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# RURAL TRANSPORT SERVICE INDICATORS:
# Work in progress paper

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***September 2012***

IFRTD

RURAL TRANSPORT SERVICES
INDICATORS

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***African Community Access Programme (AFCAP)***
***Project AFCAP/GEN/060***
***Developing Indicators for Rural Transport Services***

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**Cover photo**
Waiting motorcycle taxis and a rural taxi at the Kipsolu junction stop (and motorcycle hub) on the Nyabangi-Kapsuser road, Kericho, Kenya
*Cover photo and other photos © Paul Starkey*

This project was funded by the Africa Community Access Programme (AFCAP) which promotes safe and sustainable access to markets, healthcare, education, employment and social and political networks for rural communities in Africa.

Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supports research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

The programme is currently active in Ethiopia, Kenya, Ghana, Malawi, Mozambique, Tanzania, Zambia, South Africa, Democratic Republic of Congo and South Sudan and is developing relationships with a number of other countries and regional organisations across Africa.

This material has been funded by UKaid from the Department for International Development, however the views expressed do not necessarily reflect the department's or the managing agent's official policies.

For further information visit https://www.afcap.org

The International Forum for Rural Transport and Development (IFRTD) in conjunction with Paul Starkey was awarded a research contract by the African Community Access Programme (AFCAP) to develop and test indicators that can be used to assess how good rural transport services are at providing access for rural people. The envisaged outcome of the research will be appropriate rural transport services indicators that are tested and disseminated to the transport sector in various African countries.

The research aims to identify, develop, test and share rural transport services indicators relevant to the key stakeholders, including rural people, transport operators, regulators, planners, roads authorities and development agencies. This will be achieved using participative methodologies involving local stakeholders and sector experts.

The research team comprises:
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The project website is http://www.ruraltransport.info/RTSi.

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***Developing Indicators for Rural Transport Services***

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# Acronyms and abbreviations

| | |
|---|---|
| AFCAP | African Community Access Programme |
| Aids | Acquired immune deficiency syndrome |
| COST | Cooperation in Science and Technology |
| eg | for example |
| GIS | Geographical information systems |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit, Germany |
| GPS | Global positioning system |
| GTZ | Deutsche Gesellschaft für Technische Zusammenarbeit GmbH, Germany |
| HIV | Human immunodeficiency virus |
| ICT | Information and communication technologies |
| ie | that is to say |
| IFRTD | International Forum for Rural Transport and Development |
| IMT | Intermediate means of transport |
| ITDP | Institute for Transportation and Development Policy, New York, USA |
| KeRRA | Kenya Rural Roads Authority |
| kg | kilogram |
| km | kilometre |
| m | metre |
| NGO | Non-governmental organisation |
| PMO-RALG | Prime Minister's Office Regional Administration and Local Government |
| RAI | Rural Accessibility Index |
| RTS | Rural transport services |
| RTSi | Rural transport services indicator |
| SSATP | Sub-Saharan Africa Transport Policy Program, World Bank, USA |
| SUTP | Sustainable Urban Transport Project, GIZ, Germany |
| TCRP | Transit Cooperative Research Program, Transportation Research Board, USA |
| TDM | Transport demand management |
| TRB | Transportation Research Board, USA |
| TUDTR | Transport and Urban Development Department, World Bank |
| UK | United Kingdom (of Great Britain and Northern Ireland) |
| UN | United Nations |
| UNEP | United Nations Environment Programme |
| USA | United States of America |
| USD | United States Dollar |
| UTM | Universal Transverse Mercator |
| VTPI | Victoria Transport Policy Institute, Victoria, Canada |

## Executive summary

This paper reports the progress of Phase 1 of the project to develop indicators to 'measure' the adequacy of rural transport services for meeting the access needs of rural people. The AFCAP-funded project is implemented by an IFRTD team led by Paul Starkey and Peter Njenga. Phase 1 (Apr-Sep 2012) aimed to develop and test a methodology to acquire the information required to develop indicators. In Phase 2 (Oct-Mar), the methodology for data collection, analysis and reporting will be further developed and tested. Initial indicators will be identified in discussion key stakeholders.

In April, the team met to plan the research framework and participative survey methodology. Information for indicator development is linked to specific roads. Data should be easy to obtain, relevant to key stakeholders, reliable, replicable and comparable. Researchers should obtain specific information from users, operators, regulators and development personnel. They should verify the accuracy of information during the survey by interviewing several people per stakeholder category and by observations and triangulation between the sources.

Information is collected from a range of users (balanced for gender). Interviews are held with people who have used transport services in relation to agriculture, health, education and economic activities. Elderly and disabled people and those responsible for children are interviewed to learn of their particular transport issues. For each type of transport used, people are asked about prices, frequencies, predictability, reliability, convenience, capacity, seasonality, safety, security, accessibility, comfort and connectivity. The cost and convenience of transporting small (20-50 kg) and medium (200 kg) freight is ascertained from users.

Operators (and/or owners) of each mode of transport service are interviewed. Information is also be collected concerning fares, frequencies, reliability, predictability, seasonality, safety, security and freight transport. The information is compared with that provided by users and discrepancies investigated immediately. Detailed information is also be obtained relating to operating costs and income, associations, regulation, incentives and disincentives.

Local regulating authorities and/or competent individuals are interviewed about compliance with technical, financial, operational, safety and environmental regulations. People with knowledge of the road and the appropriate sector are interviewed to assess how the road contributes to key development issues. These include agriculture, trade facilitation, health, maternal health, HIV/Aids, education, gender, disability, information technologies (including mobile phones), cultural heritage and the environment. Traffic counts are undertaken and all data is geo-referenced.

Initial surveys were carried out on six roads in Tanzania and Kenya. Survey questions were adjusted in the light of experiences. The diversity of transport modes, the complexity of operational arrangements and the fluctuating nature of the services added to the challenges of the participatory survey methodology. On most roads, motorcycle taxis had recently started operations and had greatly affected transport services, mainly in good and complementary ways. Although pricey and not for all users, they were seen as convenient, timely and responsive (using mobile phones) and were willing to travel off the roads. However, they were more prone to accidents.

The key survey information is summarised in eight tables. Four tables summarise most of the statistics considered relevant for subsequent indictor development. These include key statistics about the road (including maps), traffic and transport services patterns (disaggregated for mode and showing service fluctuations), key operational statistics (costs, frequencies, safety, security, regulation compliance and development impact) and user satisfaction (disaggregated for gender).

Developing data entry and analysis system to automatically generate the summary tables proved very challenging. The process is complicated because much data is disaggregated for gender, several transport modes and road seasonality (four categories). An provisional analysis framework has been developed as an Excel spreadsheet. This incorporates and facilitates seven processes of data

triangulation. Data entry at the time of the survey allows data discrepancies to be highlighted which then allows correction or further research. The surveyor (transport professional) sees the developing statistics, tables and interview numbers for the different survey categories of users and transport modes. This aids survey implementation and reduces the likelihood of incomplete data sets.

The team now wishes to make the data entry, analysis and presentation system more robust and user-friendly so that it facilitates the whole survey methodology. They propose that Phase 2 should be a six-month programme in which members of the current team (with technical advice and support) first optimise the data entry and analysis systems. They will then undertake two cycles of surveys, data analysis and rigorous reviews of the methodology and the software effectiveness. These will take place in Kenya, Tanzania and Cameroun where team members are based. The emerging indicator statistics and road reports will be discussed with users, operators, regulators, development personnel and transport authorities to learn which indicator statistics appear most relevant and meaningful. Guidelines will be produced for the information gathering and analysis processes. These will enable further testing of the survey methodology and analysis systems which should eventually lead to an internationally-accepted system for measuring rural transport services.

# 1 INTRODUCTION

This work-in-progress paper is based upon the first six months of work to develop indicators for rural transport services. Initial studies were carried out in Kenya and Tanzania in the period April to September 2012. According to the research proposal and work plan, in the first phase (about six months) the team would work together to develop a preliminary methodology for obtaining the data that could be used for developing rural transport services indicators. A planned, this first phase involved fieldwork and detailed discussions between the team and a wide range of stakeholders (transport users, operators, regulators, authorities) and people from organisations that might collect, determine and use the resulting indicator. At the end of this phase, it was expected to have a tested methodology for obtaining and presenting the data that will be required for rural transport services indicators. The initial indicators are due to be identified and developed in the second phase, due to start in October 2012.

This document introduces the context of rural transport services and the aims of the project. The paper discusses previous work relating to transport indicators and highlights some of the essential features of indicators. The paper then presents initial suggestions for the types of data that need to be collected to develop rural transport services indicators.

The study team proposed that data should be collected and assessed from four different perspectives. These are:

- User's perspectives
- Regulator's perspectives
- Operator's perspectives
- Overall development perspective.

Three roads in Tanzania and three roads in Kenya selected for initial surveys are briefly described. Some of the observations and lessons from these surveys are highlighted. The paper then presents and discusses the way the survey data can be summarised. The paper concludes by outlining the data collection and analysis procedures that are designed to make the process sufficiently comprehensive for robust and valid indicators, yet relatively simple to allow their wide and affordable application.

This paper provides the reader with an understanding of the complexity of trying to 'measure' the very diverse range of rural transport services. It also presents an initial methodology that can be used to obtain the necessary information that could be used to develop indicators for rural transport services.

Readers familiar with this work and the development of the initial research framework (described here in Section 2) may proceed to Section 3. This introduces the six roads where interviews were carried out. Readers who have read the previous work-in-progress paper (July 2012) may wish to proceed directly to Section 5 which discusses the more recent work on data analysis and reporting.

## 1.1 Importance of rural transport services

Rural roads are vital for poverty reduction and economic development, but roads alone cannot meet the rural access needs of communities. People require transport services and/or means of transport for their livelihoods and to access markets, health services, education and numerous economic, social and civic opportunities. People who do not own motorised means of transport (which means most rural people in Africa) need rural transport services. Adequate rural transport services are crucial for poverty reduction, economic and social development and meeting the Millennium Development Goals.

There are many different types of rural transport services, with particular characteristics and comparative advantages (Starkey, Ellis, Hine and Ternell, 2002). Fifty years ago, large buses and/or

adapted trucks provided rural transport in many countries in Africa, including Tanzania and Zambia. Governments were actively involved in ensuring rural transport services, sometimes through parastatal transport companies. In a few countries, including Fiji, India, Nicaragua and Sri Lanka, large buses remain a major form of rural transport. In most of Africa, smaller public transport vehicles now cater for the transport demand on rural roads. Minibuses, pickups, light trucks and/or cars carry people and their goods, operate along distinct routes and stop frequently to pick up and drop passengers. They are generally operated by individuals in the informal private sector and are often given familiar local names or may be known as 'rural taxis'. These may be complemented by motorcycle taxis, bicycle taxis and animal powered transport. The smaller transport modes are sometimes referred to as intermediate means of transport (Starkey, 2001; Starkey, 2002).

Rural transport services generally connect villages with towns providing access to markets and services. Inter-city transport services in Africa may pass through rural areas, but they have very different characteristics. They are often formal sector businesses that use large buses. The government departments responsible for regulating transport services, tend to concentrate on urban and inter-urban transport services.

## 1.2 The need for rural transport indicators

Transport ministries, roads authorities, donor agencies and the road construction industry all assume that publicly-funded road construction and maintenance will enable private sector operators to run appropriate rural transport services. Road investments are justified by anticipated reductions in vehicle operating costs that will (it is assumed) lead to improved transport services. The crucial assumption that private operators will provide appropriate rural transport services in response to road investment is seldom verified, partly due to lack of agreed indicators of rural transport services. Indeed there are many examples in Africa of motorable roads that lack regular and predictable rural transport services.

At present, there are no recognised measures of transport services, and some relatively simple indicators could help the monitoring and evaluation of transport investments. For example, in a recent road programme in Ethiopia, the importance of improving rural transport services was mentioned repeatedly in the planning documents required to justify the infrastructure investment. Yet when it came to the evaluation, there was no assessment as to whether or not transport services had actually improved: the evaluation was of the physical development. We do not know, and perhaps we never will know, whether this particular investment had the intended consequences for transport services on those roads in Ethiopia.

Rural women, men, children and those with special needs will have opinions as to whether the transport services that link them to markets, employment, healthcare and services are sufficiently frequent, affordable, comfortable, safe and reliable. Those planning and implementing development investments require ways of measuring these parameters so they can compare access provision over time and distance, in order to monitor changes and prioritise interventions.

## 1.3 Rural Access Indicator

The World Bank's Rural Access Indicator (RAI) equates rural access to proximity (2 km) to a motorable road (Roberts and Thum, 2005; Roberts, Shyam and Rastogi, 2006). This indicator takes no account of any transport services on the road. This is a long-term development indicator that is 'unresponsive' to anything except the proximity of people to motorable roads. It slowly changes in response to the building of new roads, to bringing impassable roads back to motorable condition and to any movements of population towards existing roads. The Rural Access Indicator is the same if the road two kilometres away is paved and has frequent, cheap transport services or is an eroded (but passable) track with one public transport truck a week charging high fares. Upgrading a rough track to a paved road does not affect this indicator despite people's greater access to markets,

services and economic opportunities. There is need for another indicator that will complement the Rural Access Indicator and provide some means of assessing how rural transport services are meeting the access needs of rural populations.

The Rural Access Indicator measures the proportion of the population that live within two kilometres of a motorable road. The complementary Rural Transport Services Indicator should 'measure' the characteristics of the transport services the rural people will find when they reach that road.

## 1.4 Previous work on rural transport services indicators

The team has not yet come across other research that has attempted to develop indicators for rural transport services in developing countries. In socio-economic surveys and monitoring and evaluation work, travel and transport data are often collected, but they do not seem to have been used to develop indicators. Similarly, work on gender indicators relating to travel and transport has linked gender-related transport issues with indicator statistics (Maramba and Bamberger, 2001; Kunieda and Gauthier, 2007). Such indicators include reduced travel time for maternal healthcare, education, employment and marketing and the percentage of income spent on transport tariffs. However, such gender and development indicators do not seem to have been specifically linked to the assessment of transport services.

There are documents relating to transport services in urban areas and/or industrialised countries. These tend to be presented from the perspective of the regulatory authorities, with a view to greater service efficiency. One set of statistics relates to transport services in several large African cities (TransAfrica, 2010). This offers various indicators that could be used in urban transport planning including vehicle operating costs, annual distances travelled, loading levels and the proportion of budgets spent of transport operations.

In various documents relating to 'western' countries, the user perspective is addressed from the point of view of user satisfaction, comfort, safety and access (universal design practices). Examples of such documents including ones prepared in Canada (VTPI, 2011), USA (TRB, 2003) and Scotland (Transport Scotland, 2012). These provide indicators relating to reliability, punctuality, comfort, cleanliness and other attributes important to passengers. However, while these documents are valuable and thought-provoking, they relate mainly to rich, urban infrastructure and to heavily regulated environments. Their criteria for comfort and punctuality are difficult to apply to rural transport services in low-income countries.

## 1.5 The characteristics of good indicators

Indicators are widely used in many fields. Many governmental and international organisations have agreed indicators in order to ascertain or 'measure' development progress and achievements. The European organisation 'Cooperation in Science and Technology' (COST) commissioned a comprehensive review of what is required of indicators (Gudmundsson, 2010). The following analysis draws upon that valuable publication. Gudmundsson (2010) proposed that indicators should have specific characteristics that are relevant to the information they represent, their operation and their application. Building on Gudmundsson's review, good indicators should have the following characteristics.

**Validity.** A valid indicator must actually measure the issue it is supposed to measure. The indicator should be clearly defined using standard international terminology in terms of its input parameters and the causal linkages.

**Reliability.** A reliable indicator must give the same value if its measurement is repeated in the same way on the same population and at almost the same time. An indicator should be reliable, repeatable and consistent even when applied to different areas, subgroups and the time periods provided the characteristic being measured is actually at a comparable level.

**Sensitivity.** A sensitive indicator must be able to reveal important changes in the issue being 'measured'. Indicators should respond rapidly to significant changes in the phenomenon being assessed. A transport indicator should react clearly and promptly to changes in the transport, and should 'measure' the transport characteristic and not other variables.

**Measurability.** An indicator should be easily measured or calculated using simple tools and data that are straightforward and inexpensive to collect or measure. Qualitative indicators, such as user satisfaction, can be converted to ordinal measurements (eg, scale of 1 to 5). Indicators based on cardinal quantitative scales (scales with consistent increments and base zero, such as cost, speed, passenger numbers or weight) are often easily measurable. Simple indicators are easier to measure than aggregate ones combining several data streams.

**Data availability.** Indicators should be based on data that are sufficiently comprehensive (over time and distance) and readily available in a timely way. Availability may be assessed by the time and work required to obtain new data, or the time and cost implications of using data from existing sources.

**Ethical concerns.** An indicator must comply with fundamental human rights and must require only data that are consistent with morals, beliefs or values of the population.

**Transparency.** The basis of the indicator must be shared so that people can check the calculations and thereby trust the indicators. The input data, assumptions, methods, models and theories should therefore be available to, and understandable by, the users and key stakeholders. Simple indicators are easier to explain, but complex indicators can be transparent if the methodology is clearly justified, defined and explained.

**Interpretability.** The meaning of the indicator level should be intuitive and unambiguous and allow clear conclusions to be drawn. Interpretability depends on how well the indicator varies with the issue it represents and how much it is influenced by other factors.

**Target relevance.** An indicator should measure performance with regard to articulated goals objectives, targets or thresholds of the relevant organisations or users.

**Actionability.** Indicators should measure factors that can be changed or influenced directly by management or policy action. Transport services indicators should measure characteristics that could be changed and improved by specific actions of the operators, regulators, users or other relevant stakeholders (including government authorities).

## 1.6 Approach to Rural Transport Services indicators

The aim of this research is to identify and test indicators that can 'measure' rural transport services in valid ways that are meaningful to the key stakeholders. The rural transport services indicators developed should be consistent, replicable and be sensitive to changes in the transport services. They should allow appropriate comparisons over time and space. They should be based on data that are easy to collect and should measure parameters that are relevant to the main stakeholders (passengers, operators, regulators) and which could be improved by appropriate actions.

Key indicator components may include actual passenger fares, frequency and journey time. If practicable, they should also reflect safety, security, reliability, predictability, accessibility and comfort, taking into account issues concerning gender, age, disability and socio-economic disadvantage. Other issues may include transport capacity, freight transport and the integration of alternative modes of transport.

Initially rural transport service indicators will relate to individual roads. Subsequently they may be aggregated to develop indicators for wider areas such as districts. Road-specific indicators are appropriate because each road has unique transport services characteristics. Furthermore, road-specific transport services indicators could be used by those concerned with road management to justify, monitor and evaluate road investment and maintenance.

In some areas, small boats and water transport are extremely important. The suggested indicator principles and survey methodology are likely to be applicable to water transport. It may be possible to develop common indicators for different modes of transport. However, for the time being, this research is concentrating on developing effective indicators for transport services operating on rural roads. The inclusion of other modes may become possible as the work progresses.

# 2 OBTAINING DATA FOR USE IN RURAL TRANSPORT SERVICES INDICATORS

## 2.1 Lack of existing data sets

If there were reliable and relevant data available on rural transport services, these could be used to develop indicators for rural transport services. However, in most countries there is very little information available about rural transport services. Regulatory authorities generally concentrate on urban and inter-city services. Comprehensive data are often available relating to transport services and traffic on trunk roads and key urban roads. Regulatory authorities seldom keep up-to-date records about rural routes, particularly when it comes to informal sector, mixed services. Socio-economic survey data may contain transport-related questions, but seldom are these linked to particular roads and routes. Traffic count data may be available on some rural roads, but these rarely record gender-disaggregated passenger data. Therefore, in most circumstances, it will be necessary to collect new survey data from which transport services indicators can be derived.

## 2.2 Survey methodology

The survey methodology for obtaining the information on rural transport services draws upon the World Bank publication on the rapid assessment of rural transport services (Starkey, 2007). This includes an assessment of the local hub and spoke patterns of the transport services in the area, and includes the concept of the transport 'catchment population' of a road. The methodology is intended to be implemented by transport professionals (not enumerators) who will rapidly build up a detailed understanding of the issues. To obtain a broad understanding, operators, regulators and passenger will be interviewed, with specific categories of users targeted, including disadvantaged groups. At least 40% of passengers interviewed should be women, and the data are disaggregated for gender.

In addition to quantitative and qualitative questions to the various stakeholders, the survey requires observations of transport service operations. This facilitates understanding how the actual transport operations are affecting the various stakeholders, including those who are effectively excluded due to problems of access, cost, safety or service quality.

The methodology also involves triangulation at the time of the interviews. Information from the various sources (operators, regulators, passengers of different types, observations of actual practices) are continually compared. Any discrepancies are immediately highlighted and probed while the researchers are still undertaking interviews. As a result, a picture is built up of the real situation, with an agreed consensus of the actual transport costs, frequencies and capacities as well as the strengths and weakness of the services provided.

The process of triangulation is facilitated by the spread sheet that is used to summarise the results while the researcher is surveying the stakeholders associated with the road. Information from different sources (users, operators, regulators and traffic counts) is placed together. The researcher can see if there are discrepancies, and can investigate these with the stakeholders. The researcher has to enter all ‘triangulated’ values, and should be able to justify the values if they differ from those provided by surveyed stakeholders.

Spatial data on rural roads and infrastructure related to rural transport services are obtained using geographical information systems (GIS) tools. Where road GIS data are not available, these can be obtained by using simple global positioning system (GPS) handsets to record tracks. Key nodes and

facilities are identified during the survey as waypoints to capture their geo-coordinates using the Universal Transverse Mercator (UTM) system to ensure compatibility with other existing data sets such as Google earth.

In order that the indicators fulfil the criteria of being easily measurable, the final survey methodology will involve compromises between being rapid and being comprehensive. The initial surveys suggest that useful data can be collected in 5-8 days.

## 2.3 Data for user perspective indicators

Data obtained from users includes some recalled figures relating to prices and times, and various satisfaction ratings. Survey guidelines specify that approximately half the people interviewed should be women. They also specify that various categories of users should be surveyed, including farmers, traders, disabled people, elderly people, students, and people travelling for health care, maternal health care, employment, financial services and socio-cultural reasons.

**Table 1: Information required for indicators from user perspective**

| Indicator issue | Information to collect |
|---|---|
| Fares for using rural transport services (RTS) | Price paid to travel between two locations (subsequently standardised as price per kilometre) |
| Availability of service | Number of travel opportunities per day |
| Predictability of service | Availability of timetable (formal/informal) |
| | Roadside/terminal waiting time based on user perception of a typical wait |
| Space on service | User perception of likelihood to get onto the first available service |
| Travel speed of service | Average time taken to travel between two locations |
| Safety of service | User perception of accident risk |
| Security of journey | User perception of security risk |
| Comfort of service | Space available per passenger |
| | User perceptions of seat comfort |
| | User perceptions of crowding |
| | User perceptions of heat/smell/noise problems |
| Convenient access to service for the elderly and disabled | Application of 'universal design' in rural transport services and related infrastructure |
| | User perceptions of accessibility |
| Small freight transport by service | Cost of 20 kg and 50 kg of accompanied goods |
| | User satisfaction with small freight service |
| Medium freight transport by service | Cost of 200 kg of unaccompanied goods |
| | User satisfaction with medium freight service |
| Inter-modal convenience | User satisfaction with connectivity to services beyond the road |
| | User satisfaction with connectivity with feeder services along the road |
| Mobile phones and RTS | User ability to use mobile phones to access services and/or obtain information regarding service |
| Facilities at terminals / roadside stops | User satisfaction with facilities at roadside stops |
| Courier facilities | User satisfaction with courier services provided by transport operators |

The information obtained is 'triangulated' between different users, and also with information from operators and from observations. Any discrepancies must be investigated at the time of the survey. In the data analysis, all user information is disaggregated by gender and by transport mode. The small sample size and survey methodology does not make it feasible to disaggregate all data for age or for disability. However, special note should to be taken by researchers of issues relating to age (children and old people), people with disabilities and any vulnerable or marginalised groups. Examples of the information to be obtained from users are shown in Table 1.

## 2.4 Data selected for operator perspective indicators

Due to the great diversity of rural transport modes, it is necessary to survey operators of each type of transport service that operates along the road. For the more significant forms of transport, three separate operators of each transport mode should be interviewed (if practicable). In many cases, it will be necessary to interview the drivers and the owners, as they will know of different aspects of the operation and related income and expenditure. In certain cases, the vehicle owner leases the vehicle on a daily or weekly basis to the driver-operator. In this case there are two complementary enterprises: the leasing operation with capital and annual operating costs, and the transport operation, with day-to-day operating costs and income. Data sheets have been prepared to record the various operating costs, loading levels and income.

Despite the natural reluctance of people to talk openly about the real costs (including bribes at control points), the actual loading levels (often beyond legal limits) and income from passengers (perhaps different from that declared to the owner), it is usually possible to gain a relatively accurate picture. The various facts and figures provided by the drivers and/or owners can be triangulated with the interviews with passengers as well as with observations of actual practices. Examples of the information to be obtained from the transport operators are shown in Table 2.

**Table 2: Information required for indicators from operators' perspective**

| Indicator issue | Information to collect from operator's perspectives |
|---|---|
| Road infrastructure | The type/condition of road infrastructure to allow efficient operation of rural transport services (RTS) |
| Market demand | Existing annual passenger traffic (based on number of vehicles, trips and capacity, accounting for periodicity) |
| Market trends | Operators' estimates of trends in passenger traffic in past year |
| Income from providing RTS | Estimated income per passenger-km |
| Costs of providing RTS | Estimated operating costs per passenger-km for each transport mode |
| Profitability of RTS | Ratio of costs to income per passenger-km |
| Financial services for RTS | Adequacy of financial services for operator's working capital |
| Technical services for RTS | Adequacy of technical services for operating |
| Disincentives for providing RTS | Level of disincentives to operation, including regulations and corrupt officials |
| Incentives for providing RTS | Level of incentives to provide transport services, including subsidies and route allocations |
| Cooperation in service provision | Level of operation of transport association |
| Security for RTS | Security for operating RTS during normal operating hours as assessed by transport operators |

## 2.5 Regulator perspective

It is intended to develop some indicators that rate the transport services from the perspective of the regulatory authorities. These may include the authority responsible for regulating public service

vehicles, the law enforcement agencies (notably the police) and the local government administration. As part of the survey methodology, consultations should be held with all such bodies in order to learn of the existing regulatory environment. This will include regulations in force relating to vehicle technical specifications and testing, license and taxation issues and the operation of transport services (safety regulations, route allocations, loading levels, timetables and operational practices). While this information is crucial to understanding the regulatory environment, it is unlikely that district-level officials will be familiar with individual roads, and so some information will be needed from people who know the road and the vehicles operating on it. This might be a local policeman, a village elder and/or other knowledgeable person who is familiar with the current quality and quantity of transport services available.

In many countries, there is little application or enforcement of the national regulations on remote rural roads. This is partly because the local enforcement officials understand the transport problems of rural areas. They realise that the rigid enforcement of certain national regulations might not be in the best interests of the rural stakeholders. There is often a mutual understanding between regulators and operators that some rules are not rigidly enforced in rural areas. Some corrupt officials use this as an opportunity to take bribes in order to 'look the other way' at enforcement barriers. Everyone knows this, and sometimes it is discussed freely during formal interviews. More commonly, people talk around the issue, but it is generally possible to understand the situation, by triangulating the different assessments and also by observing what is happening. Some researchers were listening to a police officer at a road check point talking of full compliance with safety regulations on that road, just as the driver of an overloaded rural taxi handed his colleague the banknote that was known to be the standard 'chai' (tip or bribe) for passing that barrier. Operators have referred jokingly to the girth of the police at a barrier as a proxy indicator for the 'regulatory disincentives' to transport operations.

With this methodology, there is no need to retain information from any source that is known to be incorrect, and triangulation is one tool to identify 'biased' assessments. If responses from individual regulators, operators or passengers do not appear to be accurate, other stakeholders should be interviewed until a clear consensus is reached. The questions relating to regulatory compliance have been developed so that they do not appear to imply any self-criticism. In this way, it is not difficult for the regulators to admit to wide non-compliance, blaming the operators and not themselves. The regulators are not asked direct questions about bribery (the operators are asked about the various 'disincentives' they have to cope with). Similarly, the operators are not asked to assess their own compliance with regulations and safety, although the information may well become apparent from observations and when asking about their operating costs.

The information relating to compliance will be collected for each transport service mode. Examples of the information to be obtained from the transport regulators or other responsible stakeholders are shown in Table 3.

