginalised rural stakeholders should also interview the national and regional decision makers such as ministers and government officials. All interviews are done by the research team and not by enumerators. Team members need to have enquiring minds, a willingness to learn and the ability to analyse situations and identify key issues. Knowledge of rural transport is desirable, but these other characteristics are more important. The team needs experience in participatory research, gender analysis skills and the ability to get strangers to talk openly. They need to be willing to travel extensively, along uncomfortable roads, and to stay overnight in some remote areas while at the same time being of sufficient seniority that they can interview national and regional decision makers involved in transport.

The methodology requires surveying remote villages. This is essential but expensive in terms of transport costs and time**.** To visit the most remote village may well require a whole day in a 4x4 vehicle, remote accommodation and several hours walking**.**

6.0 Some interesting issues emerging from the pilot studies

The methodology was tested in five locations in Burkina Faso, Cameroon, Tanzania (two surveys) and Zambia and the original framework modified accordingly. The methodology described above incorporates the lessons from the pilot studies. In each country there were very many lessons relating to infrastructure, motorised transport services, intermediate means of transport, safety, regulation and the roles of transport in relation to health, education and poverty reduction. The key survey finding and lesson are due to be published in 2006. In the following sections, a few of the survey findings and lessons learned will be highlighted. These are not intended to give a balanced summary of the survey results, but provide some illustration of the type of issues that can emerge from using the methodology developed.

6.1 The importance of rural infrastructure

All stakeholders considered road quality to be a crucial limiting factor to rural transport. The importance of rural infrastructure for the functioning of rural transport services cannot be underestimated. Poor roads lead to long journey times, unreliable services, higher operating costs and higher fares. A clear example of the effect of improving rural road quality was seen in Southern Cameroon. Here a gravel feeder road was graded and provided an alternative to a regional road. Regional transport started using the feeder road due to better conditions. For villages on the improved road the frequency of transport services increased and costs decreased. This stimulated new transport patterns for the people on this road and increased production, marketing and access to education and health care. (For villages on the poorer road, transport frequency decreased and the economic and social implications of this remain to be seen).

Despite the great importance of infrastructure, it is certainly clear that 'roads are not enough'. The provision of rural roads, improved paths and footbridges is not always sufficient to stimulate rural transport services that provide people with regional mobility and reduce isolation and poverty. In Zambia, there are many reasonable gravel roads along which motorised vehicles can pass, but that do not have daily or even weekly motorised services. In such circumstances, some initiatives are required to stimulate rural transport services, and this can be done in a variety of ways, including route regulation, load consolidation, stimulating complementary transport systems and the development of rural marketing systems.

6.2 Small transport fleets and the low profitability of rural transport

The level of motorisation is very low in rural areas surveyed in the four sub-Saharan countries. The number of motor vehicles providing rural transport services ranged from one per 600 people in southern Cameroon, to one per 15,000 people in northwest Burkina Faso. This is illustrated in the table below.

Table 1: Estimated motorised public transport fleets operating within four regions in Africa

Region	*Population*	*Total regional motor transport fleet* [1]
Mouhoun, Burkina Faso	1,400,000	80
Southern, Cameroon	500,000	830
Iringa, Tanzania	1,500,000	180
Luapula Zambia	800,000	180

[1] *Estimate of motor vehicles providing transport services: buses, trucks and rural taxis*

It was clear from interviews with operators that the provision of rural transport services (as opposed to inter-urban services) is not very profitable and this constrains further investment. There is a vicious circle of low profitability, high prices, low service levels and low economic transport demand. In favourable circumstances (as on some inter-urban routes), this circle can be broken, leading to lower prices, greater supply and greater demand. There is scope for stimulating favourable circumstances though a combination of regulation, load consolidation, and collaboration between local authorities, transport operators and rural communities.

6.3 Great investment in intermediate means of transport

Most rural women and men depend on intermediate means of transport rather than on four wheeled motorised transport services. These intermediate means of transport are important for village and market services. In the areas surveyed, overall investment in IMTs was actually much greater than in motorised transport. This is illustrated in the table below.

Table 2: Estimated fleet sizes and investment in intermediate means of transport and motorised transport within four regions in Africa

	Approximate size of transport fleet (Vehicle numbers)		**Investment in transport fleet USD millions**	
Region	*IMTs*	*Large Motorised*	*IMTs*	*Large Motorised*
Mouhoun, Burkina Faso	220,000	80	34.7	1.9
Southern, Cameroon	21,000	850	14	5
Iringa, Tanzania	73,000	180	5	1.4
Luapula Zambia	80,000	180	8	1.7
Motor vehicles includes buses, minibuses, trucks and rural taxis operating within the region				

6.4 Great use of bicycles, despite high cost

Bicycles are being used quite extensively in the four sub-Saharan African countries, and their use is increasingly rapidly. Though often scorned and ignored by the authorities, bicycles are perceived as extremely important for livelihoods. Medium distance (20 km) journeys on bicycles are very common and long-distance (80+ km) journeys are not unusual. Bicycle taxi services are also increasing, and in Zambia, some very long distance (100+ km) bicycle taxi services operate.