**Table 3: Information required for indicators from regulator's perspective**

| **Indicator issue** | **Information to collect from regulator's perspective** |
|---|---|
| Technical regulation of vehicles | Compliance with the vehicle regulations by transport mode |
| Administrative regulation of vehicles | Compliance with tax, insurance and financial regulations by transport mode |
| Operational regulation of services | Compliance with operational regulations (timetables, capacity) by transport mode |
| Planning for RTS provision | Existence of a planning framework for RTS provision |
| Environmental issues in RTS provision | Compliance with environmental legislation by transport mode |
| Safety | Serious accidents involving RTS vehicles |
| | operators' compliance with safety regulations |

## 2.6 Developmental and other perspectives

It is intended to try to develop an indicator that provides some assessment of the ways in which the transport services on that road are contributing towards national and local development goals. The various questions have to be answered by knowledgeable people in that area of development who know the road in question. The indicator must be responsive, and so if the road is blocked or transport services are not operating, the indicator level should drop, as the absent transport services are no longer contributing adequately to the development goals. For this reason, district-level assessments are probably unsatisfactory and the assessments should be made by various people who know the road (local extension officers, health workers, teachers, women's groups, NGOs, village authorities, etc).

In general, the questions should relate to each mode of transport, and the responses should be appropriately disaggregated. Examples of the information to be obtained from appropriate people concerned with development issues (referred to here as 'development personnel') are shown in Table 4.

**Table 4: Information required for indicators from a development perspective**

| Indicator issue | Information to collect from 'development personnel' |
|---|---|
| Support for local industries | Ability of RTS to meet the needs of agricultural, industrial or natural resource exploitation |
| Multi-modal integration | Existence of various modes that are integrated and operating in complementary ways |
| Cultural / heritage impact | The impact of RTS on local culture |
| Environmental impact | The impact of RTS on the environment |
| HIV/AIDS | The impact of RTS on the community in relation to HIV/AIDS |
| Women's empowerment through RTS | Extent to which RTS empower women |
| Ethnic minorities empowerment through RTS | Extent to which RTS empower ethnic minorities |
| Disabled people's empowerment through RTS | Extent to which RTS empowers disabled people |
| Youth empowerment through RTS | Extent to which RTS provides opportunities for young people |
| Support for education services | Ability of RTS to meet education-related transport needs of students, staff and school supplies |
| Support for health services | Ability of RTS to meet health-related transport needs of users and medical staff |
| Information technology integration | The extent to which information and communication technologies (ICT) are contributing towards RTS |
| Road maintenance | Adequacy of road maintenance to meet the needs of RTS |

## 2.7 Passenger and freight transport

The surveys include questions for users and operators relating to the transport of passengers and small-to-medium quantities of freight. The questions identify the cost and convenience of travelling with 20-50 kg of goods. These might be typical loads carried going to market or returning from a visit to a local town. They also ask about sending a consignment of 200 kg, which is the type of load that farmers and rural people might wish to be transported on a bus, minibus, rural taxi, multipurpose passenger-freight vehicle, pickup or a local freight truck. Other freight vehicles passing along rural roads are likely to be owned or leased by traders and business people for their own purposes (supplying stores, buying produce, transporting their materials and goods). Previous studies have shown that rural freight provision is even more complicated than rural passengers services, with much greater variations in costs, in seasonality and in the nature and ownership and timing of the service provision (Starkey, 2007b). Therefore, in the first phases of this research, it is pragmatic to concentrate on developing indicators for passengers and small-freight transport.

## 2.8 Traffic counts

One indicator of rural transport services could be based on the numbers of people (disaggregated for gender) travelling on a daily, weekly or annual basis. These figures might be linked to the population of the transport catchment area. It is unlikely that such statistics could be obtained from existing traffic count information. Therefore some simple traffic counts are included as part of the methodology. If possible, counts should be conducted on both 'normal' days and 'busy' days (eg, market days). Through discussion with passengers and operators, it should be possible to ascertain the annual seasonality, and how the 'normal' and 'busy' traffic counts would vary during rainy seasons, harvest seasons and during other key events. For most rural roads, daytime counts are likely to be sufficient, although it may be necessary to capture early morning departures and evening arrivals. The cooperation of local police or other officials may be required to allow passengers (disaggregated for gender) to be counted in vehicles. The loading levels of the different transport types, including intermediate means of transport will be recorded.

## 2.9 Integration of GIS

The survey methodology will be compatible with and complementary to geographical information systems (GIS) technologies. The integration of GIS tools and data will enable future studies to model changes in transport services along roads and make comparisons between roads. However, the indicators themselves should not be totally dependant upon access to GIS technologies, as this might limit their application and utility. It is recommended that all survey data should be geo-referenced through the use of a global positioning system (GPS) receiver. GPS can also be used to create diagrams showing road position and elevations, and also indicative road quality (Geilinger, Herman and Bopoto, 2011). Diagrams can also be created showing the connecting roads and connecting paths and trails. For these, it was found appropriate to have someone wearing a GPS unit to drive on a motorcycle for the length of the studied road, and going about 100 metres down each connecting road. The exercise was repeated for all significant paths or trails. The resulting tracks illustrate well the feeder roads and paths. GIS may also be employed to estimate the ‘catchment’ populations of the roads.

# 3 ROADS SURVEYED FOR RURAL TRANSPORT SERVICES

## 3.1 Introduction

Having planned the initial survey methodology, members of the team tested this by surveying three roads in Kenya and three roads in Tanzania. Roads were selected that had some connections with infrastructure projects and/or were considered by local roads experts as being broadly typical of the local low-volume roads. Two roads had connections with AFCAP-funded infrastructure research.

Team members interviewed a wide range of users, operators, regulators and development personnel associated with each of the roads. At the time of writing this paper, the work of surveying and analysing the data was still in progress. This was partly because the various questions asked and the methods of analysis had been evolving in the light of experiences. The six roads are briefly described below, after which some of the initial survey lessons will be presented.

## 3.2 Tala- Kilimambogo (D521-01), Matungulu District, Kenya

The road linking Tala with Kilimambogo (also known as Ol Donyo Sabuk) is located in the newly created Matungulu District. Under the Kenya Road Classification system, it is a 'Class D' road. It is a secondary road linking locally important centres (Tala and Kilimambogo) to each other, and onto regionally and nationally important centres (eg, Thika and Nairobi), and to a higher class road (Thika-Garissa-Liboi Road, A3). It is a graded, unpaved all-weather road that is about 30 km long. The development, maintenance and management of this rural road is under the Kenya Rural Roads Authority (KeRRA) and the Matungulu District Roads Committee.


*Left: Minibus that is the next scheduled departure from Tala to Ol Donyo Sabuk and Thika*
*Right: Passengers descending from a side-facing rural taxi at Tala terminal*

The road traverses gently undulating landscape characterised by several ridges and hills. Highest hill to the east is the Kilimambogo or Ol Donyo Sabuk peak which is 2144 m above sea level. The geology of the area comprises volcanic rocks that are visible in some of the more prominent hills. The soils in the area are mainly sandy and well-drained. The area is characterised by mixed cropping on small-scale farm holdings. Maize, with legumes (green beans and pigeon peas) are the most common food crops, along with fruit crops including mangoes, papaya, avocado and some coffee plantations. There is a large, agro-industrial pineapple plantation near the midpoint of the road. There is also livestock rearing in the area.

*Left: Motorcycle taxis near the Tala end of the road*
*Right: Ox cart regularly hired for freight transport over distances of 10 km*

The area around the road has experienced significant land-use changes over the last five years as a result of population increases and subsequent land subdivision. Some of the outcomes of these changes are observed in population settlement patterns and in public transport. Firstly, the creation of Nairobi Metropolitan Area comprising four regions brought the area under the ambit of Nairobi's Eastern Metro. The Eastern Metro has a population of over 3 million and includes the Town Council of Kangundo/Tala, as well as the adjacent local authorities comprising Machakos County. Secondly, the opening of the Eastern bypass linking the Mombassa Road to the Nairobi-Thika Road considerably reduced the journey time to and from Nairobi making it possible to commute from Tala and the surrounding areas. The construction of the Thika Highway has likewise had a similar impact in terms of journey time and cost. Thirdly, the grading of the Tala-Kilimambogo road in 2010 has also had a significant impact in the area. It has opened up the area for settlements resulting in a vibrant land market as noted by District Commissioner during an interview as part of the survey. Concomitant with the population influx has been the rapid growth in transport services, especially motorcycles.

*Left: Kwa Mwaura market and transport hub between Tala and Ol Donyo Sabuk*
*Right: Two minibuses on the road to Tala with Ol Donyo Sabuk (Kilimambogo) peak behind*

Transport services along this road consist of motorcycle taxis and minibuses. There are also two midi-buses that link Thika and Kangundo, using this road. Some ox carts are used for medium-distance freight transport, although their significance has declined substantially in the past 10 years. Currently, there are approximately 50 motorcycle taxis plying this road. Almost all have started operating within the past two years. There are 6-8 minibuses operating as 'rural taxis' on this route. Their associations organise a 20 minute departure timetable from either end of the road.
The minibus and motorcycle (*boda boda)* operators view the Tala-Kilimambogo road as "motorable with difficulty". The road is however open throughout the year, and does not experience significant disruptions.

According to the district authorities, the road was last graded in 2010 and this resulted in many changes. Most RTS users reported a 'big increase' in the number of vehicles operating each day along the road as well as the number of trips per day especially in the case of motorcycles. In general, development actors in the district consider the maintenance regime of the road adequate, while the regulatory authorities view the road as 'fairly safe'. The number of recalled accidents in the past year involving injury and/or damage to vehicle is very low, but slightly higher for motorcycles than minibuses.

### 3.3 Longisa-Kembu-Kimuchul Road (E268), Bomet District, Kenya

The Longisa-Kembu-Kimuchul Road is classified as 'Class E' (ie, it is a link to minor or local centres in the rural area). It is a graded, unpaved all-weather road of about 21 km. The development, maintenance and management of this rural road is under KeRRA and the Bomet District Roads Committee. The road is in good condition and is easily accessible from the main B3 Narok-Buret road.

*Left: Start of surveyed road at Longisa, with taxis, motorcycles, donkeys and a truck*
*Right: Taxis, motorycles and pedestrians on the road near to Longisa*

The road runs in a north easterly direction across five Locations (Chemaner, Kapkimolwa, Kembu, Kimuchul and Tegat) of Longisa Division, Bomet Constituency in Bomet County. The population of these Locations is about 60,000 (KNBS, 2010). It traverses undulating topography that characterise the area. With the exception of November and December, the area receives rainfall throughout the year. The long rains occur from March to May and the short rains from August to October. A mean rainfall of 1100-1500 mm, hilly terrain and heavy black cotton soils combine to make road construction and maintenance in the area relatively expensive.

*Left: Motorcycle milk transporter at the Kimuchul hub*
*Right: Motorycle taxi with three passengers passing a tea farm*

The area, which is located in the Rift Valley highlands, is characterised as high agricultural potential which explains why farming is the economic mainstay of the residents who practice tea growing, horticulture and the tending of livestock including dairy cattle. Transportation of milk from farm gate to collection points and to the milk cooling/processing plant is an important component of freight transport in the area. The good economic potential of the area is reflected in the large number of banks and financial institutions present in the nearby hub town of Bomet. Despite this, half the

motorcycle operators surveyed considered the financial facilities available to them as poor, suggesting these institutions are not assisting with the working capital requirements of motorcycle taxis. Similarly, only a quarter of the rural taxi operators considered the financial services available to them as good.

*Left: Motorcycles near Kimuchul hub*
*Right: Long distance donkey freight passing along the road at the Kimuchul hub*

Bomet District is the fourth most densely populated district in Rift Valley Province. The high population manifests in terms of high demand for rural transport services. There is a predominance of rural taxis and motorcycles, both of which generally carry more people than they were designed to. Motorcycles carry an average of two passengers per trip. The popular rural taxis (*jambulit*), which are Toyota Probox estate cars, carry an average of 12 passengers per trip (instead of the five persons they are designed to carry). Regulators and development practitioners both acknowledge low compliance with regulations by operators. Most transport users that were surveyed thought that neither taxis nor motorcycles followed timetables, although a few considered that they had some informal timetable patterns.

There are approximately eight rural taxis and 20 motorcycles operating along the Longisa-Kimuchul route. The number of passengers using rural taxis in a day were 406, comprising men (174), women (152) and children (80). This figure was based on a 12 hr count on a 'normal' day in the direction of the local Longisa hub. Passenger traffic would be higher on busy days and less on disrupted days. Rural taxis have about a month when there is reported no service and another month of 'disrupted service'. The rest of the 10 months are said to have 'good service'. For motor cycles there are 8.4 months of good service, 2.6 months of disrupted service and 1 month when there is no service in a year.

*Left and right: Taxis often load four passengers in the front, six on the back seat and four in the rear*

## 3.4 Nyabangi-Kipsolu-Kapsuser Road (E222J1 – R8), Kericho District, Kenya

The Nyabangi-Kipsolu-Kapsuser Road is classified as 'Class E' (ie, it is a link to minor or local centres in the rural area). It is a graded, unpaved all-weather road of about 8 km. The development, maintenance and management of this rural road is under KeRRA and the Kericho District Roads

Committee. The road is in good condition with motorcycles and rural taxis providing most transport services. Many heavy trucks use the road to access a nearby gravel quarry. There are also lighter tea transportation trucks that regularly use the road. While these trucks do not offer rural transport services, they do affect the road. Their economic importance helps to ensure the road is kept in a reasonable state.


*Left: Large gravel truck passing along road. Right: Tea collecting truck at a smallholder tea buying shed*

Located in Belgut, one of the seven Divisions of Kericho District, the road links Kapsuser, a small trading centre on the busy B1 Kericho-Kisumu Road with Chebirbei, and further west to Kebenet. Kericho is the regional hub. This is a tea growing region with hills and valleys on the high plateau. The central part of the district where the survey road is situated rises eastwards to 3000 m above sea level. The geology of the area is characterised by igneous and metamorphic complexes. In Belgut and surrounding areas the soils are suitable for tea, coffee, and horticulture (including tomatoes and different kinds of vegetables and fruits). Sunflower, maize as well as livestock activities also do well in this area.


*Left and right: Motorcycle taxis and rural taxi at the Kipsolu junction near the middle of the road*

The population of Belgut Division where the road is located is about 65,000. The 'catchment population' of the road is much lower as the rural road network in the area is quite dense and the people of the division are served by several roads. The pattern of rivers and ridges means that the nearest road is not always the most accessible one most and one Location may be served by more than one road.


*Left: Motorcycle carrying tea. Right: Donkeys carrying freight.*

Motorcycles and rural taxis (Probox estate cars) are the most common form of public transport. There are five rural taxis and 18 motorcycles operating on this route. The number of passengers using rural taxis is on a 'normal' day is about 211, comprising men (79), women (90) and children (42). This was based on a 12 hr count in the direction of the Kericho regional hub town. The corresponding passenger figures for motorcycles were 129 (70 women, 50 men and 9 children). The rural taxis provide 9.4 months of good service, 2.3 months of disrupted service and 0.3 months of no service each year. In the case of motorcycles, it is 8.9 months of good service, 2.3 months of disrupted service and 0.8 months when there is no service in a year. Most users surveyed felt there were no timetables for either the rural taxis or the motorcycles. However, most users were satisfied with the availability of motorcycle and rural taxi services, with motorcycles considered more available.


*Left: Disabled man with crutches and iron leg brace demonstrating access problems in a rural taxi*
*Right: Taxi dropping and picking passengers at Kipsolu junction*

The grading of the Nyabangi-Kipsolu-Kipsuser Road in the last year (with spot improvements on-going under the road maintenance programme of KeRRA) has greatly improved accessibility of RTS, partly explaining the levels of user satisfaction with services reported. However, operators of motorcycles and rural taxis reported the overall condition of the road infrastructure as 'motorable with difficulty' which perhaps reflects the combined effects of the climate and topography.

## 3.5 Bagamoyo–Mlandizi Road, Coast Region, Tanzania

The Bagamoyo–Mlandizi road (40 km) is a gravel road located in the Coast Region of Tanzania. The road comprises a trunk road section and a regional road section thus the road is under the management of Tanzania National Roads Agency (TANROADS). The trunk road section starts at Bagamoyo town and traverses through flat and rolling terrain to Makofia (5.5 km) along the Bagamoyo–Makofia–Msata road (65 km) which is being upgraded to bitumen standard. From Makofia junction the Mlandizi road is a regional road that traverses lightly rolling terrain to Mlandizi town where it links to the TanZam Highway at Mlandizi junction (34.5 km).


*Left and right: Midi-buses, minibus and motorcycles at the Yombo 'bus stop' and motorcycle hub*

*Left and right: Motorcycles providing feeder transport at the Yombo 'bus stop' and motorcycle hub*

The trunk road section from Bagamoyo to Makofia junction is currently fairly poor gravel standard (but is due to be upgraded soon). From Makofia junction to Mlandizi junction (34.5 km) the road is good gravel standard. The major economic activity along the survey road is agriculture. Crops grown include rice, coconut, sorghum, maize, cassava and pineapples. Charcoal is also produced and sold.

*Left: Bicycle transporting charcoal. Right: motorcycle transporting about 200 kg of freight*

The transport services along the road based on a one day traffic count at Yombo (17.5 km from Bagamoyo town along the road) revealed the traffic volume as follows; 50 bicycles a day, 100 motorcycles a day, 15 minibuses a day and 10 midi-buses a day. There are also 10 trucks a day which are purely for freight transport.

### 3.6 Bago–Talawanda Road, Coast Region, Tanzania

The Bago–Talawanda road (20 km) is located in the Coast Region. This is a district road under the management of the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Bago village hub 43.5 km from Bagamoyo town along the Bagamoyo–Makofia–Msata trunk road (65 km). From Bago, the surveyed road traverses rolling, hilly terrain to Talawanda village hub (20 km).

*Left: Motorcycle taxi on experimental section with concrete strips. Right: Bicycle and passenger.*

The African Community Access Programme (AFCAP) has been funding a project on this road to demonstrate alternative surface options for low volume roads. These include sections of tarmac, gravel, concrete strips, packed stone and earth. Before upgrading, the road was hardly motorable even during the dry season. Currently, the road still experiences disruptions during the rainy season due to flooding at one water crossing. One section of packed stones has become so uneven it is difficult to pass, and so motorcycles use the shoulder and trucks use a bypass through the bush.

*Failed road section of packed stone. Motorcycles now drive on the shoulder while trucks take a bypass through the bush*

The major economic activity along the survey road is small-scale agriculture and livestock keeping. Crops grown include maize, sorghum, sesame, cassava, pineapples and various legumes. The production and sale of charcoal is economically important.

*Left and right. Motorcycle taxis along the road*

Transport along the road mainly involves walking, bicycles, motorcycles and occasional light charcoal trucks. After upgrading the road, a midi-bus started to operate daily services from Talawanda to Bagamoyo. Since February 2012, this has stopped. The owner said this was due to the financial difficulties of maintaining the bus on that road, and the poor condition of sections of the road, particularly during the rainy season. During a one-day survey of traffic carried out in May 2012, the only traffic was 50 motorcycles a day and 25 bicycles a day. On some days a light truck uses the road to collect charcoal.

### 3.7 Nala–Mbalawala–Mindora Road, Dodoma Region, Tanzania

This road is located in Dodoma Region in Dodoma Urban and Dodoma Rural Districts. This is a 35 km district road, managed by the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Nala which is 20 km from the city of Dodoma on the Singida road. The road traverses flat and gently rolling terrain to Mindora village which is 35 km from Nala.

*Left: The large bus that operates on the road. Right: Donkeys are important for freight transport*

The first 12 km section of the road from Nala to Mbalawala is of good gravel standard. Much of the subsequent 23 km section from Mbalawala to Mindora is a non-engineered earth road that is in 'poor' condition. There are some drainage culverts, and those near Mindora are being replaced. Due to the poor state of this second section of road, motorised transport services are considered unreliable and are disrupted for a period of 5 months during the rainy season.

*Left and right: Motorcycle and bicycles used on the road*

The major economic activities along the survey road are agriculture and livestock keeping. Crops grown include sorghum, maize, millet, sesame, groundnuts and sunflowers.

*Left: Bicycle park at the secondary school along the road. Right: Disabled man with hand operated tricycle.*

According to the traffic survey carried out in June 2012 at Mbalawala, the transport services along the road comprise 60 bicycles a day, 20 motorcycles a day and 1 large bus. Pack donkeys are quite widely used for freight transport along the road. The bus service has an informal timetable, but users say it is nonetheless unpredictable.

# 4 SOME LESSONS FROM THE INITIAL SURVEY WORK

## 4.1 Diversity of situations and types

One of the factors that makes it difficult to assess and compare the provision of transport services is the great range of transport technologies and options. The six roads surveyed to date in Tanzania and Kenya have provided a variety of transport types and services ranging from large buses to animal-drawn carts. In Bagamoyo District in Tanzania, there were no district roads on which 'conventional' transport services (buses, minibuses or rural taxis) were operating. District roads only had motorcycle taxis, supplemented by the very irregular and unpredictable services offered by pickups and light freight trucks. Bicycles were important for individuals and traders, but there were no bicycle taxis. On one small district road in Dodoma District in Tanzania, a 60-seater bus provided a daily service when the road was in good condition. On one road in Matungulu District in Kenya, much rural transport was provided by minibuses, with some motorcycle taxis, complemented by some ox-carts carrying medium-distance (10 km) freight. In Bomet District, the main rural transport services were provided by rural taxis (estate cars) and motorcycle taxis, with some freight transported on donkeys. Each of these transport services had distinctive operating patterns and characteristics. The methodology being developed will have to cope with this wide diversity and also with the many additional types of transport services that are found in other countries.

## 4.2 Complexity

Linked to the diversity is the complexity of transport operations along the roads. In some parts of the world, public transport services are run by regulated, formal sector companies that employ staff, concentrate on passenger transport, operate in consistent ways (routes, timetables) and maintain verifiable records of their activities. On the rural roads surveyed, all transport operations are provided by the informal sector, with minimal regulation or record keeping. Most operators gain income from carrying freight as well as transporting passengers. The operators are opportunistic and will rapidly change their practices in response to changing circumstances. Although they are generally based on individual roads, they may change their location if the road is bad, or if better opportunities appear elsewhere. This increases the complexity of estimating annual traffic and overall vehicle operating costs and income. A further level of complexity relates to the fact that many operations involve people with different interests. The vehicle driver is sometimes an owner-operator (with no conflicting interests, but likely to be highly opportunistic). Sometimes a driver is hired by the vehicle owner who tries to control all aspects of the operation. The driver has a vested interest in retaining some of the daily income gained from passengers or freight. More often (from the surveys in Tanzania and Kenya), vehicle owners retain regulatory responsibility for the vehicle but lease it out for a fixed amount per day to the driver who then has full operational responsibility for the vehicle, including full day-to-day control over income and expenditure. Such arrangements are seldom legal agreements, and they are often flexible, with leasing payments altering in response to changing circumstances (such as weather disruption or vehicle repairs). This complexity makes it extremely difficult to obtain verifiable figures. However, with patience and understanding, it does appear possible to build up reasonable estimates of operational costs and statistics.

## 4.3 Roads and routes

The survey data and resulting indicators will be road-specific and should relate to the various transport services using the road and to the transport needs of the catchment population. It may be that one road (as identified by its number and status within the local roads office) comprises more than one transport catchment area, which may have different transport services and indicators. For example, one low-volume road in the highlands of Kenya linked several national roads. Although it had one road number, conceptually it was a series of roads, each with different transport characteristics. For the first ten kilometres (or so), most transport moved to and from the local

market town. On the subsequent section, people were mainly moving in the other direction, towards another transport hub. Furthermore, the transport services took a 'short cut' on an unclassified road to reach a national road which provided more convenient access to the market town. It was quite possible to survey the roads and collect meaningful data. However the data and resulting indicators will not relate to the entire road, but to the particular transport catchment patterns or routes surveyed. It is the transport services routes that meet the transport needs of the rural population and need to be assessed. If routes and roads do not correspond, one road may have different indicators for its various component sections.

## 4.4 Need for very local knowledge

When preparing questions relating to transport services regulation and development issues, the team had envisaged that appropriate district-level officials would be able to provide their assessments on issues that could contribute towards the indicators. However, district-level officials naturally have a district-level orientation, and tend to be influenced by their urban context and the national roads that they use. The team found that many district-level people could give valid opinions about 'typical' rural roads, but found it difficult to concentrate on specific roads. While district-level road engineers often knew about individual roads, this was not always true for officials concerned with agriculture, health, education and the environment. For a road-based indicator to be valid and sensitive, the contributors must know that road and the actual transport services along that road at the time of the survey. Certain assessments should change if a road becomes impassable or if a pickup service is replaced by a minibus. Therefore, assessments relating to regulation and development issues should be made by people who use or know the road in question, such as village elders, teachers, extension workers, medical staff and local police or other officials.

## 4.5 Fluctuations in transport services

Many stakeholders, particularly those in Tanzania, have commented upon the great seasonality of rural transport services. Some roads are impassable for days at a time during the rainy season. Some roads visited (but not surveyed) in Tanzania had no public transport services at all during the main rainy season. People either had to walk or get a lift in one the infrequent official or commercial vehicles that sometimes got through. Some roads are treacherous when wet, and people do not travel if rain is expected. Some roads have river crossings that are impassable for a few days after a downpour and some roads develop areas of deep mud that make transport extremely difficult. There are days, weeks or months when transport services are disrupted or stop running entirely.

In addition to weather problems, transport services vary with agricultural, commercial and socio-cultural activities. There is often a significant difference between traffic on market days and non-market days. On most of the roads surveyed in Kenya and Tanzania, the regularity and the proximity of markets suggest that the difference between market days and non-market days may be small compared to the major surges seen in some other situations. For example, on one rural road in Burkina Faso, 30 animal-drawn carts a day were recorded on 'normal' days but 720 carts travelled on market days (Sirpé, 2007; Starkey, 2007b). In areas of Tanzania with fortnightly or monthly markets, there are also large market-day surges (Awadh, 2007a and 2007b).

Transport services (both passenger and freight) tend to increase when there are products for sale and when money is more available. The short duration of the on-going surveys have not allowed major agricultural fluctuations to be observed yet. Indeed, some of the agricultural production systems seen along the roads (including tea and milk production in Kenya) do not have very marked seasonality. In contrast, in southern Cameroon, rural transport services were reported to peak during the cocoa harvest (Kemtsop 2007; Starkey, 2007b). In Zambia, roads to and from fishing villages were found to have good rural transport services, except during the closed fishing season

(Musonda, 2007; Starkey, 2007b). Transport services also experience surges in transport demand and provision (and sometimes increases in fares) at the time of national holidays and/or religious festivals. On the surveyed roads, users and operators spoke of high levels of transport around Christmas.

As a result of the observed and reported variations, the data being collected is being disaggregated into four types of road condition. These are 'normal', 'busy', 'disrupted' and 'impassable'. The estimated number of days of each of these conditions are triangulated estimates of the researcher, entered into the analysis spreadsheet and based on the information received from both users and operators. These figures, together with loading levels under the different conditions, allow estimation of annual passenger and freight transport, adjusted for seasonality. They will also allow the indicators to be developed relating to the periodic variations in transport services and the disruption caused by weather and road conditions.

In subsequent research phases, some roads will be re-visited to see if the estimates of different transport conditions vary with time of the survey. This will also provide an opportunity to see whether user satisfaction reports vary with the season of the survey.

## 4.6 Motorcycle services changing rural transport and perceptions

In 2005, surveys were undertaken on transport services in Tanzania, and at that time there were very few motorcycles in the whole country (Awadh, 2007a and 2007b). However, due to recent experiences in Rwanda, Cameroon and Nigeria, it was predicted that motorcycles and motorcycle taxis could spread rapidly in countries such as Tanzania (Starkey, 2007b). This has proved to be the case and in some districts of Tanzania and Kenya, motorcycle taxis are having a major impact on transport services. On the district roads of Bagamoyo in Tanzania, there are no conventional transport services and motorcycle taxis are the main providers of rural transport services. Motorcycle taxis are more expensive than conventional transport services. Where motorcycles operate on the same route as rural taxis, they may be 50% more. However, if where they provide unique services (and may not get a return load), they can be five times more expensive, based on their price per kilometre. Some people such as the elderly, disabled people and pregnant women prefer not to use them. They are more likely to have accidents than conventional transport services. However, they offer services that are extremely convenient. On the roads surveyed in Tanzania and Kenya, people can use mobile phones to call motorcycle taxis. Unlike conventional transport services, that pick people up and drop them along the road side, motorcycles will travel off the road, even along footpaths, to collect people from their homes. They will also drop people and their goods by their homes, which may be two kilometres from the roadside. They are willing to carry bulking loads, weighing up to 200 kg.

In the conceptual framework for planning the rural transport services indicator, the researchers imagined a rural woman, man and child walking with their goods a notional two kilometres from their home to the roadside (the 2 km being the rural access indicator standard). It was envisaged that the rural transport services indicator would try to encapsulate their subsequent experience in waiting for transport services and travelling a notional 20 km in a public transport vehicle. However, with the new motorcycle taxi services, the woman, man and child could use someone's mobile phone to call a motorcycle to ride along the path to pick them up at their house to take them and their goods on their journey. Motorcycle taxis have therefore affected the concept of access and taken transport services beyond the roads. Clearly motorcycles cannot travel along all footpaths, particularly in hilly, sandy or muddy areas, but they have moved the boundaries of the transport services. Their charges make them premium services, but for those who can afford them, they greatly improve access.

Motorcycle taxis generally have a different transport 'niche' to that of rural taxis or minibuses. Motorcycles tend to operate on relatively short distances, often less than 5 km. They tend to

complement conventional services, by transporting people to and from roadside transport stops. There is some direct competition when people decide not to wait for conventional transport and take a more timely motorcycle to their destination. However, other rural transport operators do not see them as a major threat. One of the challenges of developing the rural transport service indicators will be to find a way of assessing the relative benefits of comparing a bus service (cheap and spacious but few travel opportunities each day) with a motorcycle taxi (more costly and less comfortable, but very timely).

# 5 SUMMARISING THE RURAL TRANSPORT SERVICES STATISTICS

## 5.1 RTSi road summaries and reports

The work of capturing and analysing appropriate transport services data and preparing and presenting the key statistics is still in progress. It is intended to gradually develop and refine the survey methodology to allow the relatively easy collection of a set of data for each road in order to capture the main facts and issues relating to the transport services. In the subsequent research phase, it will be possible to start to consider which of the emerging statistics appear to be more important to the various stakeholders. This should lead to the identification of relevant indicators.

It is proposed that transport professionals will report the rural transport services survey results in three ways.

- RTSi indicators (still to be developed from the RTSi summary tables).
- RTSi summary tables containing the most important statistics in a standardised format.
- RTSi narrative report containing all important statistics and discussing the many issues and lessons for the benefit of the commissioning organisation and the local transport services stakeholders.

The technical proposal envisaged that the first two research phases would concentrate on developing and testing a methodology for obtaining, analysing and presenting key statistics from which indicators could be developed. It was, and still is, envisaged that participative work on developing specific RTSi indicators would take place only after a proven system had been developed for obtaining and presenting road-based rural transport services statistics.

The main statistics arising from the surveys are being summarised in four tables which together take up about 2-3 pages including some maps. These tables are:

- **Table 1. Road information** (including maps and condition assessments)
- **Table 2. Traffic and transport along road** (including traffic counts, road disruption and annual figures for passengers and small freight for all modes of public transport)
- **Table 3. Rural transport services key operational statistics for major transport modes**, including costs, frequencies, safety, security, regulation compliance and development impact
- **Table 4. Satisfaction with main public transport modes for men and women**, including aspects of price, frequency, freight transport, safety and security, comfort and accessibility.

Most of the information in these tables will be automatically compiled by the spreadsheet programme used for data entry during the survey. This is also true for the four additional tables that provide more detailed information. For example, in the summary tables there is one statistic relating to user satisfaction with comfort, but in the more comprehensive table this is separated into elements such as seat size, seat condition, luggage around the feet and the ambient heat/noise/dust. These tables will be integrated into the RTSi report that will present and discuss all the main statistics gained from the survey using standardised headings to ensure the main issues are covered. The narrative sections of the report will explain reasons for the various levels of satisfaction recorded. They will highlight any gender differences observed and issues of particular concern to certain categories of users (eg, the old, school children, farmers, people with disability). They will also report observations from users, operators, regulators and development personnel that do not appear in the road statistics. Such reports may well be about ten pages long.

An example of the summary report template is available as an annex of this paper. During the process of developing and testing the value of these tables, numerous notes and explanations have been prepared to assist in the completion and understanding of the tables. Most of these notes will

be removed from the table templates. Relevant explanations and guidance information will be incorporated into an RTSi manual that will explain how the various statistics are calculated.

Also available as annexes are partially completed reports from Kenya and Tanzania to illustrate the types of data and statistics that will be summarised. The processes of selecting and weighting the information for the summary tables and the information for the narrative reports are continuing and this on-going work is expected to be a key aspect of the second research phase as is discussed below.

## 5.2 Summarising and analysing the data

Having developed and tested initial methodologies for acquiring the relevant data through participative surveys, the team has recently been concentrating on developing ways of analysing the data and summarising the main statistics in a series of tables. This has proved very challenging and time consuming, but significant progress has been made.

Although the survey is relatively small, a large amount of data is being collected. Analysis is complicated by the need to disaggregate data by transport mode (several types), by gender and by road/traffic conditions (four categories). A survey of twelve operators (three operators of four modes of transport) can yield 1100 pieces of information while a survey of twenty users can lead to over 4000 pieces of information.

In the first instance, it was decided to use Excel spreadsheets to analyse the data. This was because this software is widely available and most of the transport professionals who are expected to undertake the surveys would have reasonable proficiency in basic data entry with this programme. There is on-going discussion as to whether a database would be a better platform in the long term. A database such as Access can be set up to make data entry very user-friendly, which will be important in the future. However, the relatively simplicity, 'transparency' and familiarity of the spreadsheet make it preferable in these development phases where researchers in several countries are working to develop and refine effective systems of analysis.

Having decided to develop Excel spreadsheets for data entry and analysis, the team has worked together to develop systems for data entry, data tallying, data analysis and the presentation of statistics. In doing so, they have created 'intermediate tables' of step-by-step calculations, so that each intermediate calculation and statistic can been seen and verified. There are about 100 step-by-step calculations for each mode of transport, with most data entering automatically from the data-entry sheets for users, operators, regulators and development personnel. For example, annual totals of passengers and freight are calculated in a step-by-step way with data about trip loads and daily loads under four different road conditions. The 'transparency' of this intermediate table has proved valuable to picking up errors due to incorrect data entry or formulas. However, once the key statistics have been developed, it should be possible to simplify the user interface through the use of more complex, 'hidden' calculations.

## 5.3 Embedding 'triangulation' into the data analysis

One major advantage (and disadvantage) of obtaining data from different sources is that one has to reconcile the differences. If transport volumes (or prices or other statistics) were estimated by traffic counts or by operator interviews or by user interviews, there would be one resulting statistic. This happens in most transport-related research and the accuracy of results obtained are seldom questioned. With this methodology, the researchers may end up with three statistics that may differ and they have to reconcile (triangulate) the differences. The final triangulated result should be a more accurate and realistic statistic, but it does take time and effort to understand the situation and to triangulate the data.

It was initially envisaged that the transport professionals undertaking the surveys would be able to triangulate information in their heads while interviewing stakeholders. This would enable them to immediately ask the interviewees follow-up questions if their responses differed significantly from those of other stakeholders. This would have allowed an understanding of the reasons for the discrepancies and facilitated the building of a consensus of all parties on what was the 'true' situation relating to transport services on that road. While this methodology can be used when a researcher is studying one particular topic, the scale and complexity of the transport services being surveyed made this impracticable. Early survey data from the roads contained several major discrepancies that could not be resolved without going back to the sources to understand the reasons for the different estimates obtained relating to costs, service operations and seasonality.

It became clear that it would be necessary to formalise the process of triangulation and to build it into the methodology. A system for doing this has been developed using the 'intermediate tables' of the tallying spreadsheet. For each of the data sources that needs formal triangulation, the data (or statistics in the case of averaged data) from the different sources are brought together in adjacent columns and colour coded. The researcher then has to make a decision as to whether to enter a triangulated figure, or go back to information sources for clarification. For example, for daily traffic movements for each mode of transport, there are columns for operator estimates, user estimates and the traffic count. The researcher must make a decision, taking into account the three data sources. They must be able to justify the decision based on the local circumstances. Some would argue that, in this case, the most reliable information relating to transport movements would come from the operators. This could be the case for routed services with timetables, but the operators of irregular, informal modes of transport may not see the overall picture as well as a waiting passenger or an actual count of the traffic movements.

In the future, initial triangulation will be done during the survey period. It is envisaged that the transport professionals will input survey data into the spreadsheet each day. They will then be able to see if there are major discrepancies in the different estimates that need investigating and resolving while the survey is still underway. As the data is entered during the survey, various summary tables will be compiled on the numbers and types of each stakeholder interviewed. This will make it easy to see whether some parts of the dataset are under-represented. It should highlight if there is need for further interviews relating to particular modes of transport, to particular user characteristics (gender, age, transport use, disability) or to particular aspects of regulation or development.

The RTSi guidelines will require that each of the triangulated estimates is subsequently reviewed prior to finalisation of the tables and the report. If the surveyor is working within a team, a colleague or supervisor would be able to check these very important figures that are carried forward into the production of the final indicator statistics. At present the summary tables require seven triangulated inputs for each transport mode for their completion. The user, operator, regulator and traffic count data provide the evidence that enable appropriate triangulated entries to be made.

## 5.4 Data entry accuracy and order of magnitude estimations

One of the advantages of having data sets and statistics relating to a small number of vehicles is that it is relatively easy to identify errors by intuitive thought (commonsense comparisons with the reality observed). This requires the researchers to see the statistics generated as meaningful figures that relate to the reality of the road. However, some people have a tendency to accept generated statistics at face value, instead of constantly questioning them. The team has been dealing with this problem and it is clearly important to build into the methodology and data analysis not only training and instructions, but also systems of checks that quickly identify figures that are incorrect.

From the outset, it was envisaged that the surveys to collect the data would be carried out by transport professionals and not by survey enumerators. It is essential that the surveyors understand the situation relating to transport services and record and enter data that is meaningful. If the data is not correct and 'reasonable' it will distort the indicators. This is true for all indicators, irrespective of the sector.

From the outset, the RTSi participative survey methodology was designed in favour of rapid results rather than statistical significance. Interviews are held with a range of operators, local officials, relevant people and various types of users that are intended to be broadly representative of the four stakeholder perspectives being obtained. However, for each survey category, there are often only three interviews in order that the survey can be accomplished within about a week. This small sample size means that data and data entry must be accurate, as 'incorrect' entries will not be diluted within a large sample. Therefore, the RTSi guidelines will include the need to examine the data and check it is 'reasonable'. This has proved quite difficult at this development stage, as it requires understanding what all the statistics mean and a constant self-questioning to ensure the figures appear to be of appropriate orders of magnitude. Once the analysis methodology has been finalised and the calculation equations 'locked', the generation of the tables should be more straightforward. However, it is still vital that data is entered correctly. The team has witnessed what happens to the statistics when someone has mistakenly entered minibus passenger numbers for a motorcycle operation, or confused the measuring units or exchange rates. As a result, it may be appropriate to build in warning mechanisms into the data entry systems so that figures that appear of the wrong order of magnitude are highlighted or queried. This will be a challenge as some 'unlikely' figures may prove to be accurate (a motorcycle can carry four passengers and a rural taxi can carry 20 people in a 5-seater estate car).

## 5.5 Selecting and weighting the rural transport statistics

Summary Table 2 contains statistics on the numbers and frequency of all the transport types operating along the road. Tables 3 and 4 present operational and satisfaction information for the three main transport types on that road. The three transport types highlighted are selected by their contribution to the annual transport on that road. At present, the statistics presented are those of the total number of passengers carried each year by each mode of transport. Similarly, the freight statistic is the total weight of freight carried annually by each mode. These statistics do not take into account journey distance and so 'exaggerate' the significance of the smaller modes of transport. If they were presented as passenger-kilometres and tonne kilometres per year, the apparent importance of the longer-distance modes of transport would increase. In future both statistics may be included and the relative importance of these and other statistics will be considered as the research progresses.

The summary tables also contain some combined statistics. For example four separate passenger assessments of comfort are combined into one comfort statistic. More than ten responses relating to the development impact of the road have also been combined into one 'development impact' assessment. Such combinations of data are likely to contribute towards the development of the final indicators. If statistics are combined in this way, a system of weighting may be adopted. Weighting is widely used in many sectors, in developing indicators and in overall assessments of adequacy, quality and appropriateness.

The process of weighting involves emphasising the contribution of some issues, data sources or criteria (such as mode of transport) to a final statistic. Rather than each element contributing equally, some are given 'more weight' in the analysis. One reason for this is to prevent minor issues or elements from disproportionately influencing the overall statistic.

To take an example, on one road there are ten busy and very popular minibuses and one old taxi that is unpopular. It would not be very helpful to calculate the simple average satisfaction of the two modes of transport so that they had equal weight. In this case they might be weighted in proportion to the passengers they carried each year, which would give the minibuses much more weight in the final statistic.

The topic of weighting will be addressed at a subsequent stage in the research. Discussions will be held within the team and with interested stakeholders, including members of the international consultative group and national steering committees. There are bound to be interesting discussions in determining whether all the development assessments should have equal weight. There seems no compelling logic as to why they should be equal. If they are not, it may be difficult to agree the relative weightings for such things as agriculture, environment, health, education and gender. However, any weightings that are used will be clear and transparent. Until appropriate weighting are agreed, simple averages will be used to calculate most combined statistics.

Another issue to be dealt with in the future relates to indicators that appear to move in 'perverse' ways. While developing the methodology, it has been important to ensure that all questions lead to potential indicators that are intuitive and move in the same way (from very poor through medium to very good). However, some of the initial development indicators (environmental impact, protection of cultural heritage and HIV/Aids impact) appeared to move in a 'perverse' way as better transport sometimes leads to worse development impact relating to these issues. For the moment, these indicator questions have been retained but combined in separate statistics.

## 6 IMPLICATIONS FOR THE NEXT RESEARCH PHASE

The coming research phase (Phase 2) was intended to further test the methodology and start to identify the key emerging indicators. This is still the case. In the initial research proposal, it was envisaged that Phase 2 would involve spreading the research to more countries and bringing more partners into the process. However, the problems experienced in converting the road survey information into concise indicator tables now suggest that the circle of researchers should not be enlarged until all the spreadsheet problems have been resolved. There is a need for a more user-friendly and robust system for entering and analysing the survey data. This can be developed and tested in the field by various members of the existing team, with some additional expertise relating to data handling, particularly in relation to transport-related surveys. After more effective data entry and analysis systems have been developed and tested by the team in the coming Phase 2, it will be easier to extend the use and testing to more organisations and countries. Appropriate guidelines and manuals relating to the survey methodology will be a prerequisite for further sharing and testing the methodology.

It is therefore proposed that the second six-month phase of research should concentrate on: consolidating progress by:

- improving the analysis tools
- improving the data collection and in-field triangulation methodologies
- testing rigorously the whole methodology (with in-field data entry and analysis) in Kenya, Tanzania and Cameroun, resulting in three new road reports
- critically reviewing progress and making improvements as required
- preparing and sharing a work-in-progress paper with three completed road reports
- second cycle of rigorous testing of the methodology and in-field data entry and analysis in Kenya, Tanzania and Cameroun, resulting in three more road reports
- identifying the indicator statistics most relevant and meaningful to the different stakeholders and possible systems of 'weighting' the different statistics
- preparing clear user guidelines for the surveying and analysis tools.
- preparing and sharing a technical paper with three new road reports.

The envisaged activities in phase two are shown in the table below.

**Table 5 Summary of proposed timetable and activities for Phase 2.**

| *Start/ Finish date* | *Time (month)* | *Phase* | *Activities* | *Deliverables* | *Milestones* | *Milestone date* |
|---|---|---|---|---|---|---|
| 1 Oct 2012<br><br>to<br><br>31 Mar 2013 | 0 - 6.0 | 2. Methodology consolidation and development of preliminary indicators | Review and planning meeting<br><br>Development of analysis software<br><br>Testing of survey methodology and analysis software on roads in Cameroun, Kenya and Tanzania<br><br>Review and revision<br><br>Preparation of work in progress paper and road reports<br><br>Second cycle of testing (CM, KE, TZ) and revision with stakeholder discussions on most relevant statistics as indicators<br><br>Preparation of survey guidelines and manual<br><br>Preparation of road reports<br><br>Preparation of a technical paper<br><br>Preparation of final report | Three completed RTSi road reports and a work in progress paper<br><br>RTSi guidelines and manual<br><br>Three completed road RTSi reports<br><br>Work in progress paper with suggestions for indicators and follow-ups<br><br>Final project report. | RTSi Methodology and analysis software validated<br><br>Initial indicator statistics identified and methodology available for evaluation | 15 Dec 2012<br><br>15 March 2013<br><br>31 March 2013 |

Members of the current team are based in Kenya, Tanzania and Cameroun. It is therefore proposed that the refinement and testing is carried out in these countries. To date, survey work has only been carried out in Kenya and Tanzania. Team member Guy Kemptop is based in Cameroun and testing the methodology there would be cost-effective and would allow us to test the methodology in a very different environment (Francophone, West Africa). This will help us ensure the methodology and systems of analysis are appropriate for different means of transport and for different regulatory and development frameworks.

These proposals for Phase 2 are likely to be appropriate to the limited funding that might be available at this stage in the AFCAP programme. They do not diminish the long-term aim of more widespread testing and application of the methodology and eventual international acceptance of appropriate rural transport services indicators. They should provide an opportunity to ensure a reliable and robust methodology and tools are developed that can be shared with other partners in a subsequent stages of this rural transport services indicator initiative.

## 7 CONCLUSIONS

This is a 'work in progress' paper and the work is definitely progressing. The participative survey methodology has proved effective in obtaining the basic information required for most issues considered important to the different stakeholders, and which could be used to develop indicators. As noted, the diversity and complexity of the rural transport services make collecting and analysing the information a very challenging task. This is particularly true of data relating to operating costs.

Triangulation has proved extremely valuable for allowing the team to understand discrepancies while still undertaking the survey. The team has been working on an Excel-based system that allows as much of the data entry and analysis as possible to be done while close to the surveyed road. It also provides a guided method of making triangulated estimates that can be easily checked and verified. This will allow data anomalies and conflicting information to be spotted immediately so that the different information sources can be asked to explain the apparent discrepancies. Most of the statistics required for the various summary tables (that will be the basis for subsequent indicators) will be calculated automatically by the spreadsheets. It is intended to include various checks between the different sources of information and warnings if statistics appear to be out of 'normal' ranges.

The aim is to have reliable and repeatable data sets that can be gathered, analysed and reported within a period of 7-10 days. The team is aware that there is still much to do in terms of testing and further refining the survey and analysis methods to achieve this. The team has been challenged by the practical problems of rapidly generating meaningful statistics that accurately represent the complex nature of rural transport services. The team members feel they have already accomplished much, but that the system of data entry and analysis is an area that requires further attention. The mechanism for going from data entry to summary tables of statistics will be an essential part of the final methodology. Before other organisations are invited to test the survey methodology, there should be an effective, robust and user-friendly data entry and analysis mechanism that can facilitate triangulation. Therefore, the team proposes a six-month Phase 2 in which team members, with appropriate technical support, will first review and improve the data entry, analysis and reporting systems. They will then undertake two full cycles of surveying, analysing and reporting on roads in the countries where team members are based (Kenya, Tanzania and Cameroun). At this time, they will also consult with the different stakeholders (users, operators, regulators and development personnel) about the various statistics being generated. They will learn which statistics appear to be more important indicators of the rural transport services and the weightings that might be applied to the different statistics for any combined indicators. User guidelines will be prepared for the survey methodology and the system of data entry and analysis, so that by the end of March 2013, there will be a well-tested and proven system of obtaining relevant and meaningful indicator statistics about rural transport services that will be available for pilot application in Africa.

The team can be reached through the website and through the contact addresses provided on page 2. The team will warmly welcome information sharing and collaboration as well as people's comments and ideas relating to the methodology, analysis and indicator options.

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## 8 Initial template for RTSi summary and report with notes

# Rural Transport Service Indicators Summary

*The Rural Transport Services Indicator data are currently summarised in four tables relating to the road, the transport along the road, the operational statistics of the transport services and a summary of users' satisfaction with the transport services.*
*The various notes explain the statistics, with reference to the questionnaire sheets for users (U1,2), operators (O1,2), regulators (R) and development personnel (D) as well as the associated data entry spreadsheets.*

Report of: (Road name, District/Authority, Country) _____

Prepared by: _____ Date:_____

| **Table 1. Road information** | | | |
|---|---|---|---|
| *Road name:* | | | |
| *District, Region and Country:* | | | |
| *Road type:* | *Responsible authority:* | | |
| *Road start location:* | *GIS:* | | |
| *Road finish location:* | *GIS:* | | |
| *Road length:* | *Catchment population* [1] | | |
| ***Road quality and condition from different perspectives*** | | | |
| *Road authority* [2] | *Operators* [3] | *Development* [4] | *Safety* [5] |
| | | | |
| ***Summary of road geography and socio-economic situation*** | | | |
| | | | |
| ***Maps of road, with context and hub and spoke connections*** | | | |
| | | | |
| ***Schematic map of 'straightened' road with features*** | | | |
| | | | |
| ***GPS elevation track*** *(same horizontal scale)* | | | |
| | | | |
| ***GPS speed track*** [6] *(same horizontal scale)* | | | |
| | | | |
| ***Description of hub and spoke patterns*** | | | |
| | | | |
| ***Intermodal connectivity*** *(one to five stars, the more stars the better)* | | | |
| ***'Feeding'*** [7] | *User satisfaction* [8] | *Development impact* [9] | |
| ***'Lnking'*** [10] | *User satisfaction* [11] | *Development impact* [12] | |

*Table 1 notes:*

1. Estimated 'catchment' population using that road, based on estimated population living within 5 km either side of road (or to mid point of next road if nearer), plus those living within 10 km of the 'end' of the road. This population does not take account of people or traffic coming onto the road from feeder roads.
2. Assessment (if available) of the road from the perspective of the responsible road authority.
3. Assessment of road condition for transport operations from the operators' perspective (from Q. O1-8).
4. Assessment of adequacy of road maintenance from the perspective of development personnel (from Q. D-16).
5. Assessment of safety of the road infrastructure and signage from the regulators' perspective (from Q. R-8).
6. GPS speed track, illustrating road condition.
7. 'Feeding' connectivity involves the means of transport that bring passengers to and from the transport route.

8. User satisfaction of 'feeding' intermodal connectivity based on Q. U2-21.
9. Development assessment of 'feeding' intermodal connectivity based on Q. D-14.
10. 'Linking' connectivity relates to how well transport on that road connects with transport beyond the road.
11. User satisfaction of 'linking' intermodal connectivity based on Q. U2-22.
12. Development assessment of 'linking' intermodal connectivity base on Q. D-15.

**Table 2. Traffic and transport along road**

| **Daily traffic flows** [1] | | | | | **Fleet** [2] | **Passengers and small freight** [3] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Normal* [4] | *Busy* [5] | *Disrupted* [6] | *Impass-able* [7] | *No of RTS vehicles operating on road* [8] | ***Trip transport*** *normal day per vehicle* [9] | | ***Daily transport*** *normal day all vehicles* [10] | | ***Annual transport*** *adjusted for traffic fluctuations* [11] | | ***Change*** *in past year* [12] |
| | | | | | | *Pax (no)* [14] | *Frt (kg)* [15] | *Pax (no)* [16] | *Frt (kg)* [17] | *Pax (000)* [18] | *Frt (t)* [19] | *- - 0 ++* |
| Bus (large) | | | | | | | | | | | | |
| Midi-bus | | | | | | | | | | | | |
| Minibus | | | | | | | | | | | | |
| Rural taxi | | | | | | | | | | | | |
| Passenger truck | | | | | | | | | | | | |
| Large truck | | | | | | | | | | | | |
| Small truck | | | | | | | | | | | | |
| Govt/ private/NGO | | | | | | | | | | | | |
| Motor tricycle | | | | | | | | | | | | |
| Motorcycle | | | | | | | | | | | | |
| Bicycle | | | | | | | | | | | | |
| Riding/pack animal | | | | | | | | | | | | |
| Animal cart | | | | | | | | | | | | |
| Pedestrians >5km | | | | | | | | | | | | |
| **Totals** | | | | | | | | | | | | |

*Table 2 notes*

1. Vehicles per day travelling towards main hub. Derived from traffic count data, triangulated with survey observations and estimates of the number of operating vehicles provided by operators (Q. O1-1, adjusted for trips per operator per day) and user recall of travel opportunities (Q. U1-7, adjusted for difference between travel opportunities and passing vehicles). Definitions of vehicles are given on sheet C-1.
2. Number of each type of RTS vehicle that normally operates on the road. Data from question O1-1.
3. Estimates of the daily and annual volumes of passengers and small freight (accompanied and unaccompanied) for the various transport modes carried in both directions. For details, refer to the notes associated with each column.
4. Traffic on normal day. Data from traffic count triangulated with observations and questions U1-7 and O1-1.
5. Traffic on busy day such as regular market day (not exceptional annual holiday). Data sources as Note 4.
6. Traffic on disrupted travel due to weather etc, but passable with difficulty. Data sources as Note 4.
7. Traffic on day when road not motorable by conventional services. Zero for most vehicles. Data sources as Note 4.
8. Number of each type of vehicle providing transport services for people along the road, from O1-1, observations and triangulation (exclude vehicles in transit and those not providing transport services for people).
9. Typical number of passengers and freight for each 'normal' trip (one direction), based on question O2-7 and O2-9.
10. Data from previous two columns, multiplied by paid trips per day in all directions, from question O2-3, O2-4.
11. Estimated total annual transport on the road per vehicle type. Calculation details in notes 18 and 19.
12. Change in passengers carried in past year for main types of RTS. Data from questions O1-6 and U1-17. Average with operator weighted by x2. (Questions O1-4 O1-5, U1-15, U1-16 used to check reliability and understand growth or decrease patterns). Change expressed as large decrease (- -), decrease (-), static (0), increase (+) and large increase (+ +).
13. Estimates of the number of days per year for each category of day. Data from question O1-1 (number of busy days per year) and from questions O1-2 and U1-13, triangulated with observations and discussions. Means from questions O1-2 and U1-13 are converted to days (x30) and a weighted mean taken with the operator's data weighted by a factor of 2, ie, (O1-2 x2 + U1-13)/3.
14. Typical number of passengers for each 'normal' trip, based on question O2-9
15. Typical freight in kg for each 'normal' trip, based on question O2-7
16. Typical total numbers of passengers carried per 'normal' day (all directions), based on O2-9 and O2-3
17. Typical total freight (accompanied and unaccompanied) in kg for each 'normal' day in all directions, based on question O2-7 and O2-3 or O2-4.
18. Estimated numbers of passengers carried per year. Based on calculated figures for typical day (column with notes 10 and 16) x number of typical days (O1-2) plus passengers on busy days based on passengers per vehicle (O1-3) x number of operating vehicles (O1-1) x number of busy days (O1-1) plus passengers on disrupted days (O1-3) x number of operating vehicles (O1-1) x number of disrupted days (O1-1) plus numbers of operating vehicles on impassable days (O1-1, zero for most modes) x passengers on impassable days (O1-3, zero for most modes) x number of impassable days (O1-1). Total days to equal 365.

19. Estimated small freight carried per year. Based on calculated figures for typical days (column with notes 10 and 17) x number of typical days (O1-2) plus freight on busy days (O1-3) x number of operating vehicles (O1-1) x number of busy days (O1-1) plus freight on disrupted days (O1-3) x number of operating vehicles (O1-1) x number of disrupted days (O1-1) plus numbers of vehicles operating on impassable days (O1-1, zero for most modes) x freight carried on impassable days (O1-3, zero for most modes) x number of impassable days (O1-1). Total days into equal 365

| **Table 3. Rural transport services key operational statistics for major transport modes [1]** | | | |
|---|---|---|---|
| | *Mini photo* | *Mini photo* | *Mini photo* |
| | *Eg, Minibus* | *Eg, Rural taxi* | *Eg, Motorcycle* |
| Contribution to annual passenger transport (% of market) [2] | | | |
| Contribution to annual small freight transport (% of market) [3] | | | |
| Fare per km in USDc [4] | | | |
| Journey time (average speed on normal days) in km/hr [5] | | | |
| Transport frequency (normal days) [6] | | | |
| Number of days a year with normal service | | | |
| Number of busy days a year | | | |
| Number of days a year with disrupted services | | | |
| Number of days a year with no transport services | | | |
| Reliability factor [7] | | | |
| Men as % of passengers/day [8] | | | |
| Women as % of passengers/day [8] | | | |
| Children as % of passengers/day [8] | | | |
| Cost of 50 kg accompanied freight in USD per tonne-km [9] | | | |
| Cost of 200 kg consigned freight in USD per tonne-km [10] | | | |
| Safety: Recalled no. of accidents per 100,000 journeys [11] | | | |
| Security: Recalled no. of incidents per 100,000 journeys [12] | | | |
| Operating distance per year in km [13] | | | |
| Vehicle operating costs (VOC)/year (USD) [14] | | | |
| VOC per passenger-km (USDc) [15] | | | |
| Operating income per passenger-km (USDc) [16] | | | |
| Percentage operating income due to freight [17] | | | |
| Regulation compliance (overall assessment) [18] | | | |
| Development impact (overall assessment) [19] | | | |

*Table 3 notes:*

1. Three most significant types of transport by passenger volume as shown in Table 2. All transport types are summarised subsequently but three (could be four) are selected for the main indicator.
2. Passenger market share % from Table 2 (may not add to 100% as minor transport types not included)
3. Small freight market share % from Table 2 (may not add to 100% as minor transport types not included)
4. Normal fares charged per passenger kilometre in USD cents. Based on Q. U1-2 and V88.
5. Indication of normal journey time in vehicle, expressed as average speed (km/hr). Based on Q. U1-2 and calculation [reference to spread sheet to be inserted here when finalised].
6. Transport frequency expressed as the number of travel opportunities per day in the direction of the main hub. This is similar to the total number of services a day, but if two (or more) services go at about the same time (eg, early morning), this counts as only one travel opportunity. 'On demand' services through waiting motorcycles and/or mobile phone ordering are considered as 50 opportunities a day (equivalent to about one every 15 minutes during 12 hr day). Based on Q. U1-7.
7. Disruption factors. This indicator (or indicators) is (are) still to be developed. We have disruption data relating to journey times (normal vs disrupted), service frequency (normal, disrupted, no service) and waiting times. Could be percentage increase in waiting and/or travel times. Could be percentage of year with normal, disrupted and no service (although this in shown on Table 2). Pie chart could be used.
8. Percentage of men, women and children passengers based on the traffic count data and calculation [insert reference].
9. Cost per tonne-km of accompanied small freight, based on goods/produce of 20-50 kg. From Q. U1-2 and calculation V79.
10. Cost per tonne-km of unaccompanied small freight, based on goods/produce of 200 kg. From Q. U1-2 and calculation V80.
11. Safety. Recalled number of accidents involving injury or damage to vehicle for that type of transport type on that road. Weighted average of operator recall (Q. O1-7) and user recall (Q. U1-11) weighted x2 for operator as considered more likely to remember accidents along whole road. Presented as per 100,000 journeys (or comparable statistic that removes decimal places) based on total passenger journeys of that type from Table 2.
12. Security. Recalled number of security incidents including theft, harassment and assault per transport type along the surveyed road. Weighted average of operator recall (Q. O1-7) and user recall (Q. U1-2) weighted x2 for operator as considered more likely to

remember incidents along whole road. Presented as per 100,000 journeys (or comparable statistic that removes decimal places) based on total passenger journeys of that type from Table 2.