Rural people wish to buy bicycles but they are often expensive. In rural areas bicycles often from USD $80 to $100, and even up to USD $200 for a basic machine. The landed cost from China/India is about USD $25, but import duties and VAT may increase the total by USD $50. The high price reduces the market demand. If bicycles were de-taxed and prices are lowered, increased market demand is very likely, and overall tax take to governments would increase, with more bicycles stimulating more economic activity.

6.5 Increasing use of motorcycles

Prices of motorcycles are falling due to Chinese imports, from around USD $2000 for Japanese-made machines to around USD $600 for Chinese models. They are currently mainly used for personal transport and taxis in urban areas, but are becoming more affordable for rural transport.

It is predicted the prevalence of motorcycle taxis will certainly increase in rural areas. This is partly due to profit-making investments in the motorcycles being made by richer people in urban areas. This can be illustrated by an example from Cameroon. A 'rich' (urban) person buys motorcycle for $600 and hires it to a young operator for $4-6 per day. This enables the owner to recover the initial investment in three-to-six months, after which the motorcycle is replaced, being sold for half the original price. The USD $300 second hand price is relatively affordable, bringing more and more owners into the market, in both urban and rural areas. Meanwhile the young operators profit by making at least eight journeys a day, at one dollar a journey. This allows rural people have access to available and relatively affordable transport services.

6.6 New transport businesses (private franchises) with separate terminals having positive effect on transport

In several of the study countries new transport businesses have been established, mainly for inter-urban transport. These operate from private transport terminals, often with enhanced security and waiting facilities and with regular travel timetables. Agents may be paid to encourage business and consolidate loads. The competition between transport firms improves standards. In Cameroon, some rural transport firms are franchises, with independent vehicle operators taking the name and colours of the franchise, for a percentage of their takings. These are having a positive impact on transport quality and predictability. This seems to be an example of turning a vicious circle into a virtuous circle. One might expect that dividing a small market into two terminals where vehicles queue for full loads would increase average waiting time. However, with these new franchises, this does not seem to be a problem, possibly because they stimulate growth in the transport market and/or benefit from very active transport consolidators.

6.7 Importance of *predictable* transport services, especially for women

Periodic markets, weekly, monthly or annual holidays and festivals and harvest times stimulate extra transport. Closed seasons (eg, fish ban months in Zambia) and poor road conditions for example in the rainy season, reduce transport.

All stakeholders prefer dependable and predictable transport. Waiting for full loads makes travelling unpredictable and reduces demand. Waiting can be exacerbated by mistrust (the owner knows a driver's income when he carries a full load); by low liquidity (the operator must profit on every journey, not just 'on average'); and by low transport demand along the route (the vicious circle of unpredictable services and reduced demand). The lack of predictability is especially a problem for women who do not want to be left stranded, and who have competing pressures on their time.

In Tanzania, route regulation for buses includes timetable conditions. In Ethiopia, transport associations work with regulators to assign a rota of routes, so operators have to alternate profitable, high-demand routes with lower demand routes. These regulations are beneficial to all, as the whole transport market can grow when people start to make more use transport because it is reliable and predictable.

6.8 Control barriers

In all countries surveyed, there are control points for mandatory or random questioning. These may be operated by traffic police, para-militaries, customs, or 'road safety' officials. In some countries (eg, Cameroon), there are multiple barriers, with different services acting separately. These barriers generally fail to enforce safety regulations (eg, overloading, inadequate lights), but often extract payments (bribes). In Zambia, the survey found no evidence of bribe barriers, but in the Burkina Faso, Cameroon and Tanzania vehicle operators openly talked about the amounts they were expected to pay. In Southern Cameroon (where there are multiple barriers), minibus operators considered that bribes increased transport costs significantly, sometimes being as much as the cost of fuel.

6.9 Mapping and modelling hub and spoke systems

The survey demonstrated that hub and spoke models can be used to describe and understand rural transport systems. Hub and spoke systems can be modelled, using mapping software, ascribing properties to the different regional, market and village hubs (eg, population, health facilities, transport terminals). These nodes can be joined by lines (vectors) to represent the roads and tracks. The vectors can also be ascribed properties (eg, road classification, road condition, journey time, frequency of transport services). Survey data can added to the model, and maps can be generated to illustrate relative isolation, transport frequency, transport costs, gender and transport or the relative importance of intermediate means of transport. Some examples of simple mapping are provided in Figure 7.