13. Total operating distance per year in kilometres, based on calculation V64.
14. Annual Vehicle Operating Costs (VOC) in USD based on calculation V76.
15. Annual VOC divided by total operating kilometres and divided by total passengers carried based on calculation V74.
16. Total annual operating income in USD x 100 (for cents) divided by total operating kilometres and divided by total passengers carried based on calculation V84.
17. Total operating income from freight x 100 (for percentage) divided by total operating income from both passengers and freight, based on calculation V85.
18. Overall regulation compliance for that mode of transport. For the moment this is a simple average response to all compliance-related questions (R-1 to R-6), without weighting for importance. Weighting will be considered at a later stage. Statistics from Table 7.
19. Overall development impact for that mode of transport. For the moment this is a simple average response to questions D-1 to D-10, without weighting for importance. Statistics from Table 8. Weighting will be considered at a later stage. Also to be considered are the indicators from questions D-11 to D-13 on cultural heritage, environment and HIV/Aids that appear to move in a perverse way (better transport, worse development outcome).

| **Table 4. User satisfaction with main RTS modes (disaggregated for gender)** [1] | | | | | | |
|---|---|---|---|---|---|---|
| | *Eg,* **Bus** | | *Eg,* **Minibus** | | *Eg,* **Motorcycle** | |
| | *Men* | *Women* | *Men* | *Women* | *Men* | *Women* |
| *Sample size (N)* | | | | | | |
| Fares | | | | | | |
| Journey time | | | | | | |
| Operational features [2] | | | | | | |
| Freight [3] | | | | | | |
| Safety and security [4] | | | | | | |
| Comfort [5] | | | | | | |
| Universal access [6] | | | | | | |
| **Overall satisfaction** [7] | | | | | | |
| *The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied* | | | | | | |

*Table 4 notes:*

1. Three most significant types of transport by passenger volume as shown Table 2. This is a summary of the more comprehensive Table 5, which includes all the questions and all the transport types. Only three (could be four) transport types have been selected for the main indicator summary tables.
2. Operational features include service frequency, service predictability and passenger capacity.
3. Freight includes average satisfaction with small freight (20-50 kg) and medium freight (200 kg) in terms of availability, price and handling, as well as courier services.
4. Average satisfaction of the safety (accident risk) and security (theft, assault, harassment risk) of the transport type
5. Satisfaction of comfort in terms of space, seat type, surrounding baggage and goods and the environment (noise, heat, dust).
6. Satisfaction with accessibility for the elderly and people with mobility aids.
7. This is an un-weighted average of all the questions relating to satisfaction with that type of transport.

# Rural Transport Service Indicators Report

*The Rural Transport Services Indicator Report follows the four summary tables of indicator data. It includes both tables of statistics and narrative descriptions of the survey findings, observations, interpretation and conclusions. Following an overview of the road and the transport services, it analyses the transport services from the perspectives of the users, the operators, the regulators and those concerned with development. It concludes with priority areas for action that would improve the services for the benefit of the rural population. Such action would resulting in improved the indicator statistics.*

Report of: (Road name, District/Authority, Country) _____
Prepared by: _____ Date:_____

## Overview of road situation and issues

*Include map showing road context and the main markets and services (hospitals, schools).*
*Summarise the location of the road and the responsible authorities.*
*Summarise the geography, topography and socio-economic context.*
*Summarise the condition of the road, any recent changes and the seasonal patterns affecting the road.*

## Overview transport services situation and issues

*Include schematic map showing road with feeder and linking patterns and location of main transport hubs and destinations.*
*Summarise the typical daily transport services, seasonal patterns and overall annual passenger volume from (Table 2).*
*Summarise the main transport types on the road (with photos?) together with their 'market share'.*
*Summarise any minor transport types and their significance.*
*Summarise the typical frequency patterns and disruption patterns.*
*Summarise any key issues affecting the transport services including complementarity and competition.*

## User perspectives

*State how many users and types of user were interviewed and the gender balance of the user survey.*
*Refer to Table 5 which summarises user satisfaction with the different transport services.*
*Summarise the various users' perspectives, noting the comparative advantages of the various transport types for the different types of user, with particular reference to:*

- *Cost and affordability issues*
- *Frequency and predictability issues*
- *Comfort, convenience, security and safety issues*
- *Freight and agricultural transport issues*
- *Health transport issues, including maternal health*
- *Education transport issues*
- *Gender issues (highlight any differences in the disaggregated data)*
- *Age and disability issues*
- *Interconnectivity and mobile phones*
- *Other issues arising from the survey and discussions (including any issues relating to transport for trade, financial transactions and socio-cultural purposes).*

| Table 5. Summary of user satisfaction responses disaggregated for gender [1] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Means of transport* | **Bus** | | **Minibus** | | **Rural taxi** | | **Truck** | | **Motorcycle** | | **Other** | |
| *Gender of respondent* | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** |
| *Sample size (N)* | | | | | | | | | | | | |
| Passenger fares | | | | | | | | | | | | |
| Journey times | | | | | | | | | | | | |
| Service frequency | | | | | | | | | | | | |
| Service predictability | | | | | | | | | | | | |
| Passenger capacity [2] | | | | | | | | | | | | |
| Small freight availability [3] | | | | | | | | | | | | |
| Small freight charges | | | | | | | | | | | | |
| Small freight handling | | | | | | | | | | | | |
| Medium freight availability [4] | | | | | | | | | | | | |
| Medium freight charges | | | | | | | | | | | | |
| Medium freight handling | | | | | | | | | | | | |
| Courier services [5] | | | | | | | | | | | | |
| Road safety [6] | | | | | | | | | | | | |
| Security [7] | | | | | | | | | | | | |
| Comfort: space | | | | | | | | | | | | |
| Comfort: seat type/conditions | | | | | | | | | | | | |
| Comfort: surrounding baggage [8] | | | | | | | | | | | | |
| Comfort: environment [9] | | | | | | | | | | | | |
| Access for vulnerable people [10] | | | | | | | | | | | | |
| **Overall un-weighted [11]** | | | | | | | | | | | | |
| **Overall weighted [12]** | | | | | | | | | | | | |

| Satisfaction for all transport types | | |
|---|---|---|
| *Gender of respondent* | **M** | **F** |
| Facilities at roadside stops [13] | | |
| Feeding intermodal connectivity [14] | | |
| Linking intermodal connectivity [15] | | |
| **Overall un-weighted [16]** | | |
| **Overall weighted [17]** | | |

*The higher the score the better.*
*1 = Very dissatisfied. 2 = Dissatisfied. 3 = Medium. 4 = Satisfied. 5 = Very satisfied*
*(note due to numerous columns, numbering rather than stars will be used for this table)*

*Notes:*

1. Data from Questionnaire U2. All questions (U2-1 to U2-22) disaggregated for gender.
2. Ability to get on the first available transport service.
3. Small freight considered as 20-50 kg of accompanied produce or goods.
4. Medium freight considered as 200 kg of unaccompanied goods or produce.
5. Courier service is considered as the facility to send letters or small packets up to 1 kg with the transport service to another location along the route.

6. Satisfaction with the safety of that form of transport
7. Satisfaction with the security on that form of transport (against risk of theft, assault or harassment).
8. Satisfaction with the amount of goods and luggage around passengers.
9. Satisfaction with the environment of the transport mode, in terms of noise, smell, heat, dust, etc.
10. Satisfaction with convenience of access for elderly and disabled people (eg, with mobility aids)
11. Simple average of all the questions relating to satisfaction.
12. The different user satisfaction parameters for each means of transport will be ascribed weightings for the computation of the weighted averages to prevent relatively minor issues from disproportionately affecting the overall averages. The weighting process will be developed later and will be fully explained in the RTSi methodology manual.
13. Facilities at roadside waiting places including seats and shelters.
14. Satisfaction with smaller modes of transport bringing passengers to and from the transport route.
15. Satisfaction with how the transport services on that road connect with transport modes beyond the road.
16. Simple average of all the questions relating to satisfaction combined for all transport modes.
17. The different user satisfaction parameters for each means of transport, as well as the various means of transport, will be ascribed weightings for the computation of the weighted averages to prevent relatively minor issues or transport types from disproportionately affecting the overall averages. The weighting process will be developed later and will be fully explained in the RTSi methodology manual.

## Operator perspectives

*State how many operators and types of operator were interviewed.*
*Refer to Table 3 which summarises some operational and cost-related statistics and to Table 6 which summarises some operators' perspectives for the different transport types.*
*For each main transport type, note how many operators were interviewed, present key statistics and discuss:*

- *Ownership and operator characteristics*
- *Operational features (capacity, frequencies, loading, passenger and freight mix, etc)*
- *Financial statistics (costs, income, profitability, constraints)*
- *Cooperation and competition issues, including roles of associations*
- *Incentives and disincentives (including regulatory issues and corruption)*
- *Key issues from the operator perspectives.*

*After separate discussion of each main means of transport, provide information on any minor means of transport (from the operators' perspective) and end with a discussion of any other operator issues and concerns arising from the survey and discussions, including interconnectivity and use of mobile phones.*

**Table 6. Summary of operator perspectives** [1]

| *Means of transport* | **Bus** | **Minibus** | **Rural taxi** | **Truck** | **Motorcycle** | **Other** |
|---|---|---|---|---|---|---|
| *Sample size (N)* | | | | | | |
| Road condition for operations | | | | | | |
| Adequacy of working capital | | | | | | |
| Facilities for formal credit | | | | | | |
| Facilities for informal credit | | | | | | |
| Adequacy of technical facilities | | | | | | |
| Regulatory disincentives | | | | | | |
| Regulatory incentives | | | | | | |
| Active associations | | | | | | |
| Security risks | | | | | | |
| **Un-weighted average** [2] | | | | | | |
| **Weighted average** [3] | | | | | | |

*The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied*

*Notes:*

1. Taken from Question Sheet O1 and questions: O1-8 to O1-16. Questions O1-1 to O1-7 from sheet O1 contribute to Tables 2 and 3. One question (Q. O1-17) is not included in this table or the other tables. This relates to market competition, including vehicle ownership and how (if at all) different vehicles operate together as fleets or franchises. This may be included subsequently, when it becomes clearer how this can be developed as an indicator. On the roads assessed so far, all vehicles have been owned separately and are in direct competition. For minibuses and some rural taxis, competition is reduced by queuing rotas organised by the associations.
2. Simple average of all the questions relating to the operators' perceptions of the suitability of the operating environment for their means of transport and/or their satisfaction with the issues.
3. The different operator perception parameters for each means of transport will be ascribed weightings for the computation of the weighted averages to prevent relatively minor issues from disproportionately affecting the overall averages. The weighting process will be developed later and will be fully explained in the RTSi methodology manual.

## Regulator perspectives

*State which people (positions rather than names) were consulted about the regulatory perspectives, and justify why their opinions were reasonably authoritative and relevant.*
*Refer to Table 7 which summarises some of the opinions relating to compliance.*
*Discuss the overall compliance relating to vehicles, operations and safety, and any differences between the modes of transport.*
*Discuss any implications from the regulators' perspectives.*

**Table 7. Summary of regulator perspectives [1]**

| *Means of transport* | **Bus** | **Minibus** | **Rural taxi** | **Truck** | **Motorcycle** | **Other** |
|---|---|---|---|---|---|---|
| Vehicle technical compliance | | | | | | |
| Vehicle fiscal compliance | | | | | | |
| Insurance compliance | | | | | | |
| Operational compliance | | | | | | |
| Safety compliance | | | | | | |
| Environmental compliance | | | | | | |
| Regulatory planning framework | | | | | | |
| Safety of the road | | | | | | |
| **Un-weighted average** [2] | | | | | | |
| *Number of people interviewed* | | | | | | |

*The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied.*

*Notes:*
1. Taken from data sheet R and all questions: R1-R8.
2. Simple average of all the questions relating to the regulators' perceptions of the level of compliance, the existence of planning frameworks for the transport modes and the overall safety of the road. It is possible that the different regulator perception parameters for each means of transport could be ascribed weightings to provide indicators that emphasise particular issues, but this does not seem necessary at this stage. Any weighting process would be developed later and would be fully explained in the RTSi methodology manual.

## Development perspectives

*State which people (positions rather than names) were consulted about the development perspectives, and justify why their opinions were reasonably authoritative and relevant.*
*Refer to Table 7 which summarises the various development issues discussed.*
*Briefly go through list and for each topic mention the key concerns and issues raised and the contribution of the different types of transport to the following development topics:*

- *Agricultural facilitation*
- *Enterprise/trade facilitation*
- *Women's empowerment*
- *Minority group empowerment*
- *Disabled people's empowerment*

- *Young people's empowerment*
- *Maternal health needs*
- *Medical service transport*
- *Education-related transport*
- *Mobile phone and ICT integration*
- *Cultural impact*
- *Environment impact*
- *HIV/Aids impact*

*End by highlighting key development issues benefiting from existing transport services and any ways in which the beneficial impact of rural transport services might be improved.*

| **Table 8. Summary of development perspectives** [1] | | | | | | |
|---|---|---|---|---|---|---|
| *Means of transport* | **Bus** | **Minibus** | **Rural taxi** | **Truck** | **Motorcycle** | **Other** |
| Agricultural facilitation | | | | | | |
| Enterprise/trade facilitation | | | | | | |
| Women's empowerment | | | | | | |
| Minority group empowerment | | | | | | |
| Disabled people's empowerment | | | | | | |
| Young people's empowerment | | | | | | |
| Maternal health needs | | | | | | |
| Medical service transport | | | | | | |
| Education-related transport | | | | | | |
| Mobile phone and ICT integration | | | | | | |
| **Un-weighted average** [2] | | | | | | |
| Cultural impact | | | | | | |
| Environment impact | | | | | | |
| HIV/Aids impact | | | | | | |
| **Un-weighted average** [3] | | | | | | |
| **Weighted average** [4] | | | | | | |
| **Overall weighted average** [5] | | | | | | |
| Integration with feeder transport | | | | | | |
| Integration with external transport | | | | | | |
| Road maintenance adequacy | | | | | | |
| **Final weighted average** [6] | | | | | | |
| *Number of people interviewed (people answer questions relevant to their experience)* | | | | | | |
| *The more stars the better, from the development perspective. For example, the contribution of each mode of transport to the achievement of development goals in that area of concern has been rated by the people interviewed as:* ★☆☆☆☆ *= Very poor.* ★★☆☆☆ *= Poor.* ★★★☆☆ *= Medium.* ★★★★☆ *= Good.* ★★★★★ *= Very good.* | | | | | | |

1. Taken from data sheet D and all questions: D1-D16.
2. Simple average of all the questions D1-D10 relating to the interviewees' perceptions of the contribution of each mode of transport to the achievement of development goals in ten fields of development concern.

3. Simple average of three questions D11-D13 relating to the interviewees' perceptions of the contribution of each mode of transport to three further fields of development concern areas. These are grouped separately as they tend to move in a 'perverse' sense as better transport sometimes leads to worse development impact relating to these issues.
4. It may be appropriate to ascribe different weightings to the various development indicators to emphasise particular development issues. Such weighting would be developed in discussion with interested stakeholders. Any weighting process would clear and transparent and would be fully explained in the RTSi methodology manual.
5. It may be appropriate to combine the indicators for the different transport mode into a single development index. This would require appropriate weightings to ensure that minor means of transport did not have a disproportionate influence on the overall indicator. Such weightings might be based on the relative 'market share' of each mode of transport, as estimated in Table 2. Any weighting process would clear and transparent and would be fully explained in the RTSi methodology manual.
6. Three development perspective questions relating to transport integration and the adequacy of road maintenance do not relate to individual transport modes. If they are to be included in an overall development indicator, this would be done after combining the different transport modes.

## Conclusions

*Succinctly state the major issues relating to rural transport services on the road.*
*Briefly summarise the most important findings in terms of passenger and freight volumes, transport costs, service frequencies and other key issues (such as safety) and put these in a local, national and/or international comparative context.*
*Briefly summarise the major concerns of the:*

- *Users (of different types)*
- *Operators*
- *Regulators*
- *Development authorities*

*Suggest possible actions could be taken by the different stakeholders that would improve the transport services along the road (and improve the indicators of these).*

## 9 RTSi Report of Tala- Kilimambogo Road, Matungulu District, Kenya

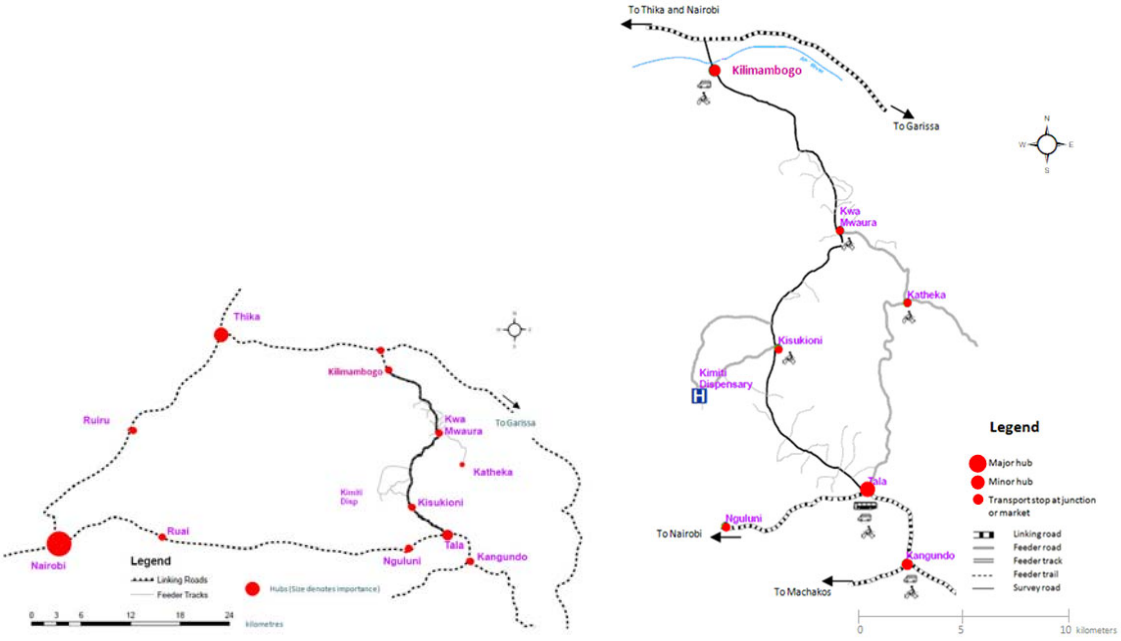
# Rural Transport Service Indicators Report

**Report of Tala–Kilimambogo Road, Machakos County, Kenya**

*Prepared by: Kenneth Odero, Musyimi Mbathi, Peter Njenga and Paul Starkey*

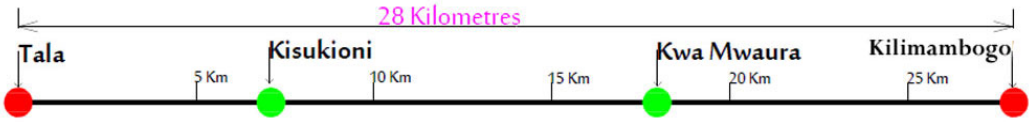
*Date: 18 September 2012*

## Part 1: Summary Tables

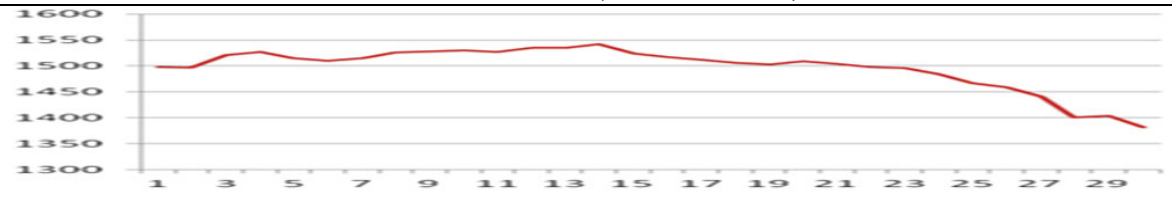
| **Table 1. Road information** | | | |
|---|---|---|---|
| *Road name:*Tala-Kilimambogo (Ol Donyo Sabuk) D521-01 | | | |
| *District, Region and Country:*Matungulu District, Machakos County, Kenya | | | |
| *Road type:* Class D (secondary road linking locally important centres) | *Responsible authority:*Kenya Rural Roads Authority | | |
| *Road start location:*Tala | *GIS:* 37 0312964 - 9860036 | | |
| *Road finish location:* Kilimambogo | *GIS:*37 0311425 - 9872841 | | |
| *Road length:* 29 km | *Catchment population*[1] *wip* | | |
| ***Road quality and condition from different perspectives*** | | | |
| *Road authority*[2] | *Operators* [3] | *Development*[4] | *Safety* [5] |
| ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ | ★★★☆☆ |
| ***Summary of road geography and socio-economic situation*** | | | |
| The Tala-Kilimambogo Road traverses gently undulating landscape characterised by several ridges and hills, rising towards the north and the highest peak (also known as Kilimambogo or Ol Donyo Sabuk) is 2144 m above sea level. The geology is primarily volcanic and the soils are mainly sandy and well-drained. The area is characterised by mixed cropping on small-scale farm holdings. Maize, with legumes are the most common food crops, along with fruit crops including mangoes, papaya and avocado. There are some coffee plantations and an agro-industrial pineapple estate. There is also livestock rearing in the area. The whole area is being affected by rapid peri-urban growth around Nairobi and land acquisition, property development and travel opportunities into Nairobi and Thika are beginning to influence the local economy. | | | |
| ***Maps of road, with context and hub and spoke connections*** | | | |
|  | | | |
| ***Description of hub and spoke patterns*** | | | |
| Tala is a small and growing town with a transport terminal hub with bus routes to the city of Nairobi and several minibus and rural taxi routes including to Kilimambogo, Kangundo and Machakos. Kilimambogo is a much smaller community with a market and small transport terminal, with transport services routes to Tala and the industrial town of Thika. Kisukioni and Kwa Mwaura are smaller communities along the route that are transport stops for the minibuses and small hubs for motorcycle taxis. | | | |

| ***Intermodal connectivity*** *(one to five stars, the more stars the better)* | | | | |
|---|---|---|---|---|
| ***'Feeding'***[7] | *User satisfaction*[8] | ★★★☆☆ | *Development impact*[9] | ★★★☆☆ |
| ***'Linking'***[10] | *User satisfaction*[11] | ★★★★☆ | *Development impact*[12] | ★★★★☆ |

***Schematic map of 'straightened' road with features***




***GPS elevation track*** *(same horizontal scale)*




***GPS speed track***[6] *(same horizontal scale)*

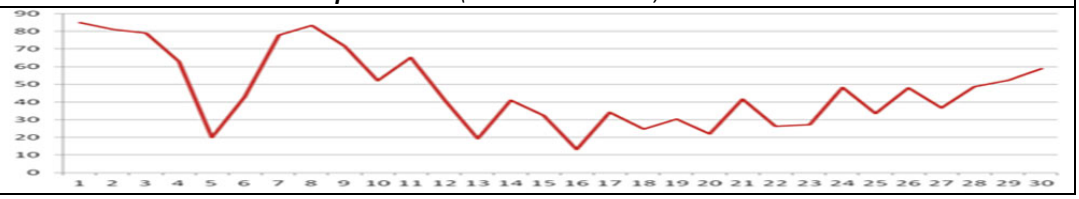



**Table 2. Traffic and transport along road**

| **Daily traffic flows**[1] | | | | | **Fleet**[2] | **Passengers and small freight**[3] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Normal*[4] | *Busy*[5] | *Disrupted*[6] | *Impass-able*[7] | *No of RTS vehicles operating on road*[8] | ***Trip transport*** *normal day per vehicle*[9] | | ***Daily transport*** *normal day all vehicles*[10] | | ***Annual transport*** *adjusted for traffic fluctuations*[11] | | ***Change*** *in past year*[12] |
| | | | | | | *Pax (no)* [14] | *Frt (kg)* [15] | *Pax (no)* [16] | *Frt (kg)* [17] | *Pax (000)* [18] | *Frt (t)* [19] | *- - 0 ++* |
| Bus (large) | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| Midi-bus | 1 | 2 | 1 | 0 | 1 | wip | wip | wip | wip | wip | wip | wip |
| Minibus | 40 | 60 | 18 | 0 | 18 | 18 | 400 | 995 | 16000 | 37 | 5600 | 0 |
| Rural taxi | 30 | 40 | 15 | 0 | 8 | wip | wip | wip | wip | wip | wip | wip |
| Passenger truck | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| Large truck | 1 | 2 | 0 | 00 | | | | | | | | |
| Small truck | 7 | 15 | 4 | 0 | | | | | | | | |
| Govt/ private/NGO | 10 | 20 | 5 | 0 | | | | | | | | |
| Motor tricycle | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| Motorcycle | 170 | 250 | 80 | 80 | 82 | 2 | 50 | 552 | 12,000 | 21 | 4200 | + |
| Bicycle | 20 | 40 | 15 | 15 | | | | | | | | |
| Riding/pack animal | 0 | 0 | 0 | 0 | | | | | | | | |
| Animal cart | wip | wip | wip | wip | wip | | | | | | | |
| Pedestrians >5km | wip | wip | wip | wip | | | | | | | | |
| **Totals** | | | | | | | | | | | | |

*wip: work in progress (data is being checked or is not yet available)*

| Table 3. Key operational statistics for major transport modes | | |
|---|---|---|
| |  |  |
| | *Minibus* | *Motorcycle* |
| Contribution to annual passenger transport (% of market) | wip | wip |
| Contribution to annual small freight transport (% of market) | wip | wip |
| Fare per km in USDc[4] | 6 | 15 |
| Journey time (average speed on normal days) in km/hr [5] | 21 | 21 |
| Transport frequency (normal days) [6] | 35 | 14 |
| Disruption factor (%)[7] | 76 | 64 |
| Men as % of passengers/day [8] | 43 | 47 |
| Women as % of passengers/day [8] | 48 | 47 |
| Children as % of passengers/day [8] | 9 | 6 |
| Cost of 50 kg accompanied freight in USD per tonne-km [9] | wip | wip |
| Cost of 200 kg consigned freight in USD per tonne-km [10] | wip | wip |
| Safety: Recalled no. of accidentsper 100,000 journeys [11] | 173 | 550 |
| Security: Recalled no. of incidents per 100,000 journeys [12] | 25 | 80 |
| Operating distance per year in km[13] | wip | wip |
| Vehicle operating costs (VOC)/year (USD) [14] | wip | wip |
| VOC per passenger-km (USDc)[15] | wip | wip |
| Operating income per passenger-km (USDc)[16] | wip | wip |
| Percentage operating income due to freight[17] | wip | wip |
| Regulation compliance (overall assessment) [18] | ★★☆☆☆ | ★★☆☆☆ |
| Development impact (overall assessment)[19] | ★★★☆☆ | ★★★★☆ |
| *wip: work in progress (data is being checked or is not yet available)* | | |

| Table 4. User satisfaction with main RTS modes (disaggregated for gender) | | | | | | |
|---|---|---|---|---|---|---|
| | **Minibus** | | **Motorcycle** | | **Rural Taxi** | |
| | *Men* | *Women* | *Men* | *Women* | *Men* | *Women* |
| *Sample size (N)* | *17* | *13* | *15* | *8* | *2* | *0* |
| Fares | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | |
| Journey time | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | |
| Operational features [2] | ★★★☆☆ | ★★★☆☆ | ★★★★☆ | ★★★☆☆ | ★★★★☆ | |
| Freight [3] | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | |
| Safety and security [4] | ★★★★☆ | ★★★★☆ | ★★★☆☆ | ★★★☆☆ | ★★★★★ | |
| Comfort [5] | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★★☆ | |
| Universal access [6] | ★★☆☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | |
| **Overall satisfaction** [7] | **3.1** | **3.1** | **3.2** | **2.8** | **3.1** | |
| *The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied.* | | | | | | |

# Part 2: Report

## Overview of road situation and issues

The Tala–Kilimambogo (also known as Ol Donyo Sabuk) Road is classified under the Kenyan system of road classification as Class D (ie, it is a secondary Road linking locally important centres). It links Tala (Geo-Code 37 0312964–9860036), a vibrant rural hub where many commercial and social services are available, to Kilimambogo to the north (Geo-Code 37 0311425 - 9872841), a small but busy market hub for a wide range of agricultural commodities. The road traverses gently undulating landscape characterised by several ridges and hills, rising towards the east to the highest hill (Kilimambogo or Ol Donyo Sabuk peak) which is 2144 m above sea level. From Tala, after four kilometres, the road passes through Kisukioni, an administrative centre and headquarters of Matungulu District. Further north it passes through Kwa Mwaura, a trading and former mission post situated about 21 km from Tala and 8 km from Kilimambogo. The road is therefore an important connector between the busy Kangundo–Nairobi Road and the Thika–Garissa highway (Figure 1).

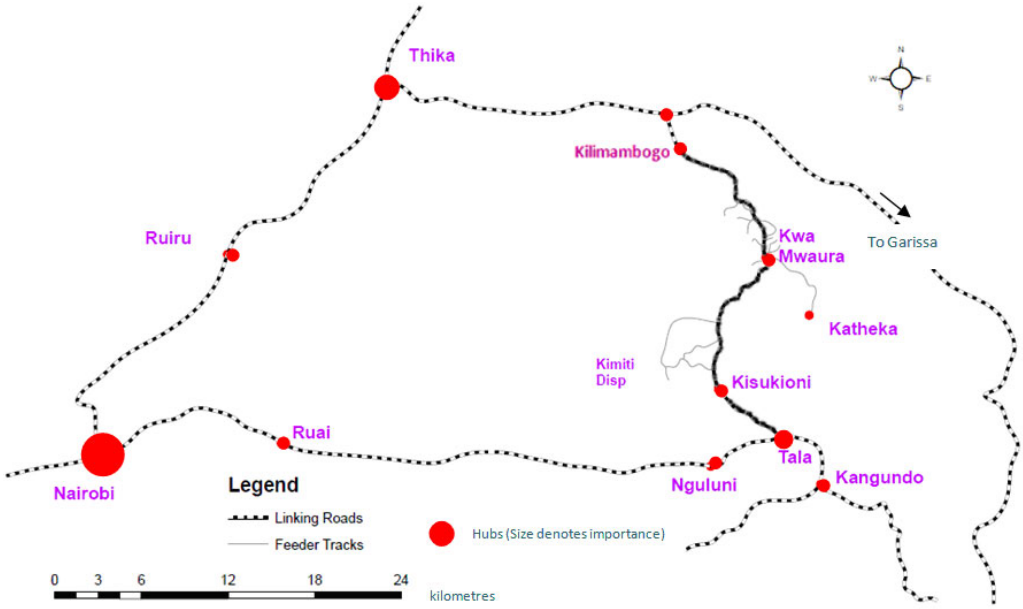



**Figure 1: The context of the surveyed road**

The grading of the road in 2010, a year after Matungulu was upgraded to a District (it had been a Division of Kangundo District), has generally improved its condition and attracted increased transport services. In general, RTS operators said the road is motorable with difficulties, which would suggest that more regular and better maintenance of the road could improve its condition. However, the overall assessment of the rural transport services (RTS) from the perspective of development personnel was positive. Currently, the road and the rural transport services (primarily motorcycles and minibuses) are having positive development impacts in the area. This has resulted, for example, in many people buying land for property development as new immigrants start to settle in this previously neglected region on the peri-urban fringe of Nairobi. Performance of schools in the area has also improved (based on exam performance charts) which was probably a result of improved access and mobility conditions for both teachers and pupils. There is also evidence that agriculture in the area is undergoing a transformation from food deficit zone to self-sustenance. Maize, with legumes (green beans and pigeon peas) are the most common food crops, along with fruit crops including mangoes, papaya, avocado and some coffee plantations. There is also livestock rearing in the area and a large agro-industrial pineapple plantation.

The area in which the road is located is rapidly being absorbed into the peri-urban fringe of Nairobi. Increased human settlements and socio-economic activities are exerting a growing demand for

transport services. With this in mind, the Tala–Kilimambogo road requires regular and better maintenance in order to service the growing demand for mobility. Although the road is considered 'fairly safe' from the regulators' perspective, there is certainly need to improve the general road infrastructure condition and signage. The average speed for vehicles is 40 km/h. However, the first 5 km from Tala towards Kilimambogo is in good condition and vehicles achieve speeds above 40 km/h (80 km/h while recording the speed track). The local authority has maintained this section because it links with the District Headquarters at Kisukioni. The area between Kisukioni and Kwa Mwaura centres is characterised by rocky outcrops and gullies on the road. These features make it difficult for vehicles to attain speeds above 40 km/hr (see GPS speed track).

## Overview transport services situation and issues

The main means of transport on the Tala–Kilimambogo road are minibuses and motorcycles, with about 82 motorcycles and 18 minibuses operating on normal days (more on busy days and fewer on disrupted days). There are also rural taxis that generally operate on particular sections of the road as they link Tala and Kilimambogo with settlements off the road. There is also a daily medium distance midi-bus that passes along the road. Minibuses transport 358,000 people annually compared with the 213,000 passengers transported by motorcycles annually (see Figure 2). While fewer in number, minibuses generally carry 18 passengers per trip compared to two for motorcycles. Despite the big difference in capacity, motorcycles make many shorter distance trips per day compared to other modes. This, together with their fleet size, explains their current share (37%) of the market (excluding rural taxis and the midi-bus). This is likely to change with time as the number of motorcycles as well as the number of passengers transported by this mode is fast growing.

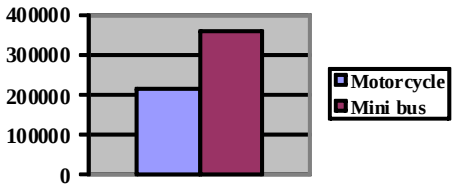



**Figure 2: Annual passenger volumes for motorcycles and minibuses**

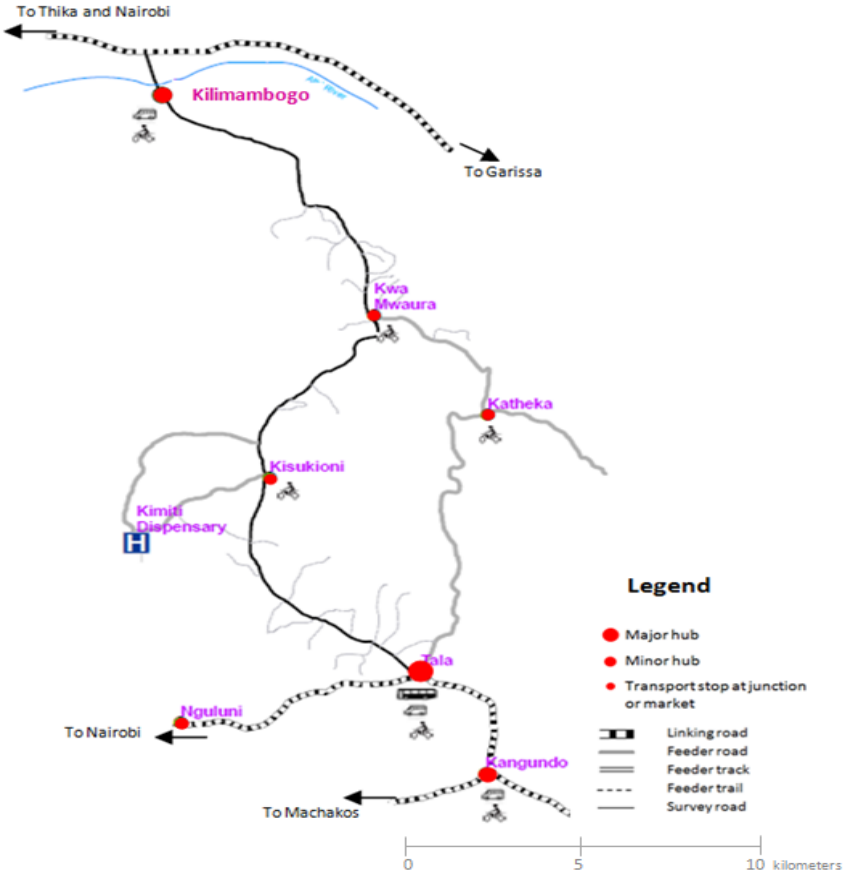



**Figure 3: Road showing hubs, linking and feeding roads**

## User perspectives

A total of 31 users of RTS along the Tala–Kilimambogo Road were interviewed. Of these 18 (58%) were male and 13 (42%) were female. Different types of users were interviewed as shown below in Figure 4. The largest group was in the employment category while people travelling for reasons relating to finance was the least. The youngest respondent was 7 years and the oldest was 70 years.

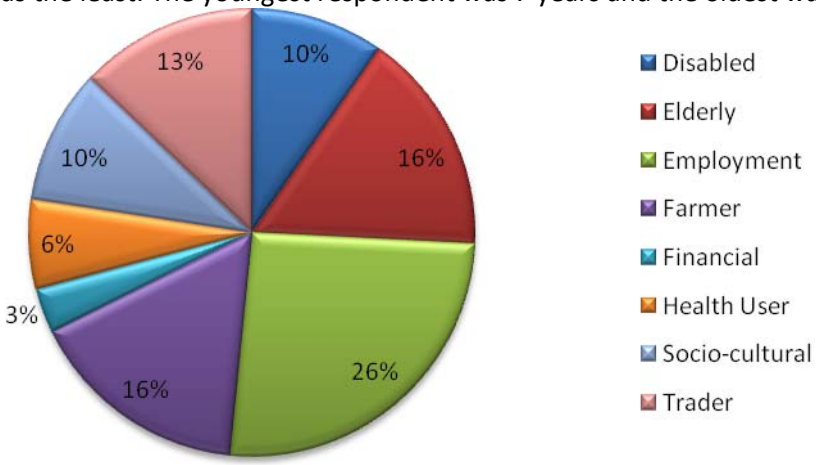



**Figure 4: The type of users interviewed**

## Summary of user satisfaction with motorcycle transport services

The survey interviewed both women and men on their satisfaction with the different means of transport. For the motorcycle transport service, 15 (66%) men and 8 (34%) women were interviewed. Figure 5 shows gender disaggregated levels of satisfaction with passenger fares, journey times, service frequency, and service predictability. Higher scores (away from the centre) represent greater satisfaction. Both genders were satisfied with service frequency and medium satisfied with journey times. Men tended to be more satisfied with service predictability of motorcycles compared to women. Women also tended to be less satisfied with passenger fares compared to men.

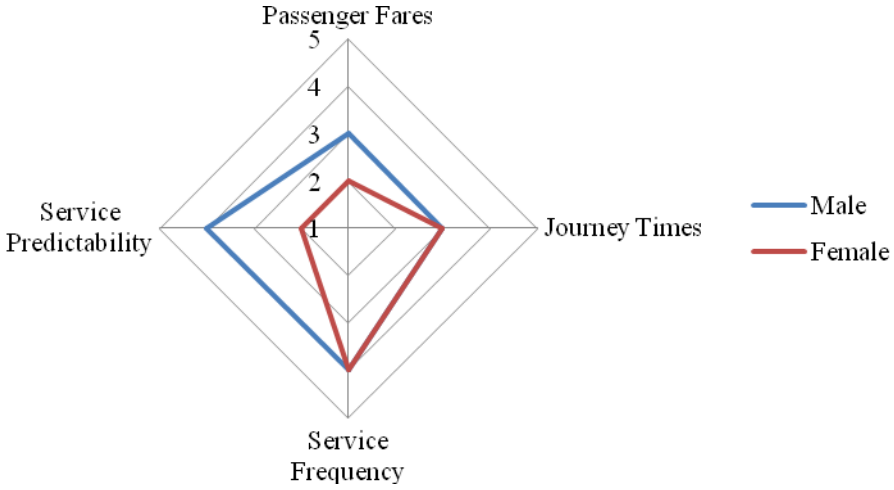



**Figure 5: User satisfaction with motorcycle fares, journey times, frequency and predictability**

In terms of motorcycle freight characteristics, both men and women were satisfied with small freight availability, small freight charges, medium freight availability and medium freight handling (Figure 6). Men were more satisfied with courier services and the charges for consigned freight.

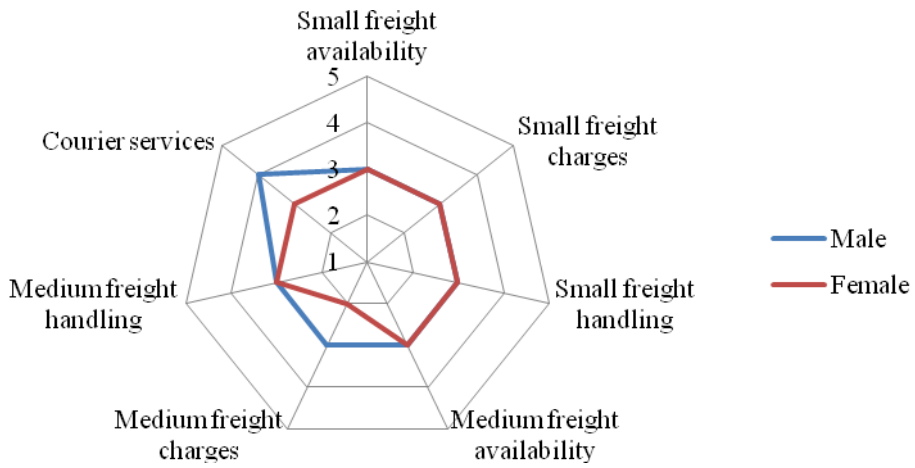



**Figure 6: User satisfaction with motorcycle freight services**

Both women and men were equally satisfied with the level of comfort in terms of motorcycle seats but only medium satisfied with the level of comfort in terms of baggage around the passengers. Both men and women thought access was poor for vulnerable people (elderly or physically challenged people, for example those using mobility aids). Similarly the level of comfort in terms of the environment (noise levels/dust/heat) was considered poor for both male and female passengers on motorcycles on the road (Figure 7).

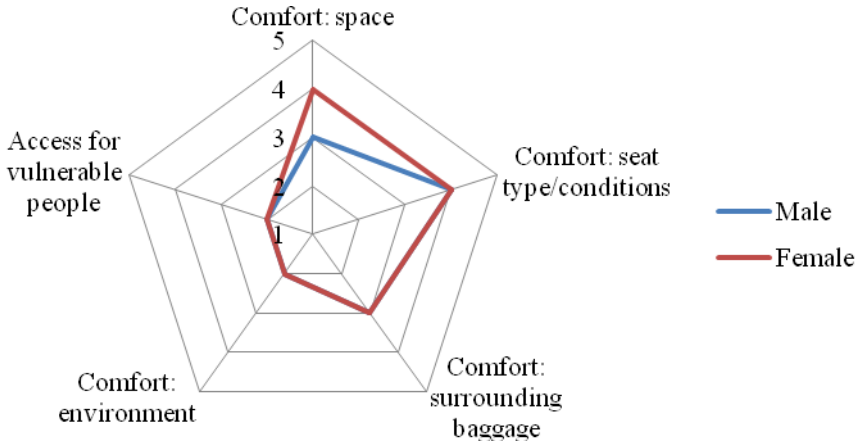



**Figure 7: Level of user satisfaction with motorcycle comfort and access for vulnerable people**

Both women and men expressed satisfaction with passenger capacity. Motorcycles often carry two passengers per trip although there are many situations when only one passenger is available. On road safety and security, both men and women have medium satisfaction with the level of safety of motorcycles on this road. At the same time they were both medium satisfied with the level of security of this mode of transport on the Tala–Kilimambogo Road.

**Summary of user satisfaction with minibuses**

A total of 30 interviewees responded to questions on minibuses, 17 (57%) men and 13 (43%) women. Both genders expressed similar level of satisfaction (medium satisfaction) with passenger fares, journey times, service frequency and predictability of minibus transport services along the Tala–Kilimambogo Road.

With regard to small and medium freight services offered by mini buses, there was a gender difference in the level of satisfaction with respect to the availability of small freight services (20-50 kg of accompanied goods). In general women said they were satisfied with the available small freight service while their male counterparts said they were only medium satisfied with the same services. The same responses were obtained with respect to the levels of satisfaction with handling

of small freight services. Another difference related to the availability of medium freight services (200kg) where men said they were medium satisfied while women said they were unsatisfied. These results are shown in Figure 8.

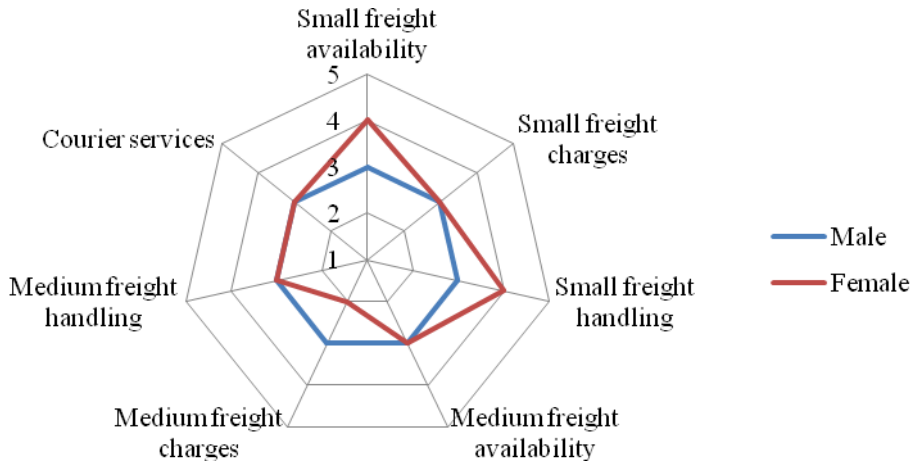



**Figure 8: User satisfaction with minibus freight services**

Gender disaggregated levels of satisfaction with respect to comfort of services offered by minibuses as well as access for vulnerable people are depicted in Figure 9. In general, both women and men have similar levels of satisfaction on all aspects of comfort discussed, including seat space, seat type/conditions, baggage around passenger and noise levels/dust/heat in the minibus. However, as seen in Figure 9, men were less satisfied with the present convenience of access for the elderly and physically challenged people. One possible explanation for this apparent difference is that the three people with disabilities interviewed were all males.

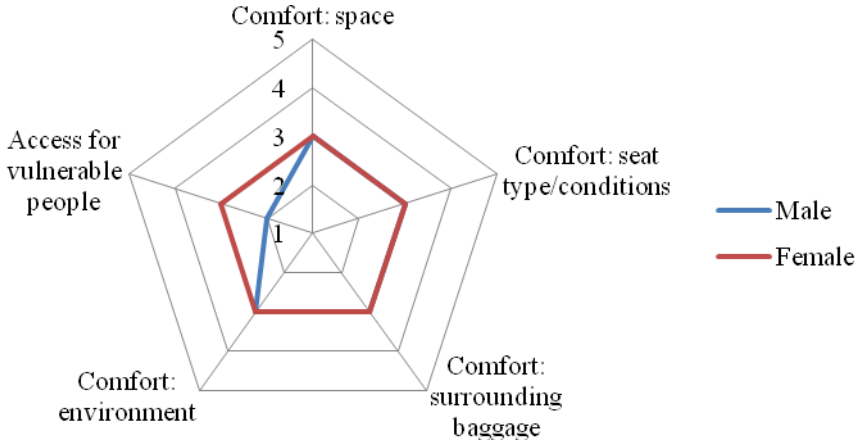



**Figure 9: User satisfaction with minibus comfort and access for vulnerable people**

Men and women expressed the same levels of satisfaction with regard safety and security issues and passenger capacity for minibuses. However, the level of satisfaction was lower in relation to passenger capacity, which may be associated with overloading issues.

**Overall assessment of all transport modes**

Both women and men said they were very unsatisfied with roadside waiting facilities, which in most cases do not exist. However, both men and women are moderately satisfied with inter-modal integration of services along the road and satisfied with the inter-modal integration with services beyond the road. This suggests that rural transport services in the area facilitate the movement of people and goods to and from the road as well as facilitating timely links to other types of transport on the Thika-Garissa road and the southern roads to Nairobi. All the satisfaction levels relating to the transport services are summarised in Table. 5

| Table 5. Summary of user satisfaction disaggregated for gender | | | | | | |
|---|---|---|---|---|---|---|
| *Means of transport* | **Minibus** | | **Motorcycle** | | **Rural taxi** | |
| *Gender of respondent* | **M** | **F** | **M** | **F** | **M** | **F** |
| *Sample size (N)* | *17* | *13* | *15* | *8* | *2* | *0* |
| Passenger fares | 3 | 3 | 3 | 2 | 2 | |
| Journey times | 3 | 3 | 3 | 3 | 2 | |
| Service frequency | 3 | 3 | 4 | 4 | 4 | |
| Service predictability | 3 | 3 | 4 | 2 | 4 | |
| Passenger capacity | 3 | 3 | 4 | 4 | 4 | |
| Small freight availability | 3 | 4 | 3 | 3 | 3 | |
| Small freight charges | 3 | 3 | 3 | 3 | 4 | |
| Small freight handling | 3 | 4 | 3 | 3 | 4 | |
| Medium freight availability | 3 | 3 | 3 | 3 | 2 | |
| Medium freight charges | 3 | 3 | 3 | 2 | 2 | |
| Medium freight handling | 3 | 3 | 3 | 3 | 2 | |
| Courier services | 3 | 3 | 4 | 3 | 3 | |
| Road safety | 4 | 4 | 3 | 3 | 4 | |
| Security | 4 | 4 | 3 | 3 | 4 | |
| Comfort: space | 3 | 3 | 3 | 4 | 4 | |
| Comfort: seat type/conditions | 3 | 3 | 4 | 4 | 4 | |
| Comfort: surrounding baggage | 3 | 3 | 3 | 3 | 3 | |
| Comfort: environment | 3 | 3 | 2 | 2 | 4 | |
| Access for vulnerable people | 2 | 3 | 2 | 2 | 3 | |
| **Overall un-weighted** | **3.1** | **3.2** | **3.2** | **2.8** | **3.1** | |
| **Overall weighted** | | | | | | |

| Satisfaction for all transport types | | |
|---|---|---|
| *Gender of respondent* | **M** | **F** |
| Facilities at roadside stops | 1 | 1 |
| Feeding intermodal connectivity | 3 | 3 |
| Linking intermodal connectivity | 4 | 4 |
| **Overall un-weighted** | **2.9** | **2.8** |
| **Overall weighted** | | |
| The higher the score the better. 1 = Very dissatisfied. 2 = Dissatisfied. 3 = Medium. 4 = Satisfied. 5 = Very satisfied | | |

## Operator perspectives

A total of six operators were interviewed, three of each for the two main transport modes (minibuses and motorcycles). All three of the minibus operators interviewed were hired drivers. The three motorcycle operators all hired their motorcycles from fleet owners who charged KSH 300/day (approximately USD 3.60/day). Fares per passenger-km are higher for motorcycles at around 15 USDc (KSH 13) compared to USDc 6 for minibuses (KSH 5). Accompanied freight on motorcycles is twice as expensive as in minibuses.

Both motorcycles and mini-bus operators expressed a medium level of satisfaction on the road condition, they both felt the road condition restricted their speed (to around 21 km/h). Both types of operator had similar medium scores on the adequacy of working capital and financial services. Both types of operator expressed satisfaction with the availability of back-up services (spare parts and repair services) as well as availability of facilities offering formal credit. The responses are summarised in Table 6.

| Table 6. Summary of operator perspectives | | |
|---|---|---|
| *Means of transport* | **Minibus** | **Motorcycle** |
| *Sample size (N)* | | |
| Road condition for operations | ★★★☆☆ | ★★★☆☆ |
| Adequacy of working capital | ★★★☆☆ | ★★★☆☆ |
| Facilities for formal credit | ★★★★☆ | ★★★★☆ |
| Facilities for informal credit | ★★★☆☆ | ★★★☆☆ |
| Adequacy of technical facilities | ★★★★☆ | ★★★★☆ |
| Regulatory disincentives | ★★★☆☆ | ★★★☆☆ |
| Regulatory incentives | ★★★☆☆ | ★★☆☆☆ |
| Active associations | ★★★☆☆ | ★★☆☆☆ |
| Security risks | ★★★★☆ | ★★★☆☆ |
| **Un-weighted average** [2] | **3.3** | **3.0** |
| **Weighted average**[3] | | |
| *The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied.* | | |

## Regulator perspectives

Two people were interviewed to provide the regulator's perspective. One was an enforcement officer with the local council, responsible for management and revenue collection at the Tala terminus. Another was a police officer who did not want to be quoted on record because he was not authorised to comment officially. The enforcement officer at the local council restricted his perspectives to issues of revenue collection and order in the terminus. He confirmed compliance of minibuses to daily terminal charges, parking zones and time-tables. They were well self-regulated through their association that assisted in enforcing time-tabling and order in the terminus. The police confirmed that generally, there was a medium level of compliance by minibuses on technical and insurance issues, while safety and environment issues scored poorly.

There were however difficulties with motorcycles because they used informal termini and, although they were ubiquitous, there was no clear regulatory policy on the management of their operations. The overall compliance of motorcycles was low. The police conceded that there is a poor regulatory and enforcement framework for motorcycles as the laws have lagged behind the growth of the industry. Also, for this particular road, there are no well-established motorcycle associations. Emerging associations are more focussed on social welfare rather than self regulation and operational issues. The policeman noted that in general, full compliance along rural roads is hardly practicable given the fact that standards established for urban and inter-urban transport are not suited for rural services. Furthermore, the capacity for enforcement is very low as the presence of police officers is very thin in rural areas. The perspectives are summarised in Table 7.

| **Table 7. Summary of regulator perspectives** | | |
|---|---|---|
| *Means of transport* | **Minibus** | **Motorcycle** |
| Vehicle technical compliance | ★★★☆☆ | ★☆☆☆☆ |
| Vehicle fiscal compliance | ★★★☆☆ | ★☆☆☆☆ |
| Insurance compliance | ★★★☆☆ | ★☆☆☆☆ |
| Operational compliance | ★★★★☆ | ★★★★☆ |
| Safety compliance | ★☆☆☆☆ | ★☆☆☆☆ |
| Environmental compliance | ★☆☆☆☆ | ★☆☆☆☆ |
| Regulatory planning framework | ★☆☆☆☆ | ★☆☆☆☆ |
| Safety of the road | ★★★☆☆ | ★★★☆☆ |
| **Un-weighted average** | **2.4** | **1.6** |
| *The more stars the better. ★☆☆☆☆ = Very poor. ★★☆☆☆ = Poor. ★★★☆☆ = Medium. ★★★★☆ = Good. ★★★★★ = Very good.* | | |

| **Table 8. Summary of development perspectives** | | | | |
|---|---|---|---|---|
| *Means of transport* | **Minibus** | **Motorcycle** | **Rural taxi** | **Truck** |
| Agricultural facilitation | ★★★★☆ | ★★★★☆ | ★★☆☆☆ | ★★☆☆☆ |
| Enterprise/trade facilitation | ★★★☆☆ | ★★★★☆ | ★★☆☆☆ | ★★☆☆☆ |
| Women's empowerment | ★★★★☆ | ★★★★☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Disabled people's empowerment | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ |
| Young people's empowerment | ★★★★☆ | ★★★★★ | ★★★☆☆ | ★★★★☆ |
| Maternal health needs | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★☆☆☆☆ |
| Medical service transport | ★★★☆☆ | ★★★★☆ | ★★★★☆ | ★☆☆☆☆ |
| Education-related transport | ★★★★☆ | ★★★★☆ | ★★★☆☆ | ★☆☆☆☆ |
| Mobile phone and ICT integration | ★★☆☆☆ | ★★★★★ | ★★★★★ | ★★☆☆☆ |
| **Un-weighted average** [2] | **3.4** | **4.1** | **3.0** | **1.8** |
| Cultural impact | ★★★☆☆ | ★★★☆☆ | ★★★★☆ | ★★★☆☆ |
| Environment impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ |
| HIV/Aids impact | ★★☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ |
| **Un-weighted average** [3] | **2.6** | **2.4** | **2.5** | **1.8** |
| **Overall weighted average**[5] | | | | |
| *Number of interviews (people answer questions relevant to their experience)* | | | | *6* |
| *The more stars the better. ★☆☆☆☆ = Very poor. ★★☆☆☆ = Poor. ★★★☆☆ = Medium. ★★★★☆ = Good. ★★★★★ = Very good.* | | | | |

## Development perspectives

Six people were interviewed to gain development perspectives in the education, health, agricultural sectors and trading sectors. These sectors are crucial in rural development. Since agricultural extension services do not exist anymore, transport services in the sector are mostly seen from the point of view of buying and selling of agricultural inputs and produce. Two decades ago, extension services demanded some level of rural mobility, but this was provided by government owned motorcycles and bicycles. There is a good level of satisfaction with the role of minibuses and motorcycles in facilitating agricultural inputs and marketing. They are an important part of the distribution of food from key hubs in Tala and Kilimambogo to the smaller hubs along the road.