Such maps can be used to illustrate transport features, and also to predict the effects of transport interventions (road improvements, effect of transport service regulations). The methodology described here provides a mechanism whereby the stakeholders views can be assessed in a relatively short time. If such information could be included into mapping models, there is great potential for developing valuable tools to assist decision making relating to rural transport services.

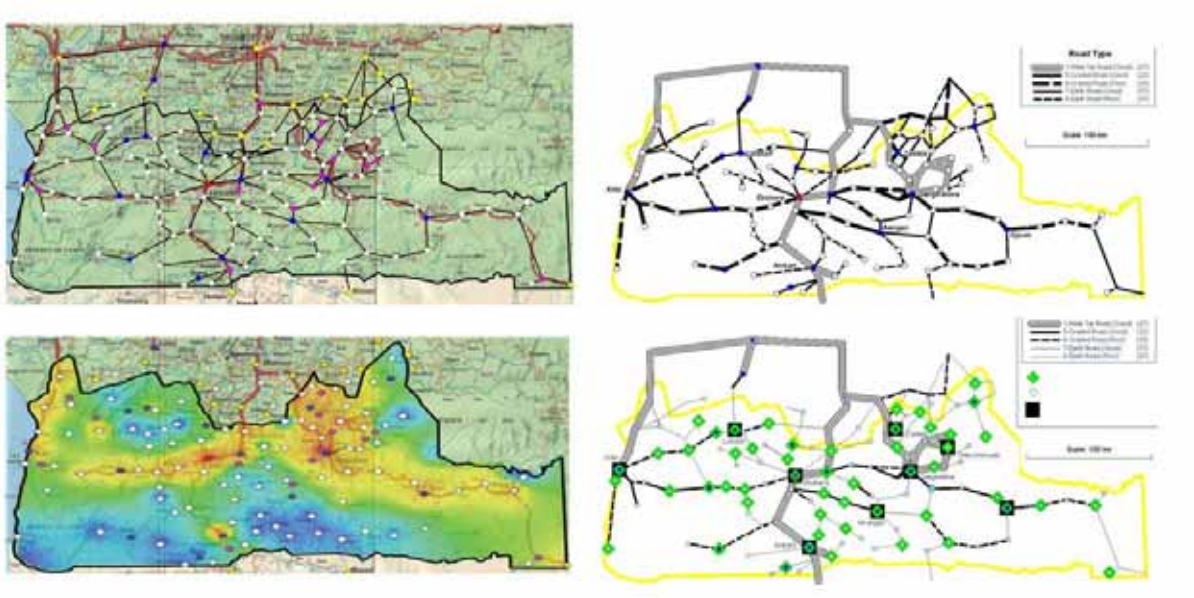

Figure 7. Simple examples of mapping regional transport systems in southern Cameroon
Fig 7a (top left) Southern Cameroon with road vectors super-imposed on roadmap.
Fig 7b (top right) Schematic map of road system, with vector width based on road quality.
Fig 7c (bottom right) Schematic map with health facilities ascribed to nodes.
Fig 7d (bottom left). Computer generated diagram illustrating rural access, with cooler colours (blues) representing rural isolation.

7.0 Policy implications

There are several important lessons that can be drawn from this work for transport policy makers.

The first is that rural transport policy making need not take place in an uninformed context. With increasing use of GIS mapping systems in many countries, and using the hub-spoke concept, policy makers can quickly and easily obtain a reliable picture of the status of rural transport which can be used for evidence-based decision-making.

A second lesson relates to the importance of intermediate means of transport, particularly bicycles and motorcycles. While this maybe 'invisible' to capital-city based policy makers, the importance of IMTs to rural women and men, and for the reduction of isolation and poverty cannot be overemphasised. The country studies show that rural people also make a considerable investment in intermediate means of transport. It is important that fiscal policies and import regulations should encourage, rather than discourage, the growth of these means of transport that increase both the productivity and the quality of life of rural people.

A third lesson, and one that is rapidly gaining recognition by the transport sector, is the importance of maintaining rural infrastructure. Well-maintained year-round access is important and needs to be provided in a cost-effective and sustainable manner.

A fourth lesson, is that while rural infrastructure is important, the provision and maintenance of roads may not be enough to ensure that there are reliable and predicable transport services operating along the roads. This may require collaborative action between the users, operators and regulators to ensure consolidated transport demand that will allow profitable transport operations and create a virtuous circle of increasing transport services stimulating increasing demand, greater competition and lower prices.

8.0 Conclusions

The methodology developed by the international team has been tested in four countries and has already resulted in some valuable insights. The hub and spoke model is used to help understand the rural transport system and to survey it in a relatively quick time. By contacting a wide range key stakeholders (transport users, operators and regulators) and triangulating their different opinions, a picture of the transport situation, constraints and opportunities can be build up. Further details obtained through person observations and traffic counts on representative spokes help to build up a model of the rural transport system. This can then be used to inform decision making and help set priorities for appropriate interventions for improving rural mobility.

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