Although they are uncomfortable, motorcycles are particularly useful for those seeking medical attention. The hospital in this area is located about 4 km from the road and is not served by minibuses. Apart from walking, motorcycles are the main transport mode to reach the hospital. The development perspectives are summarised in Table 8.

## Conclusions

The Tala–Kilimambogo road survey has helped profile some of the emerging characteristics of rural transport services in Kenya. Transport services along this road consist mainly of minibuses and motorcycles. Motorcycles offer flexible short distance services of around 7 km per journey. Minibuses offer medium distance services between Tala–Kilimambogo Road and the places along the roadside. The area is fast becoming part of the expanding Nairobi-Thika peri-urban area. The population is increasing and small-scale business is beginning to thrive. Demand for housing, schools and health facilities is likely to increase. A vibrant construction sector is likely to develop soon. Demand for improved transport with better maintained roads, roadside waiting facilities and an efficient transport services should be an important development priority. The government tends to view transport service policies from the point of view of regulations. It is important to take a broader planning approach that supports and incentivises better transport services. Key elements of this would include such issues as inter-modal integration, use of ICTs to monitor and manage transport services and paying attention to the needs of different transport users, the disabled, children and women.

The 18 minibuses operating on this road provide a regular and predictable service, leaving the termini at 20 minute intervals. The minibus service seems to operate at good capacity. The minibuses operating on this road are in relatively good condition, and would benefit from better road infrastructure.

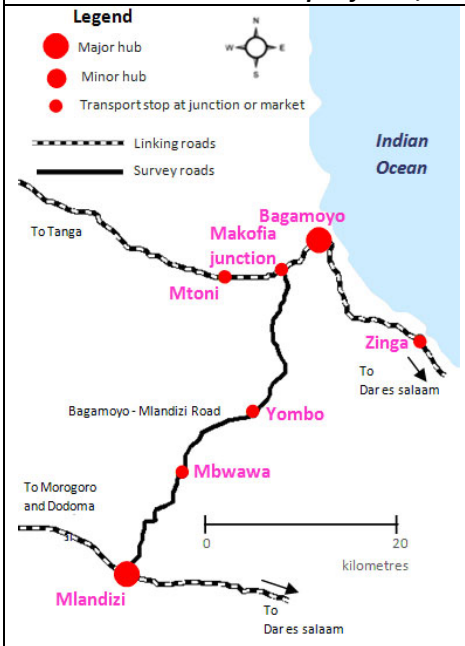
The recently started and highly responsive motorcycle transport services are of huge importance for both men and women in rural areas. An important aspect of this is their ability to provide linking transport services from the homesteads to the roadside and also from one hub to another. Mobile telephones have become an important tool for enabling users to get motorcycle transport service when needed. Both men and women report a good level of satisfaction with motorcycle services, though men express higher levels of satisfaction then women. The higher fares per passenger-km charged by motorcycles are noted as a concern by the users, though they acknowledge that convenience of use and responsiveness compensates for the higher fares. Operation of motorcycle taxis has also become an important source of employment for rural youth. There are about 80 motorcycles operating on the survey road. Apart from direct employment to the operators, they are also an important part of rural enterprises through leasing services and repair and maintenance services.

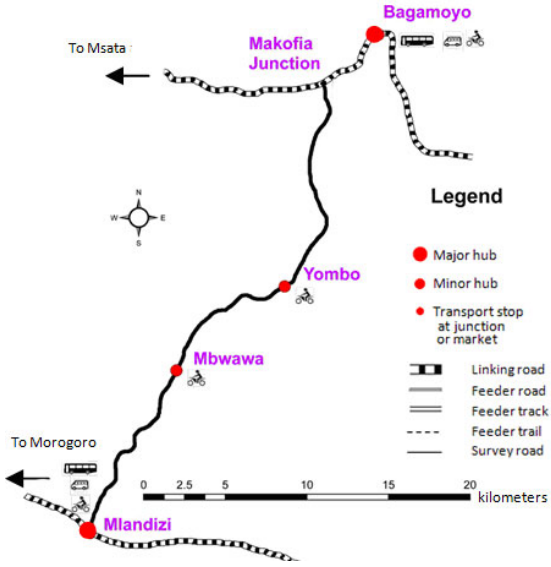
## 10 RTSi Report of Bagamoyo–Mlandizi Road, Coast Region, Tanzania

*Prepared by: Shedrack Willilo. Date: 19 September 2012*

# Part 1: Summary tables

| Table 1. Road information | | | |
|---|---|---|---|
| *Road name: Bagamoyo–Mlandizi* | | | |
| *District, Region and Country: Bagamoyo, Coastal, Tanzania* | | | |
| *Road type: Graded gravel road* | *Responsible authority: TANROADS/PMO-RALG* | | |
| *Road start location: Bagamoyo town* | *GIS:* | | |
| *Road finish location: Mlandizi town* | *GIS:* | | |
| *Road length:40 km* | *Catchment population [1]* | | |
| ***Road quality and condition from different perspectives*** | | | |
| *Road authority [2]* | *Operators [3]* | *Development [4]* | *Safety [5]* |
| *wip* | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| ***Summary of road geography and socio-economic situation*** | | | |
| The first 5.5 km of the Bagamoyo-Mlandizi are part of the Bagamoyo-Msata trunk road. At Makofia junction, a good graded gravel road provides a link to Mlandizi, a transport hub on the main TanZam highway that links Dar-es-Salaam with Morogoro. The road transverses through lightly rolling terrain and the main economic activity of the area is smallholder agriculture. | | | |
| ***Maps of road, with context and hub and spoke connections*** | | | |



***Schematic map of 'straightened' road with features***


***GPS elevation track*** *(metres above sea level, same horizontal scale)*

***GPS speed track*** [6] *(same horizontal scale)*

***Description of hub and spoke patterns***

Bagamoyo is a district market town and transport hub. Mlandizi is a transport hub on the main highway. Minibuses and midi-buses connect these hubs, and provide transport services for communities along the road. Motorcycle taxis also provide transport services, with hubs at 'bus stops' at Yombo and Mbwawa.

***Intermodal connectivity*** *(one to five stars, the more stars the better)*

| | | | | |
|---|---|---|---|---|
| ***'Feeding'*** [7] | *User satisfaction* [8] | ★★★★☆ | *Development impact* [9] | ★★★☆☆ |
| ***'Lnking'*** [10] | *User satisfaction* [11] | ★★★★☆ | *Development impact* [12] | ★★★☆☆ |

**Table 2. Traffic and transport along road** *(work in progress)*

| **Daily traffic flows** | | | | | **Fleet** | **Passengers and small freight** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Normal* | *Busy* | *Disrupted* | *Impassable* | *No of vehicles operating on road* | ***Trip transport*** *normal day per vehicle* | | ***Daily transport*** *normal day all vehicles* | | ***Annual transport*** *adjusted for traffic fluctuations* | | ***Change*** *in past year* |
| | | | | | | *Pax (no)* | *Frt (kg)* | *Pax (no)* | *Frt (kg)* | *Pax (no) 000* | *Frt (t)* | *- - 0 ++* |
| Midi-bus | 11 | 15 | 11 | 0 | 8 | 35 | 200 | 209 | 2200 | 220 | 803 | 0 |
| Minibus | 15 | 20 | 15 | 0 | 10 | 25 | 185 | 275 | 2775 | 318 | 1013 | + |
| Small truck | 8 | 8 | 4 | 0 | 8 | 3 | wip | 23 | wip | 0 | wip | + |
| Motorcycle | 93 | 115 | 35 | 15 | 15 | 2 | 25 | 157 | 2325 | 108 | 849 | + |
| **Total** | **127** | **158** | **65** | **15** | **41** | **65** | **410** | **664** | **7300** | **646** | **2665** | |

*1. Annual transport is based on total passengers and freight carried on trips, not the overall passenger-km or tonne-km*
*wip: work in progress (data is being checked or is not yet available)*

| **Table 3. Rural transport services key operational statistics for major transport modes** |  |  |  |
|---|---|---|---|
| | **Motorcycle** | **Minibus** | **Midi-bus** |
| Contribution to annual passenger transport (% of market) | 11 | 89 | 0 |
| Contribution to annual small freight transport (% of market) | 60 | 25 | 15 |
| Fare per km in USDc | 21 | 3 | 3 |
| Journey time (average speed on normal days) in km/hr | 22 | 13 | 19 |
| Transport frequency (normal days) | 8 | 8 | 5 |
| Number of days a year with 'normal service' | 283 | 283 | 283 |
| Number of busy days a year | 52 | 52 | 52 |
| Number of days a year with disrupted service | 30 | 30 | 30 |
| Number of days a year with no transport services | 0 | 0 | 0 |
| Reliability factor(s) (%) | 65 | 88 | 84 |
| Men as % of passengers/day | 78 | 63 | 57 |
| Women as % of passengers/day | 16 | 34 | 36 |
| Children as % of passengers/day | 6 | 4 | 6 |
| Cost of 50 kg accompanied freight in USD per tonne-km | 4 | 0 | 0 |
| Cost of 200 kg consigned freight in USD per tonne-km | 2 | 0 | 0 |
| Safety: Recalled no. of accidents per 100,000 vehicle trip | 320 | 75 | 55 |
| Security: Recalled no. of incidents per 100,000 vehicle trip | 13 | 7 | 0 |
| Operating distance per year in km | 42296 | 48720 | 37800 |
| Vehicle operating costs (VOC)/year (USD) | 3703 | 32883 | 33267 |
| VOC per passenger-km (USDc) | 7 | 3 | 3 |
| Operating income per passenger-km (USDc) | 19 | 3 | 3 |
| Percentage operating income due to freight | wip | wip | wip |
| Regulation compliance (overall assessment) | ★☆☆☆☆ | ★★☆☆☆ | ★★★☆☆ |
| Development impact (overall assessment) | ★★★☆☆ | ★★★★☆ | ★★★☆☆ |

| **Table 4. User satisfaction with main RTS modes (disaggregated for gender)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Motorcycle** | | **Minibus** | | **Midi-bus** | | **Truck** | |
| | ***Men*** | ***Women*** | ***Men*** | ***Women*** | ***Men*** | ***Women*** | ***Men*** | ***Women*** |
| *Sample size (N)* | *14* | *10* | *14* | *14* | *9* | *5* | *2* | *0* |
| Fares | ★☆☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ | wip |
| Journey time | ★★★★☆ | ★★★☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★★☆☆ | wip | wip |
| Operational features | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | wip |
| Freight | ★★☆☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | wip |
| Safety and security | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | wip |
| Comfort | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | wip |
| Universal access | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★☆☆☆☆ | wip |
| Overall satisfaction | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★☆☆☆ | wip |
| *The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆= Medium. ★★★★☆= Satisfied. ★★★★★= Very satisfied* | | | | | | | | |

# Part 2: Rural Transport Service Indicators Report

## Overview of road situation and issues

The Bagamoyo–Mlandizi road (40 km) is a gravel road located in the Coast Region of Tanzania. The road comprises a trunk road section and a regional road section. The road is under the management of Tanzania National Roads Agency (TANROADS). The trunk road section starts at Bagamoyo town and traverses through flat and rolling terrain to Makofia (5.5 km) along the Bagamoyo–Makofia–Msata road (65 km) which is being upgraded to bitumen standard. From Makofia junction the Mlandizi road is a regional road that traverses lightly rolling terrain to Mlandizi (34.5 km), a transport hub on the main TanZam highway that links Dar-es-Salaam with Morogoro.

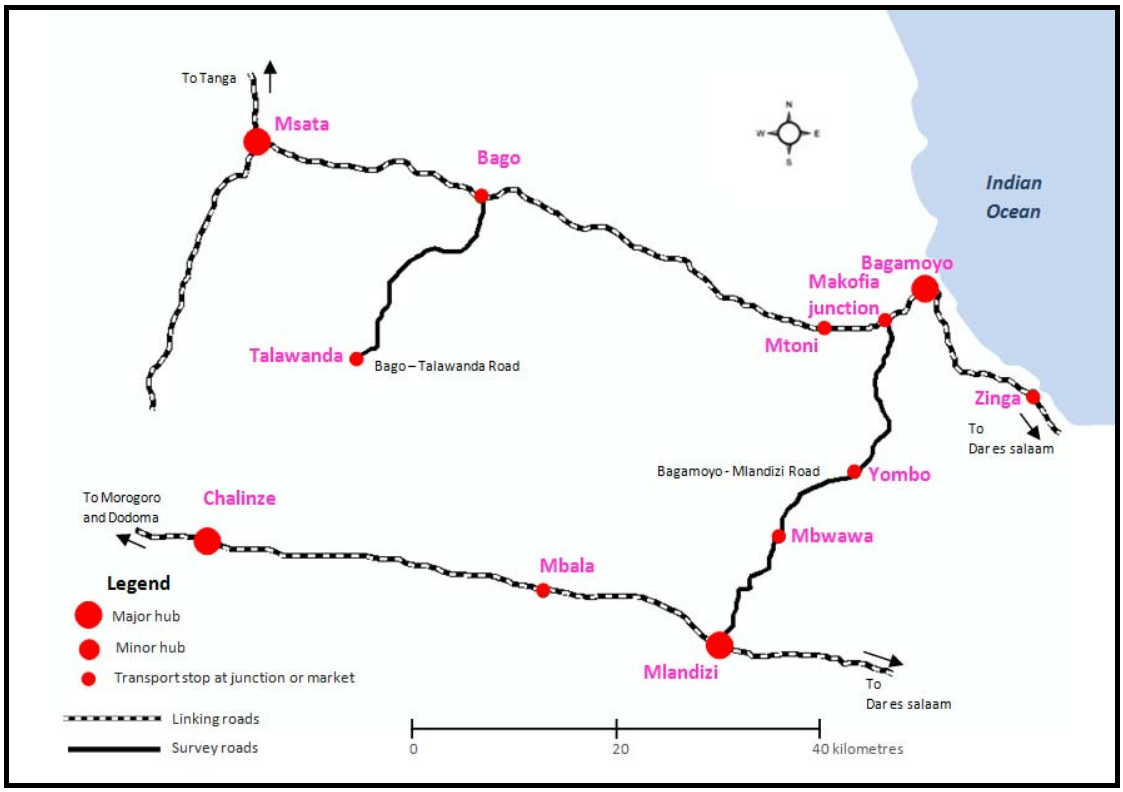



**Fig. 1: Bagamoyo–Mlandizi road context map**

The trunk road section from Bagamoyo to Makofia junction is currently fairly poor gravel standard (but is due to be upgraded soon). From Makofia junction to Mlandizi junction (34.5 km) the road is in a good gravel standard. The average speed of vehicles is 43 km/hr. The major economic activity along the survey road is agriculture. Crops grown include rice, coconut, sorghum, maize, cassava and pineapples. Charcoal is also produced and sold.

## Overview transport services situation and issues

The main means of transport on the Bagamoyo–Mlandizi road are motorcycles, minibuses and midi-buses. Bicycles and trucks are also widely used. Based on a one day traffic count at Yombo (17.5 km from Bagamoyo town along the road) revealed the traffic volume as follows: 50 bicycles a day, 100 motorcycles a day, 15 minibuses a day and 10 midi-buses a day. There are also 10 trucks a day which are mainly freight transport in transit.

Seasonal patterns are of minor importance and disruption to services is very low for a rural road (30 days in a year). Based on the surveys, the overall annual passenger volumes are 108,000, 318,000 and 220,000 for motorcycles, minibuses and midi-buses respectively (Table 2 above). The capacity of midi-buses is 35 passengers while for minibuses can take up to 25 passengers. However, there are more minibuses, which is why they have a larger market share. The market share in terms of total passengers carried on these modes is 17%, 49% and 34% for motorcycles, minibuses and

midi-buses respectively. The market share for minibuses and midi-buses would be greater in terms of passenger-kilometres as they take people on longer journeys. Motorcycles make many short distance trips per day compared to other modes.

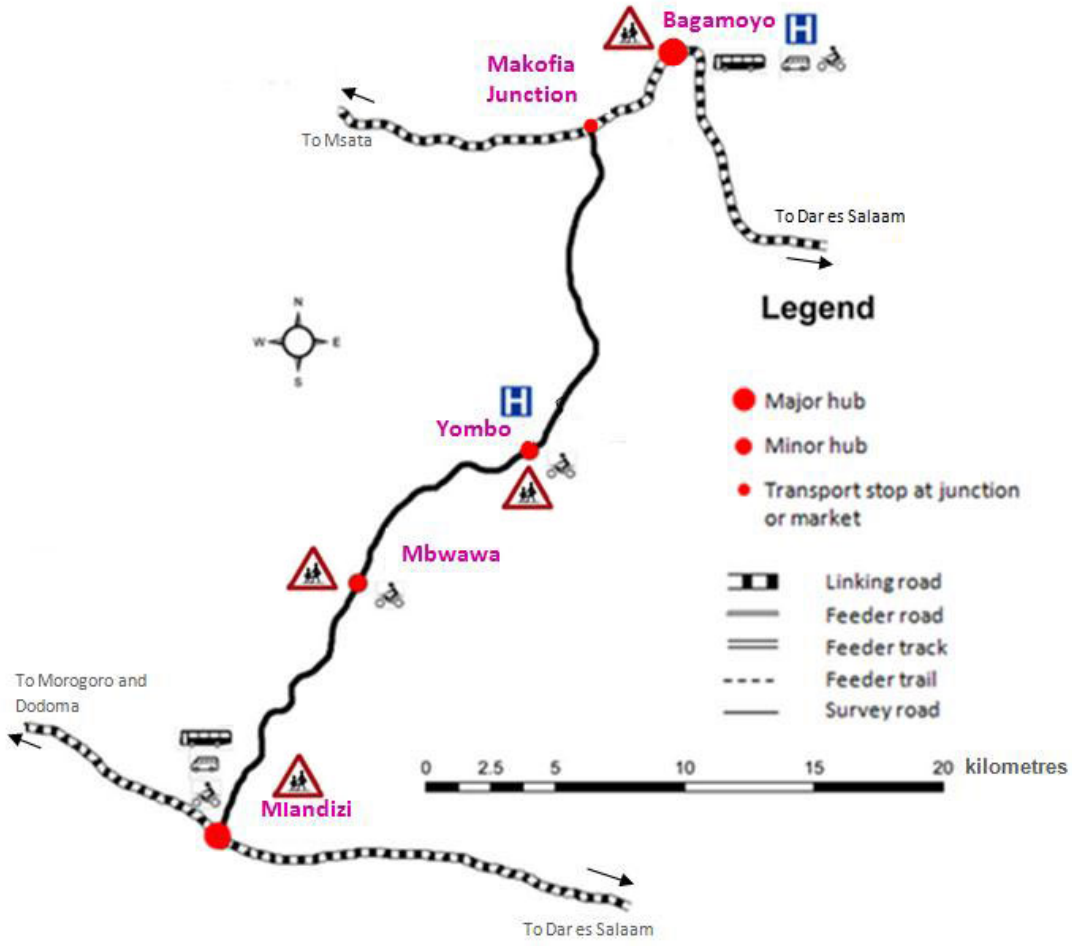



**Fig. 2: Bagamoyo–Mlandizi Road showing hubs, linking and feeding roads**

A total of 68 users of motorcycles, minibuses midi-buses and truck were interviewed for the Bagamoyo–Mlandizi road of which 39 were male and 29 female. The youngest respondents were students of 18 years while the oldest was a 62-year-old farmer. The user category interviewed included the farmers, traders, people with disability, elderly, students, health users, maternal health care, and those using transport for employment, financial services and/or for socio-cultural or religious reasons.

**Summary of user satisfaction for motorcycle**

Women and men were asked about their satisfaction with the different means of transport. For the motorcycle transport service, 14 men (58%) and 10 women (42%) women were interviewed. In the case of minibuses, 28 users were questioned of which 14 (50%) were men and 14 (50%) women. Figure 3 shows gender disaggregated levels of satisfaction with passenger fares, journey times, service frequency and service predictability. Higher scores represent greater satisfaction.

The survey result show that users were not satisfied with passenger fares of motorcycles but medium satisfied with minibus fares. Along the surveyed road, men were satisfied with the journey time for motorcycles but less satisfied with minibuses. Women were medium satisfied with journey time for motorcycles and medium satisfied with minibuses. This could be explained by the fact that motorcycles are usually fast and they do not normally stop along the route. Men appeared more concerned about journey time than women. Men and women were both medium satisfied with the

predictability of minibuses along the road. Women were particularly satisfied by the service predictability of motorcycles, as they were generally available at the junction hubs or could be called by a mobile phone (Fig. 3).

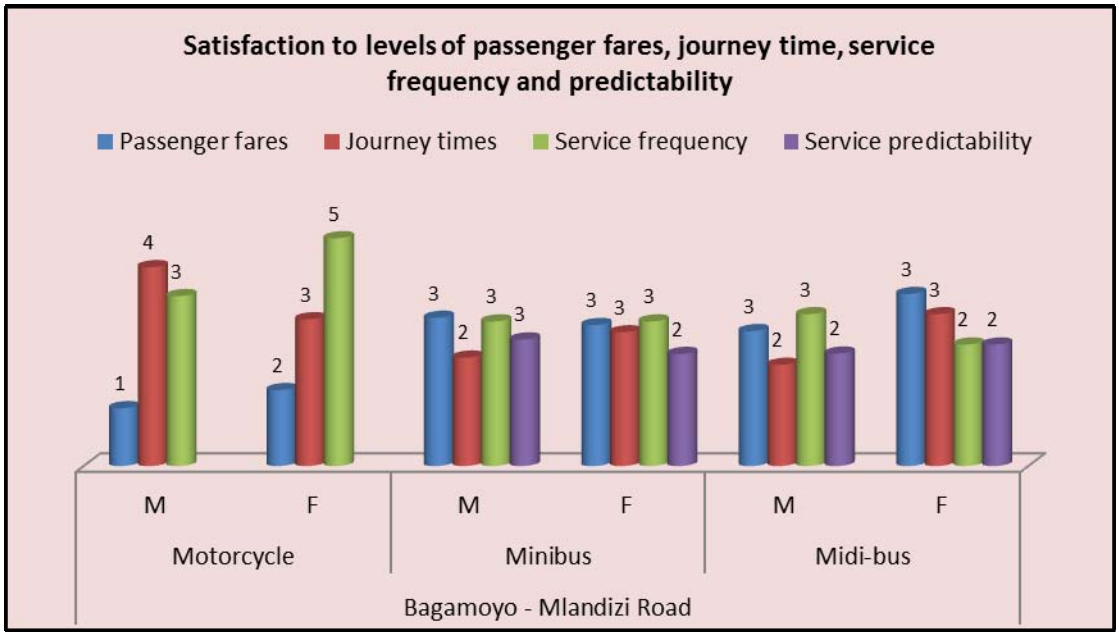



**Fig. 3: Satisfaction levels for passenger fares, journey time, service frequency and predictability**

In terms of freight characteristics, both men and women were medium satisfied with availability of motorcycles to carry small freight (20–50 kg). However, they were unsatisfied with the charges. Men were satisfied with availability of minibuses to carry small freight but medium satisfied with the charges. Women were medium satisfied with freight service availability but dissatisfied with the charges. Nonetheless, both men and women were medium satisfied with the handling of medium freight carried by minibuses. Correspondingly, both men and women were not satisfied with the availability of both motorcycles and minibuses to carry medium freight (100–200 kg). Users argued further that it is very expensive to transport medium freight using motorcycles compared to minibuses. However, both men and women were medium satisfied with the handling of medium freight across the transport modes (Figure 4).

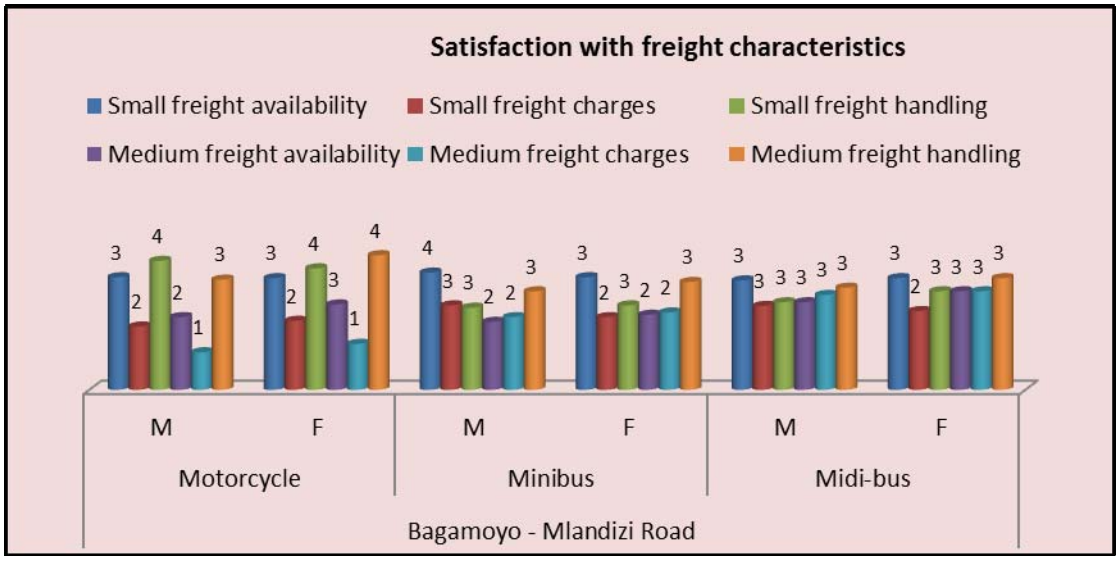



**Fig. 4: Satisfaction with freight characteristics**

The survey results indicate that women were satisfied with the comfort in terms of seat condition of motorcycles while men were medium satisfied. However, for the case of minibuses, both men and women were not satisfied with the comfort of the seat. Both men and women were satisfied with the security risk of minibuses (theft, assault, harassment) but dissatisfied with the security of motorcycles. Motorcycles were also perceived to be more prone to accidents than minibuses. Similarly, both men and women complained of the poor access for vulnerable people (elderly or physically challenged people) for both modes. Comfort in terms of the environment (noise levels/dust/heat) was also seen to be more of a problem on motorcycles than in minibuses. Motorcycle passengers are more exposed to dust and noise than minibus passengers (Figure 5).

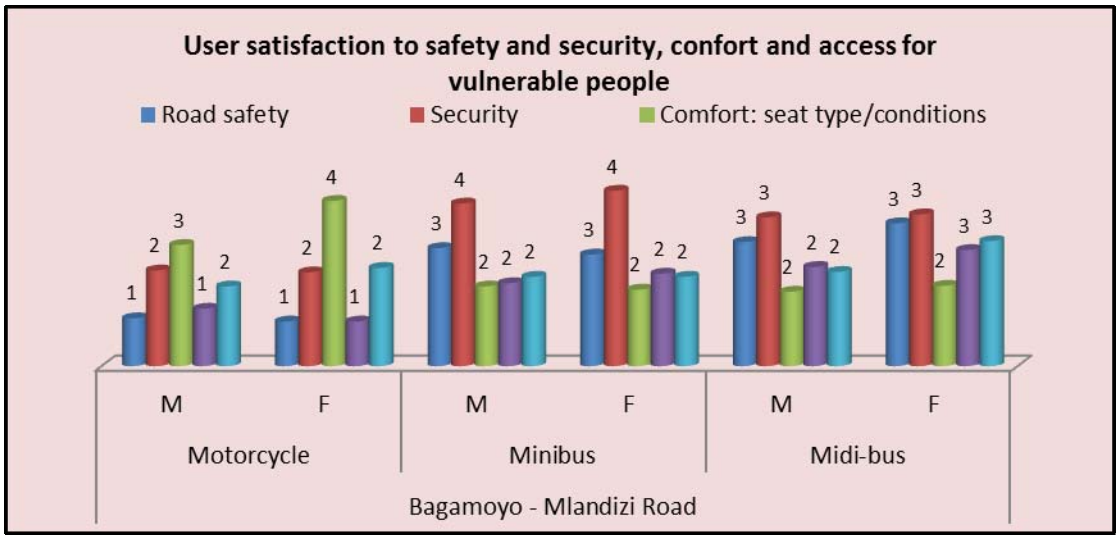



**Fig. 5: User satisfaction to safety & security, comfort and access for vulnerable**

Across the transport modes, all RTS users interviewed indicated that they were not satisfied with the roadside waiting facilities. This is easily explained as bus shelters or other waiting facilities do not exist along this road. In terms of intermodal connectivity, RTS users across the surveyed roads were generally satisfied with the feeding and linking intermodal connectivity. This suggests that motorcycles have an important role in facilitating the movement of people and goods to and from the road. They complement minibuses and midi-buses in facilitating timely links to the transport available at the major hubs. Table 5 provides as summary of user satisfaction for all transport modes, disaggregated for gender.

| Table 5. Summary of user satisfaction responses disaggregated for gender[1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Means of transport* | **Minibus** | | **Midi-bus** | | **Motorcycle** | | **Truck** | |
| *Gender of respondent* | **M** | **F** | **M** | **F** | **M** | **F** | **M** | **F** |
| *Sample size (N)* | *14* | *14* | *9* | *5* | *14* | *10* | *2* | *0* |
| Passenger fares | 3 | 3 | 3 | 3 | 1 | 2 | 1 | Wip |
| Journey times | 2 | 3 | 2 | 3 | 4 | 3 | wip | Wip |
| Service frequency | 3 | 3 | 3 | 2 | 3 | 5 | 2 | Wip |
| Service predictability | 3 | 2 | 2 | 2 | n/a | n/a | 2 | Wip |
| Passenger capacity | 2 | 2 | 2 | 2 | 4 | 3 | 1 | Wip |
| Small freight availability | 4 | 3 | 3 | 3 | 3 | 3 | 2 | Wip |
| Small freight charges | 3 | 2 | 3 | 2 | 2 | 2 | 3 | Wip |
| Small freight handling | 3 | 3 | 3 | 3 | 4 | 4 | 3 | Wip |
| Medium freight availability | 2 | 2 | 3 | 3 | 2 | 3 | 2 | Wip |
| Medium freight charges | 2 | 2 | 3 | 3 | 1 | 1 | 2 | Wip |
| Medium freight handling | 3 | 3 | 3 | 3 | 3 | 4 | 4 | Wip |
| Courier services | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Wip |
| Road safety | 3 | 3 | 3 | 3 | 1 | 1 | 3 | Wip |
| Security | 4 | 4 | 3 | 3 | 2 | 2 | 3 | Wip |
| Comfort: space | 2 | 2 | 2 | 1 | 4 | 5 | 1 | Wip |
| Comfort: seat type/conditions | 2 | 2 | 2 | 2 | 3 | 4 | 1 | Wip |
| Comfort: surrounding baggage | 2 | 2 | 2 | 3 | 3 | 3 | 3 | Wip |
| Comfort: environment | 2 | 2 | 2 | 3 | 1 | 1 | 3 | Wip |
| Access for vulnerable people | 2 | 2 | 2 | 3 | 2 | 2 | 1 | Wip |
| **Overall un-weighted** | **2** | **2** | **2** | **3** | **3** | **3** | **2** | Wip |
| **Overall weighted** | **2** | | | | | | | |

| **Satisfaction for all transport types** | | |
|---|---|---|
| *Gender of respondent* | M | F |
| Facilities at roadside stops | 1 | 1 |
| Feeding intermodal connectivity | 4 | 4 |
| Linking intermodal connectivity | 4 | 3 |
| **Overall un-weighted** | **3** | **3** |
| **Overall weighted** | **3** | |

*The higher the score the better.*
*1 = Very dissatisfied. 2 = Dissatisfied. 3 = Medium. 4 = Satisfied. 5 = Very satisfied*

## Operator perspectives

The Bagamoyo–Mlandizi road has three modes of RTS: motorcycles, minibuses and midi-buses. Two operators were interviewed for each mode. In all cases the operated leased the vehicles from the owners. The motorcycle operators paid a daily rental charge of about TZS 5000 (USD 3). Minibus and midi-bus drivers paid TZS 55,000 (USD 34) and TZS 70,000 (USD 44) a day respectively. Minibuses and midi-buses along the surveyed road make three or four return trips a day. The road has minimal seasonality patterns that affect the RTS operations. The road disrupted for perhaps thirty days a year, which is low for a rural road. Fares per kilometre were much higher for motorcycles than minibuses or midi-buses. Motorcycle fares were about USDc 21 per kilometre, while minibuses and midi-buses charged USDc 3 per kilometre (Fig. 6). Operators revealed that, there were two active associations of minibus and midi-bus operators which are concerned with the welfare of the members and the control of fares, queuing and terminal operations. One association is based in Bagamoyo terminal and the other at the Mlandizi terminal. The motorcycle operators do not yet have any association. In terms of competition amongst RTS, minibus and midi-bus operators indicated that motorcycle operators were mainly complementing their services. Motorcycles bring passengers to and from minibus and midi-bus terminals and transport stops. Motorcycles provide

'feeding intermodal' services. Competition between minibuses and midi-buses is controlled by the associations through a queuing system. Vehicles generally do no leave the terminals until they are full.

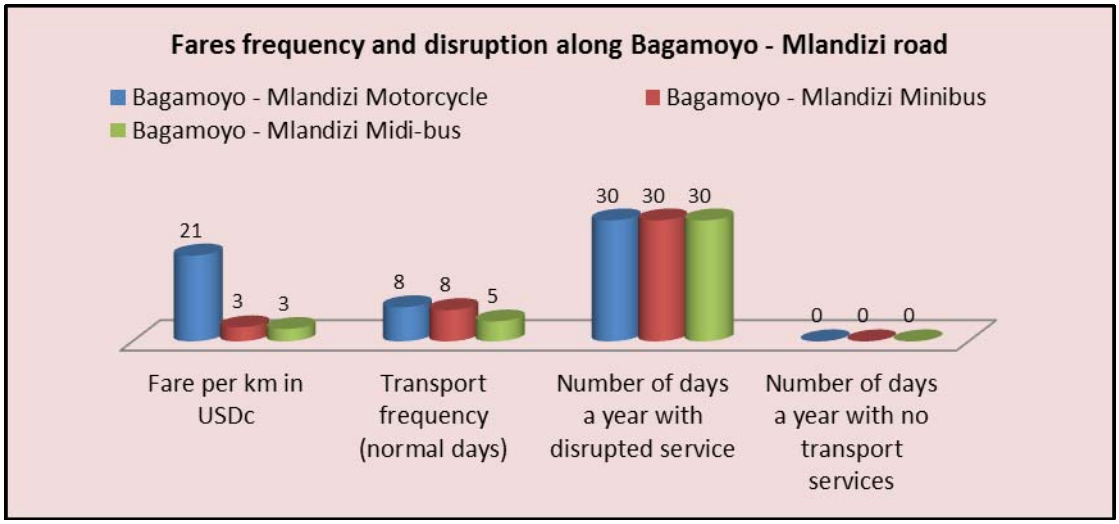



**Fig. 6: Fares, service frequency and disruption along the Bagamoyo–Mlandizi road**

Based on the survey access to capital is seen as a problem for operators. Regulatory issues such as check points, barriers, enforced safety regulations relating to loading levels, crash helmets, seat belts and restrictions on operating hours and routes of operation were not considered major constraints or 'disincentives'. Operators felt that they had some incentives for RTS operations, perhaps in the form of flat-rate taxes.

**Table 6. Summary of operator perspectives**

| **Means of transport** | **Motorcycle** | **Minibus** | **Midi-bus** |
|---|---|---|---|
| ***Sample size (N)*** | ***2*** | ***2*** | ***2*** |
| Road condition for operations | ★★★☆☆ | ★★★★☆ | ★★★★☆ |
| Adequacy of working capital | ★★★★☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Facilities for formal credit | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Facilities for informal credit | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Adequacy of technical facilities | ★★★☆☆ | ★★★★☆ | ★★★☆☆ |
| Regulatory disincentives | ★★★★☆ | ★★★★★ | ★★★★★ |
| Regulatory incentives | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Active associations | ★☆☆☆☆ | ★★★★☆ | ★★★★☆ |
| Security risks | ★★★★☆ | ★★★★★ | ★★★★★ |
| **Un-weighted average 2** | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |

*The more stars the better.* ★☆☆☆☆*= Very dissatisfied.* ★★☆☆☆*= Dissatisfied.* ★★★☆☆*= Medium.* ★★★★☆*= Satisfied.* ★★★★★*= Very satisfied*

## Regulator perspectives

A Ward Executive Officer (WEO) and a traffic police officer were interviewed to provide their opinions on the regulator's perspective. The traffic police are responsible for enforcing traffic regulations and have a good understanding about the operators' compliance with traffic regulations. Ward Executive Officers are also suitable people to interview as they have to travel regularly by public transport and are generally aware of various regulatory issues.

The people interviewed suggested that motorcycle operators did little to comply with technical regulations or tax and financial regulations. Officials in the Surface and Marine Transport Regulatory Authority (SUMATRA) revealed that motorcycles regulation only started in January 2012. There is

little enforcement of regulations in rural areas as SUMATRA does not have available staff. There are on-going discussions as to whether village leaders could be involved in the enforcement of regulations.

Minibuses and midi-buses tended to comply more with insurance, tax and financial regulations. In general, rural transport services on the road do little to comply with safety regulations (speed, overloading, drivers' behaviour, use of safety belts and crash helmets), operational regulations (timetables, routes and loading levels) or environmental legislations such as emission and noise control. The traffic police do little enforcement on that road and tend to be inconsistent. Operators' compliance with insurance is high for the larger vehicles. This is partly due to the fact that these vehicles generally travel to and from Bagamoyo and sometimes on the Mlandizi-Dar es Salaam road where regulation enforcement is higher. The regulator perspectives are summarised in Fig. 7 and Table 7.

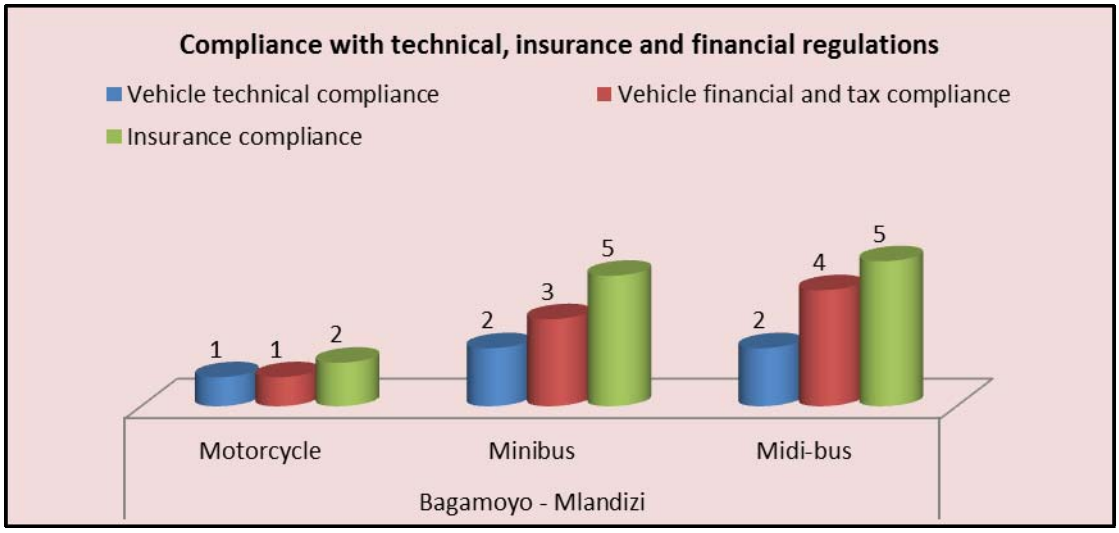



**Fig. 7: Technical, insurance and financial compliance**

**Table 7. Summary of regulator perspectives**

| Means of transport | Motorcycle | Minibus | Midi-bus | Truck |
|---|---|---|---|---|
| Vehicle technical compliance | ★☆☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★★☆ |
| Vehicle fiscal compliance | ★☆☆☆☆ | ★★★☆☆ | ★★★★☆ | ★★★★★ |
| Insurance compliance | ★★☆☆☆ | ★★★★★ | ★★★★★ | ★★★★★ |
| Operational compliance | ★☆☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Safety compliance | ★☆☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ |
| Environmental compliance | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ |
| Regulatory planning framework | ★☆☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Safety of the road | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| **Un-weighted average** | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ |

*The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆= Medium. ★★★★☆= Satisfied. ★★★★★= Very satisfied*

## Development perspectives

A total of four people were interviewed to provide opinions on the development perspective. These were a Ward Executive Officer (WEO), a medical doctor and two head teachers. The doctor was able to give opinions on how the various type of transport meet the needs of patients and the activities of the various health services. The Ward Executive Officer was regularly involved in discussions within communities that address development issues such as constraints to rural enterprises, agriculture, and medical sector. Head teachers tend to have good understanding of various rural

challenges, including education and the empowerment of young people. Therefore, the people consulted together are thought to have provided relevant and authoritative assessments of development perspectives.

Good capacity and a mix different transport services were considered crucial for agriculture and rural enterprises which are the key economic activities. This road is in reasonable condition and has a mix of services. Opinions from the development perspective suggest that motorcycles, minibuses and midi-buses play an important role in facilitating agriculture and rural enterprises along the road. All forms of transport contributed to the transport for many health needs, but transport for maternal needs was less good, as the transport was not really comfortable or appropriate. Mobile phones are increasingly important to help rural transport operations across the surveyed road, particularly for motorcycles.

While motorcycles are considered risky in terms of accidents, they contribute greatly to the employment of young men. The VEO at Yombo suggested that thefts had declined in recent years as young men could now earn an income driving motorcycles. The high cost of motorcycle fares meant they had a less positive impact on education than minibuses and midi-buses. Table 8 summarises the development impact of the different modes of transport.

**Table 8. Summary of development perspectives**

| Means of transport | Motorcycle | Minibus | Midi-bus | Truck |
|---|---|---|---|---|
| Agricultural facilitation | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★☆☆☆ |
| Enterprise/trade facilitation | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★☆☆☆ |
| Women's empowerment | ★★☆☆☆ | ★★★★☆ | ★★★★☆ | ★☆☆☆☆ |
| Minority group empowerment | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ |
| Disabled people's empowerment | ★★★☆☆ | ★★★★☆ | ★★★★☆ | ★★☆☆☆ |
| Young people's empowerment | ★★★★★ | ★★★☆☆ | ★★★☆☆ | ★☆☆☆☆ |
| Maternal health needs | ★★★☆☆ | ★★★★☆ | ★★★☆☆ | ★☆☆☆☆ |
| Medical service transport | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★☆☆☆☆ |
| Education-related transport | ★★☆☆☆ | ★★★★☆ | ★★★★☆ | ★★☆☆☆ |
| Mobile phone and ICT integration | ★★★★☆ | ★★☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Un-weighted average | ★★★☆☆ | ★★★★☆ | ★★★☆☆ | ★☆☆☆☆ |
| Cultural impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Environment impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| HIV/Aids impact | ★★★★☆ | ★★★★☆ | ★★★★☆ | ★★★☆☆ |
| **Un-weighted average** | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| **Weighted average** | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ |
| **Overall weighted average** | ★★★☆☆ | | | |
| Integration with feeder transport | | ★★★☆☆ | | |
| Integration with external transport | | ★★★☆☆ | | |
| Road maintenance adequacy | | ★★☆☆☆ | | |
| **Final weighted average** | | ★★★☆☆ | | |
| *Number of interviews (people answer questions relevant to their experience)* | | 4 | | |

*The more stars the better, from the development perspective. The contribution of each mode of transport to the achievement of development goals in that area of concern has been rated by the people interviewed as:*
*★☆☆☆☆= Very poor. ★★☆☆☆= Poor. ★★★☆☆= Medium. ★★★★☆= Good. ★★★★★= Very good.*

## Conclusions

The survey of the Bagamoyo–Mlandizi (40 km) road has helped to define many of the characteristics of the rural transport services along the road. Transport services along this road respond to the condition of the road that provides interconnectivity between two major hubs (Bagamoyo and Mlandizi). Public transport is provided by motorcycles, minibuses and midi-buses. Trucks mainly carry freight in transit. Bicycles are widely used but mainly for individual use (including traders carrying freight). Bicycles do not generally provide public transport services.

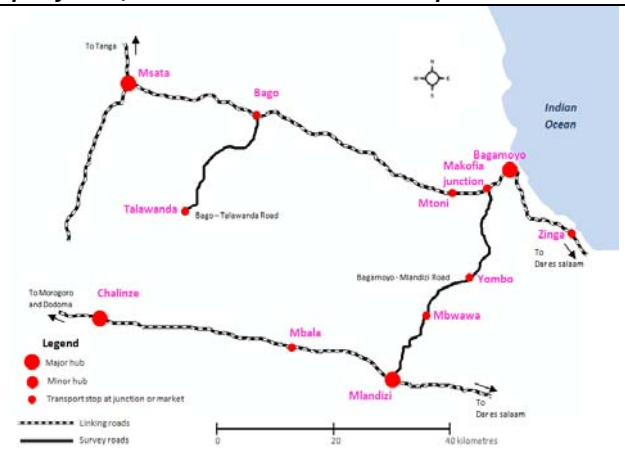
Several concerns have been raised by different stakeholders. The key concerns for the users include the high passenger fares especially for motorcycles, unavailability of medium freight (200 kg) services coupled with high charges, safety of the RTS particularly with motorcycles and the environment (noise level/dust/heat). Operators were more concerned with access to capital/credit facilities to own and/or operate RTS. Regulators noted the low levels of compliance with safety regulations, operational regulations and environmental legislations such as emission and noise control. People providing a development perspective stressed the importance of good road maintenance which impacts positively on the rural transport services that are crucial to facilitate agriculture and rural enterprises.

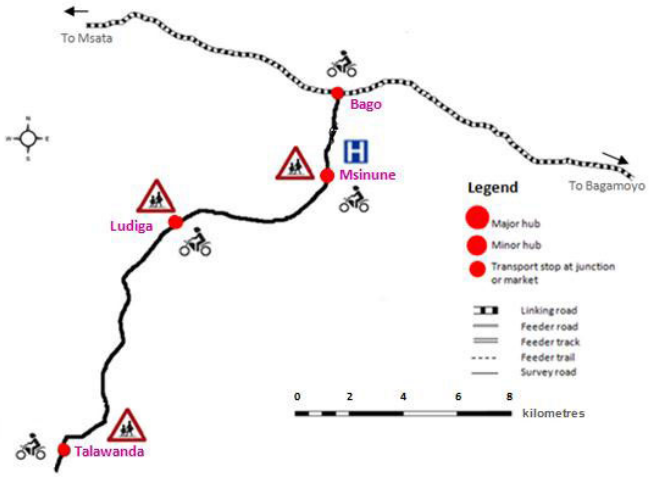
## 11 RTSi Report of Bago–Talawanda Road, Coast Region, Tanzania

*Prepared by: Shedrack Willilo. Date: 28 September 2012*

# Part 1: Summary tables

| **Table 1. Road information** | | | |
|---|---|---|---|
| *Road name: Bago–Talawanda* | | | |
| *District, Region and Country: Bagamoyo, Coastal, Tanzania* | | | |
| *Road type: District Road* | *Responsible authority: PMO-RALG* | | |
| *Road start location: Bago* | *GIS:* | | |
| *Road finish location: Talawanda* | *GIS:* | | |
| *Road length:20Km* | *Catchment population* [1] | | |
| ***Road quality and condition from different perspectives*** | | | |
| *Road authority* [2] | *Operators* [3] | *Development* [4] | *Safety* [5] |
| | ★★★☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| ***Summary of road geography and socio-economic situation*** | | | |
| The Bago–Talawanda road (20 km) is located in the Coast Region. This is a district road under the management of the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Bago village hub 43.5 km from Bagamoyo town along the Bagamoyo–Makofia–Msata trunk road (65 km). From Bago, the road traverses rolling, hilly terrain to Talawanda village hub (20 km). The major economic activity along the survey road is small-scale agriculture and livestock keeping. Crops grown include maize, sorghum, sesame, cassava, pineapples and various legumes. The production and sale of charcoal is economically important. | | | |
| ***Maps of road, with context and hub and spoke connections*** | | | |



***Schematic map of 'straightened' road with features***


***GPS elevation track*** *(same horizontal scale)*


***GPS speed track*** [6] *(same horizontal scale)*


***Description of hub and spoke patterns***

Bago is a small transport hub along the Bagamoyo–Makofia–Msata road (65km) which links Bagamoyo to Msata along the Tanga-Arusha trunk road. Bagamoyo is a district market town and transport hub. Talawanda is a small village and transport hub. Village market is also held at this village monthly. Several spokes feed into this village via Intermediate Means of Transport (IMT) mainly motorcycles and bicycles. Motorcycle taxis are the sole transport services, with hubs at Talawanda, Ludiga, Msinune and Bago where minibuses stop.

***Intermodal connectivity*** *(one to five stars, the more stars the better)*

| | | | | |
|---|---|---|---|---|
| ***'Feeding'*** [7] | *User satisfaction* [8] | ★★★☆☆ | *Development impact* [9] | ★★★☆☆ |
| ***'Lnking'*** [10] | *User satisfaction* [11] | ★★★★☆ | *Development impact* [12] | ★★★☆☆ |

**Table 2. Traffic and transport along road** *(work in progress)*

| **Daily traffic flows** | | | | | **Fleet** | **Passengers and small freight** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Normal* | *Busy* | *Disrupted* | *Impassable* | *No of vehicles operating on road* | ***Trip transport*** *normal day per vehicle* | | ***Daily transport*** *normal day all vehicles* | | ***Annual transport*** *adjusted for traffic fluctuations* | | ***Change*** *in past year* |
| | | | | | | *Pax (no)* | *Frt (kg)* | *Pax (no)* | *Frt (kg)* | *Pax (no) 000* | *Frt (t)* | *- - 0 ++* |
| Motorcycle | 75 | 85 | 23 | 5 | 40 | 2 | 100 | 150 | 7500 | 217 | 2,738 | ++ |
| **Total** | **75** | **85** | **23** | **5** | **40** | **2** | **100** | **150** | **7500** | **217** | **2,738** | |

| **Table 3. Rural transport services key operational statistics for major transport modes** |  |
|---|---|
| | **Motorcycle** |
| Contribution to annual passenger transport (% of market) | 100 |
| Contribution to annual small freight transport (% of market) | 100 |
| Fare per km in USDc | 22 |
| Journey time (average speed on normal days) in km/hr | 27 |
| Transport frequency (normal days) | 10 |
| Number of days a year with 'normal service' | 193 |
| Number of busy days a year | 52 |
| Number of days a year with disrupted service | 90 |
| Number of days a year with no transport services | 30 |
| Reliability factor(s) (%) | 66 |
| Men as % of passengers/day | 88 |
| Women as % of passengers/day | 12 |
| Children as % of passengers/day | 0 |
| Cost of 50 kg accompanied freight in USD per tonne-km | 1 |
| Cost of 200 kg consigned freight in USD per tonne-km | 1 |
| Safety: Recalled no. of accidents per 100,000 vehicle trip | 2060 |
| Security: Recalled no. of incidents per 100,000 vehicle trip | 127 |
| Operating distance per year in km | 54560 |
| Vehicle operating costs (VOC)/year (USD) | 2965 |
| VOC per passenger-km (USDc) | 3 |
| Operating income per passenger-km (USDc) | 22 |
| Percentage operating income due to freight | 0 |
| Regulation compliance (overall assessment) | 1 |
| Development impact (overall assessment) | 4 |

| **Table 4. User satisfaction with main RTS modes (disaggregated for gender)** | | |
|---|---|---|
| | **Motorcycle** | |
| | **Men** | **Women** |
| **Sample size (N)** | **23** | **11** |
| Fares | ★★☆☆☆ | ★☆☆☆☆ |
| Journey time | ★★★☆☆ | ★★☆☆☆ |
| Operational features | ★★☆☆☆ | ★★★☆☆ |
| Freight | ★★☆☆☆ | ★★☆☆☆ |
| Safety and security | ★★☆☆☆ | ★★☆☆☆ |
| Comfort | ★★☆☆☆ | ★☆☆☆☆ |
| Universal access | ★★☆☆☆ | ★★☆☆☆ |
| Overall satisfaction | ★★☆☆☆ | ★★☆☆☆ |
| *The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆= Medium. ★★★★☆= Satisfied. ★★★★★= Very satisfied* | | |

# Part 2. Rural Transport Service Indicators Report

## Overview of road situation and issues

The Bago–Talawanda road (20 km) is located in the Coast Region. This is a district road under the management of the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Bago village hub 43.5 km from Bagamoyo town along the Bagamoyo–Makofia–Msata trunk road (65 km). From Bago, the surveyed road traverses rolling, hilly terrain to Talawanda village hub (20 km).

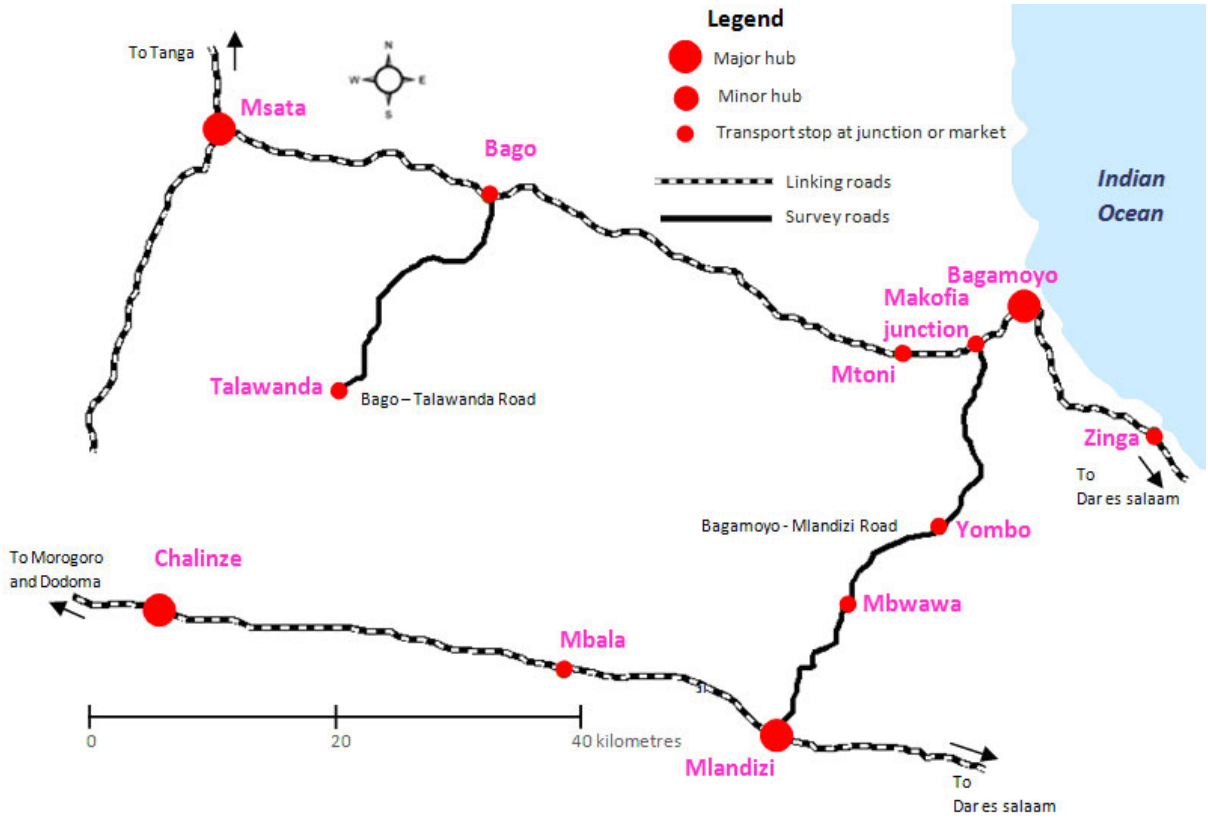



**Fig. 1: Bago–Talawanda road context map**

The African Community Access Programme (AFCAP) has been funding a project on this road to demonstrate alternative surface options for low volume roads. These include sections of tarmac, gravel, concrete strips, packed stone and earth. Before upgrading, the road was hardly motorable even during the dry season. Currently, the road still experiences disruptions during the rainy season due to flooding at one water crossing. One section of packed stones has become so uneven it is difficult to pass, and so motorcycles use the shoulder and trucks use a bypass through the bush. The major economic activity along the survey road is small-scale agriculture and livestock keeping. Crops grown include maize, sorghum, sesame, cassava, pineapples and various legumes. The production and sale of charcoal is economically important.

## Overview transport services situation and issues

Transport along the road mainly involves walking, bicycles, motorcycles and occasional light charcoal trucks. After upgrading the road, a midi-bus started to operate daily services from Talawanda to Bagamoyo. Since February 2012, this has stopped. The owner said this was due to the financial difficulties of maintaining the bus on that road, and the poor condition of sections of the road, particularly during the rainy season. During a one-day survey of traffic carried out in May 2012, the only traffic was 50 motorcycles a day and 25 bicycles a day. On some days a light truck uses the road to collect charcoal.

Disruption to services is significant (90 days in a year of disruption and 30 days with no services). Based on the surveys, the overall annual passenger volume for motorcycles was 217,000. This is two times the annual number of passengers carried on similar mode along the Bagamoyo–Mlandizi road in the same region.

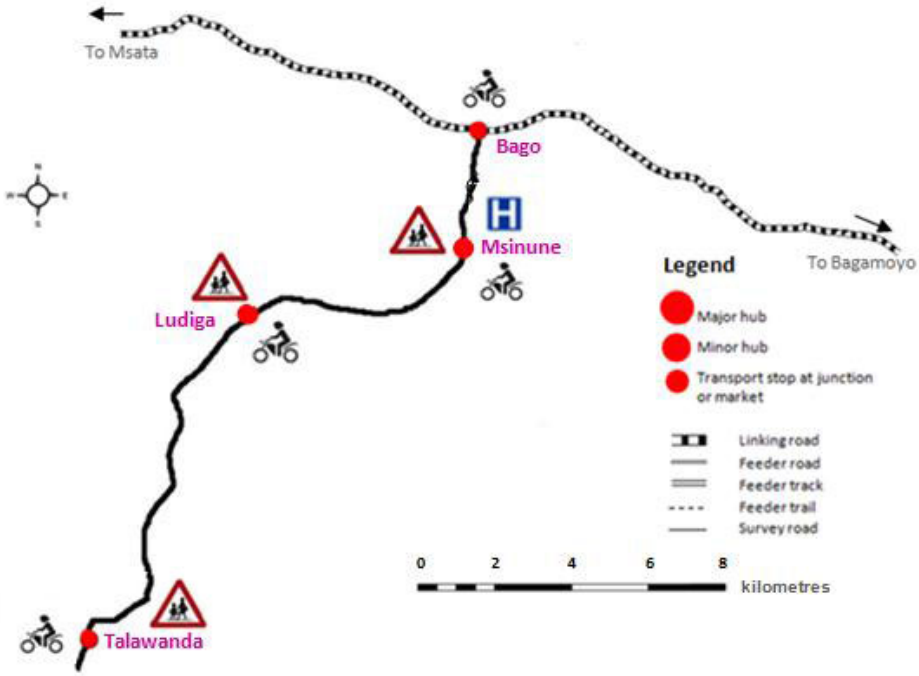



**Fig. 2: Bago–Talawanda Road showing hubs, linking and feeding roads**

## User perspective

Motorcycles were the only transport service operating along the Bago–Talawanda road. A total of 34 users of motorcycles were interviewed for their opinions. Of these, 23 (68%) were male and 11 (32%) were female. The youngest respondent was a student of 18 years while the oldest was a 70-year-old farmer. The users included farmers, traders, people with disability, elderly, students, health users, maternal health care users and those using transport for employment, financial services and/or for socio-cultural or religious reasons.

### Summary of User Satisfaction

Generally, user satisfaction with transport services along the Bago–Talawanda road is very low as only motorcycles operate on the road. These are can be unpredictable and are not always convenient to people, notably the old and those seeking medical attention. Motorcycles services were expensive compared to the midi-bus that used to operate along the road. The survey results show that users were dissatisfied with passenger fares, with women being very dissatisfied. Users were not happy with the availability of the medium freight transport (using motorcycles) and with their high charges. The safety and security risks of motorcycles were also reported to be high along the road. Although access on motorcycles is difficult for vulnerable people and those with disabilities, access was only considered a problem, not a serious problem. These findings are illustrated in Fig. 3.

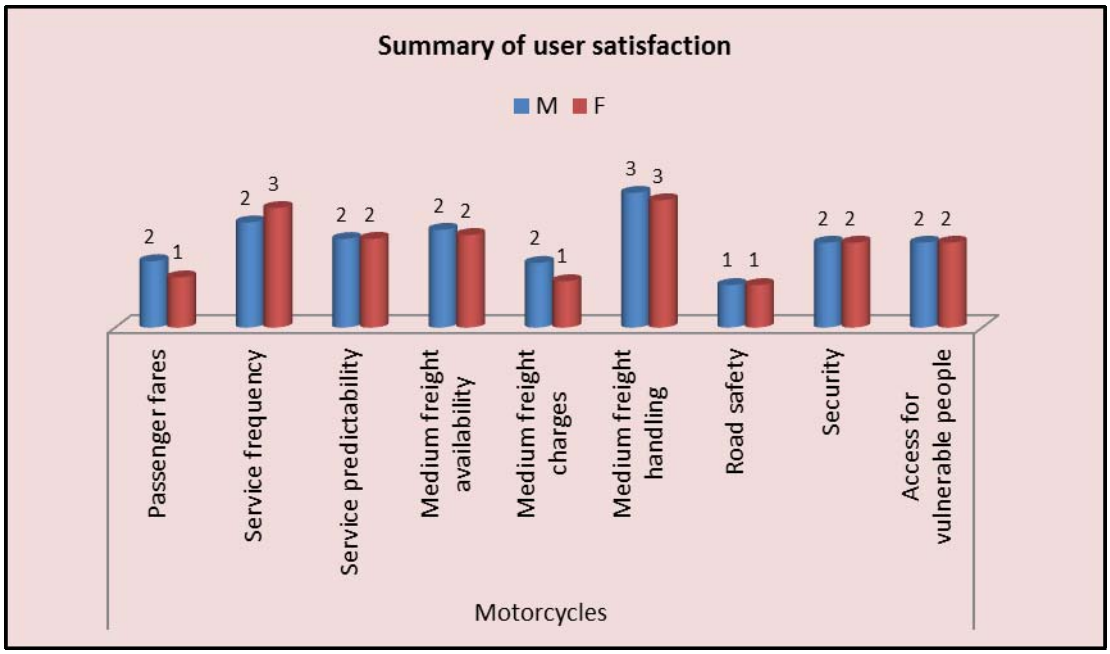



**Fig. 3: Summary of user satisfaction for motorcycles services**

There is severe seasonal disruption to the transport services along the road. During the rainy season students have to walk about 15 km to school with luggage on their head. Some female students reported that during the rainy season they do not go to school as they cannot walk 15 km with luggage as the male students do. Pregnant women depend on local midwives to assist them to deliver at home when there is no transport to take them to the health facility as Msinune.

| Table 5. Summary of user satisfaction responses disaggregated for gender | | |
|---|---|---|
| **Means of transport** | **Motorcycle** | |
| **Gender of respondent** | **M** | **F** |
| **Sample size (N)** | **23** | **11** |
| Passenger fares | 2 | 1 |
| Journey times | 3 | 2 |
| Service frequency | 2 | 3 |
| Service predictability | 2 | 2 |
| Passenger capacity | 3 | 3 |
| Small freight availability | 3 | 4 |
| Small freight charges | 2 | 2 |
| Small freight handling | 4 | 3 |
| Medium freight availability | 2 | 2 |
| Medium freight charges | 2 | 1 |
| Medium freight handling | 3 | 3 |
| Courier services | 1 | 2 |
| Road safety | 1 | 1 |
| Security | 2 | 2 |
| Comfort: space | n/a | n/a |
| Comfort: seat type/conditions | 3 | 3 |
| Comfort: surrounding baggage | n/a | n/a |
| Comfort: environment | 2 | 1 |
| Access for vulnerable people | 2 | 2 |
| **Overall un-weighted** | **2** | **2** |
| **Overall weighted** | **2** | |
| **Satisfaction for all transport types** | | |
| Gender of respondent | **M** | **F** |
| Facilities at roadside stops | 1 | 1 |
| Feeding intermodal connectivity | 3 | 3 |
| Linking intermodal connectivity | 4 | 4 |
| **Overall un-weighted** | **3** | **3** |
| **Overall weighted** | **3** | |
| *The higher the score the better.*<br>*1 = Very dissatisfied. 2 = Dissatisfied. 3 = Medium. 4 = Satisfied. 5 = Very satisfied* | | |

## Operator perspectives

Three motorcycle operators were interviewed to gain information from the operators' perspective. Two operators leased their motorcycles for TZS 6000 (USD 3.75) a day. The third was an owner-operator. Operators stressed that seasonal weather patterns affect their operations. The road is disrupted for about three months with about thirty days a year with no services. Fares per kilometre were about USDc 22 which is much higher than the rates that used to be charged on the midi-bus. There is no association of motorcycle operators along the road.

The survey showed that the operators regard the formal and informal financial services and the access to working capital and/or credit as very inadequate. This is a key challenge faced by the operators. Regulatory issues such as check points, barriers, enforced safety regulations relating to

loading levels, crash helmets, seat belts and restrictions on operating hours and routes of operation were not regarded as constraints or disincentives. This because there are no traffic police enforcing regulations along this road and there is little compliance. The operators did not feel there were significant regulatory incentives for RTS operations.

| Table 6. Summary of operator perspectives | |
|---|---|
| **Means of transport** | **Motorcycle** |
| *Sample size (N)* | *3* |
| Road condition for operations | ★★★☆☆ |
| Adequacy of working capital | ★☆☆☆☆ |
| Facilities for formal credit | ★☆☆☆☆ |
| Facilities for informal credit | ★☆☆☆☆ |
| Adequacy of technical facilities | ★★☆☆☆ |
| Regulatory disincentives | ★★★★☆ |
| Regulatory incentives | ★★☆☆☆ |
| Active associations | ★☆☆☆☆ |
| Security risks | ★★★★☆ |
| **Un-weighted average 2** | ★★☆☆☆ |
| **Weighted average 3** | |
| *The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆=Medium.★★★★☆= Satisfied. ★★★★★= Very satisfied* | |

## Regulator perspectives

Around the road, a Ward Executive Officer (WEO), a teacher and a traffic police officer were interviewed to provide their opinions on the regulator's perspective. Ward Executive Officers are suitable people to interview as they have to travel regularly by public transport and are generally aware of various regulatory issues. The teacher was knowledgeable and travelled regularly. The traffic police officer was responsible for enforcing traffic regulations and had a good understanding about the operators' compliance with traffic regulations. Therefore, the opinions from the interviewed people on the regulator perspective were considered authoritative and relevant.

The people interviewed all agreed that motorcycles operating on that road do not comply with any regulations. Regulations relating to motorcycles do not appear to have reached the Talawanda road, due to its remoteness.

| Table 7. Summary of regulator perspectives | |
|---|---|
| **Means of transport** | **Motorcycle** |
| Vehicle technical compliance | ★☆☆☆☆ |
| Vehicle fiscal compliance | ★☆☆☆☆ |
| Insurance compliance | ★☆☆☆☆ |
| Operational compliance | ★☆☆☆☆ |
| Safety compliance | ★☆☆☆☆ |
| Environmental compliance | ★☆☆☆☆ |
| Regulatory planning framework | ★☆☆☆☆ |
| Safety of the road | ★☆☆☆☆ |
| **Un-weighted average** | ★☆☆☆☆ |
| *The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆=Medium.★★★★☆= Satisfied. ★★★★★= Very satisfied* | |

## Development perspectives

Three people were interviewed to provide opinions on the development perspective: a medical doctor, a Ward Executive Officer (WEO) and a head teacher. The doctor was able to give opinions on how the various type of transport meet the needs of patients and the activities of the various health services. The Ward Executive Officer was regularly involved in discussions within communities that address development issues such as constraints to rural enterprises, agriculture and the medical sector. Head teachers tend to have a good understanding of various rural challenges, including education and the empowerment of young people. Therefore, the people consulted together are thought to have provided relevant and authoritative assessments of development perspectives.

Opinions from the development perspective showed that although the community depend entirely on motorcycles, these do make an important contribution to facilitating agriculture and rural enterprises along the road. Similarly, despite motorcycles being uncomfortable and difficult for some people, they are useful for those seeking medical attention (there is no alternative). They are a positive contribution to education. The surveys also indicated that the use of mobile phones was very important, allowing people to organise trips and order transport from various points. Although motorcycles have a high accident risk, they are important for the advancement of the young, particularly young men. The trucks that occasionally use the road are primarily buying charcoal and make little contribution to development issues.

**Table 8. Summary of development perspectives**

| Means of transport | Motorcycle | Truck |
|---|---|---|
| Agricultural facilitation | ★★★½☆ | ★☆☆☆☆ |
| Enterprise/trade facilitation | ★★★½☆ | ★☆☆☆☆ |
| Women's empowerment | ★★★☆☆ | ★☆☆☆☆ |
| Minority group empowerment | ★★★☆☆ | ★☆☆☆☆ |
| Disabled people's empowerment | ★★☆☆☆ | ★★☆☆☆ |
| Young people's empowerment | ★★★½☆ | ★☆☆☆☆ |
| Maternal health needs | ★★★☆☆ | ★☆☆☆☆ |
| Medical service transport | ★★★½☆ | ★☆☆☆☆ |
| Education-related transport | ★★★½☆ | ★☆☆☆☆ |
| Mobile phone and ICT integration | ★★★★★ | ★☆☆☆☆ |
| Un-weighted average | ★★★½☆ | ★☆☆☆☆ |
| Cultural impact | ★★★☆☆ | ★★★☆☆ |
| Environment impact | ★★★☆☆ | ★★☆☆☆ |
| HIV/Aids impact | ★★★½☆ | ★★☆☆☆ |
| **Un-weighted average** | ★★★☆☆ | ★★☆☆☆ |
| **Weighted average** | | |
| **Overall weighted average** | | |
| Integration with feeder transport | | ★★★☆☆ |
| Integration with external transport | | ★★★☆☆ |
| Road maintenance adequacy | | ★★☆☆☆ |
| **Final weighted average** | | |

*The more stars the better, from the development perspective. For example, the contribution of each mode of transport to the achievement of development goals in that area of concern has been rated by the people interviewed as:*

*★☆☆☆☆= Very poor. ★★☆☆☆= Poor. ★★★☆☆= Medium. ★★★★½= Good. ★★★★★= Very good.*

## Conclusions

The survey of the Bago–Talawanda road (20 km) has provided understanding of some of the transport challenges in various rural communities along the road. Motorcycles were introduced about three years ago and are now the only transport services along the road. Prior to the motorcycles, the only means of transport were bicycles and walking. The survey highlighted the impact of various road maintenance interventions for rural roads. Despite the road rehabilitation, the road is not considered good enough for minibus services. The road is badly disrupted during rainy season, particularly due to flooding at one drift.

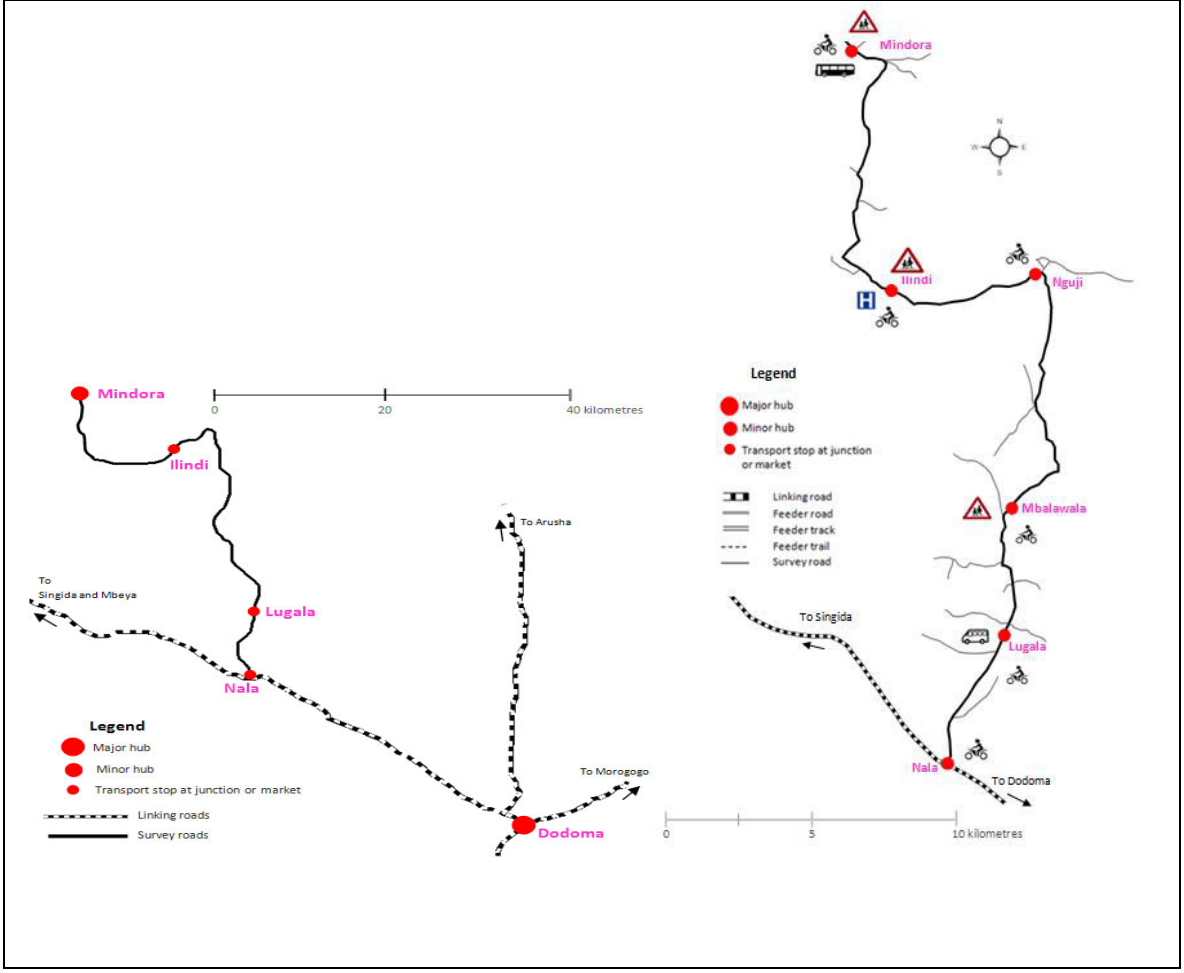
Several concerns have been raised by different stakeholders. The key concerns for the users include the high passenger fares and expensive medium freight (200 kg) services. There were also problems of poor safety, security and the problems of noise and dust on the motorcycles. Operators were concerned about access to capital/credit facilities to own and/or operate motorcycle services. Regulators felt there was minimal compliance with regulations relating to safety, operations and environmental legislation. From the development perspective, the biggest problem was the lack of rural taxis or minibuses. However, people commended the contribution of motorcycles in facilitating agriculture and rural enterprises in the area and for assisting transport to health and education and providing opportunities for young men.

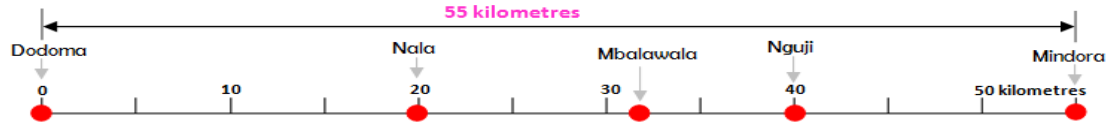
## 12 RTSi Report of Nala–Mindora Road, Dodoma Region, Tanzania

*Prepared by: Shedrack Willilo. Date: 28 September 2012*

# Part 1: Summary Tables

| Table 1. Road information | | | |
|---|---|---|---|
| *Road name: Nala–Mbalawala–Mindora* | | | |
| *District, Region and Country: Urban & Rural Dodoma, Dodoma, Tanzania* | | | |
| *Road type: District road* | *Responsible authority: PMO-RALG* | | |
| *Road start location: Nala* | *GIS:* | | |
| *Road finish location: Mindora* | *GIS:* | | |
| *Road length: 35km* | *Catchment population* [1] | | |
| ***Road quality and condition from different perspectives*** | | | |
| *Road authority* [2] | *Operators* [3] | *Development* [4] | *Safety* [5] |
| | ★★☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| ***Summary of road geography and socio-economic situation*** | | | |
| This road is located in Dodoma Region in Dodoma Urban and Dodoma Rural Districts. The Nala–Mbalawala–Mindora road is a 35 km district road managed by the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Nala which is 20 km from the city of Dodoma on the Singida road. The road traverses flat and gently rolling terrain to Mindora village which is 35 km from Nala. The major economic activities along the survey road are agriculture and livestock keeping. Crops grown include sorghum, maize, millet, sesame, groundnuts and sunflowers. | | | |
| ***Maps of road, with context and hub and spoke connections*** | | | |



| ***Schematic map of 'straightened' road with features*** |
|---|
|  |
| ***GPS elevation track*** *(same horizontal scale)* |
| |
| ***GPS speed track*** [6] *(same horizontal scale)* |
| |
| ***Description of hub and spoke patterns*** |
| Nala is a small transport stop for the buses along the Dodoma–Singida road. Mindora is a large village and transport hub. A village market is also held at this village on a weekly basis during the dry season. Several small spokes feed into this village that are mainly used by motorcycles and bicycles. Motorcycles are important transport services but they are few. Most are operated by owners who also use them for other private activities. The motorcycle hubs along the road are at Mindora, Ilindi, Nguji, Mbalawala and Lugala. However, the main transport hubs along the road are Mindora, Ilindi and Lugala. |
| ***Intermodal connectivity*** *(one to five stars, the more stars the better)* |

| | | | | |
|---|---|---|---|---|
| ***'Feeding'*** [7] | *User satisfaction* [8] | ★★☆☆☆ | *Development impact* [9] | ★★☆☆☆ |
| ***'Lnking'*** [10] | *User satisfaction* [11] | ★★★★☆ | *Development impact* [12] | ★★★☆☆ |

**Table 2. Traffic and transport along road** *(work in progress)*

| **Daily traffic flows** | | | | | **Fleet** | **Passengers and small freight** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Normal* | *Busy* | *Disrupted* | *Impassable* | *No of vehicles operating on road* | ***Trip transport*** *normal day per vehicle* | | ***Daily transport*** *normal day all vehicles* | | ***Annual transport*** *adjusted for traffic fluctuations* | | ***Change*** *in past year* |
| | | | | | | *Pax (no)* | *Frt (kg)* | *Pax (no)* | *Frt (kg)* | *Pax (no) 000* | *Frt (t)* | *- - 0 + +* |
| Bus | 1 | 1 | 0 | 0 | 1 | 61 | 800 | 61 | 800 | 10 | 292 | + |
| Minibus | 1 | 1 | 0 | 0 | 1 | 10 | 200 | 10 | 200 | 4 | 73 | + |
| Motorcycle | 22 | 30 | 10 | 5 | 10 | 2 | 50 | 44 | 1100 | 5 | 402 | + |
| **Total** | **24** | **32** | **10** | **5** | **12** | **73** | **1050** | **115** | **2100** | **18** | **767** | |

**Table 3. Rural transport services key operational statistics for major transport modes**

| |  |  | |
|---|---|---|---|
| | **Motorcycle** | **Minibus** | **Bus** |
| Contribution to annual passenger transport (% of market) | 33 | 43 | 0 |
| Contribution to annual small freight transport (% of market) | 40 | 43 | 17 |
| Fare per km in USDc | 24 | 3 | 3 |
| Journey time (average speed on normal days) in km/hr | 23 | 20 | 16 |
| Transport frequency (normal days) | 8 | 1 | 1 |
| Number of days a year with 'normal service' | 0 | 180 | 0 |
| Number of busy days a year | 20 | 20 | 20 |
| Number of days a year with disrupted service | 210 | 90 | 162 |
| Number of days a year with no transport services | 135 | 75 | 183 |
| Reliability factor(s) (%) | 52 | 68 | 57 |
| Men as % of passengers/day | 82 | 60 | 52 |
| Women as % of passengers/day | 15 | 40 | 33 |
| Children as % of passengers/day | 3 | 0 | 15 |
| Cost of 50 kg accompanied freight in USD per tonne-km | 1 | 0 | 0 |
| Cost of 200 kg consigned freight in USD per tonne-km | 2 | 0 | 0 |
| Safety: Recalled no. of accidents per 100,000 vehicle trip | 2701 | 38 | 1167 |
| Security: Recalled no. of incidents per 100,000 vehicle trip | 14 | 0 | 0 |
| Operating distance per year in km | 15600 | 25200 | 34320 |
| Vehicle operating costs (VOC)/year (USD) | 1939 | 15638 | 50721 |
| VOC per passenger-km (USDc) | 8 | 3 | 2 |
| Operating income per passenger-km (USDc) | 27 | 4 | 1 |
| Percentage operating income due to freight | 13% | 19% | 19% |
| Regulation compliance (overall assessment) | 1 | 2 | 2 |
| Development impact (overall assessment) | 2 | 2 | 2 |

**Table 4. User satisfaction with main RTS modes (disaggregated for gender)**

| | **Motorcycle** | | **Minibus** | | **Bus** | |
|---|---|---|---|---|---|---|
| | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **Sample size (N)** | **21** | **12** | **6** | **7** | **16** | **14** |
| Fares | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Journey time | ★★★★☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ |
| Operational features | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Freight | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Safety and security | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Comfort | ★★★☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Universal access | ★★☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| **Overall satisfaction** | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |

*The more stars the better. ★☆☆☆☆= Very dissatisfied. ★★☆☆☆= Dissatisfied. ★★★☆☆= Medium. ★★★★☆= Satisfied. ★★★★★= Very satisfied*

# Part 2: Report

## Overview of road situation and issues

The Nala–Mbalawala–Mindora road is located in Dodoma Region in Dodoma Urban and Dodoma Rural Districts. This is a 35 km district road, managed by the Prime Minister's Office Regional Administration and Local Government (PMO-RALG). The road starts at Nala which is 20 km from the city of Dodoma on the Singida road. The road traverses flat and gently rolling terrain to Mindora village which is 35 km from Nala.

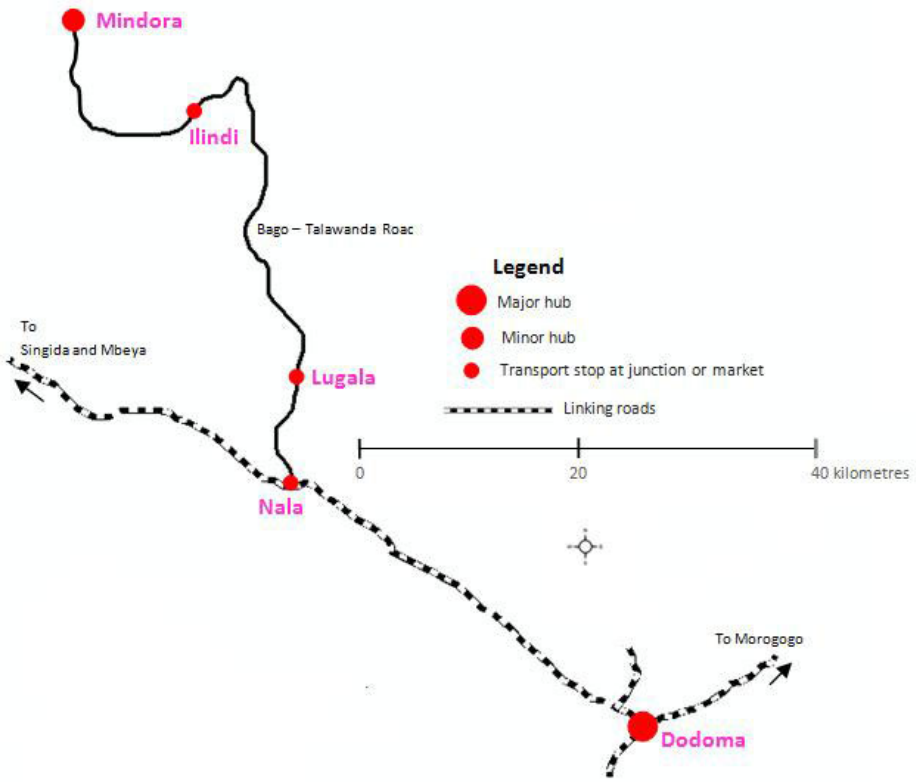



**Fig. 1: Nala–Mbalawala–Mindora road context map**

The first 12 km section of the road from Nala to Mbalawala is of good gravel standard. Much of the subsequent 23 km section from Mbalawala to Mindora is a non-engineered earth road that is in 'poor' condition. There are some drainage culverts and those near Mindora are being replaced. Due to the poor state of this second section of road, motorised transport services are considered unreliable and are disrupted for a period of five months during the rainy season. The major economic activities along the survey road are agriculture and livestock keeping. Crops grown include sorghum, maize, millet, sesame, groundnuts and sunflowers.

## Overview transport services situation and issues

Typical transport services along the Nala–Mbalawala–Mindora road include several motorcycles, two minibuses and one large bus. Bicycles are important for personal transport, including carrying goods, but they are not considered public transport services. Truck operations are important in the dry season, when they are used to buy agricultural produce for sale at the Dodoma market hub. Based on a one day traffic count at Mbalawala, the daily transport along the road comprises 60 bicycles, 20 motorcycles and one large bus. Pack donkeys are quite widely used for freight transport along the road. The daily bus service has an informal timetable, but users say it is nonetheless unpredictable.

Disruption to services is a serious issue and increases in the direction of the Mindora hub. Generally, the road is disrupted for about five months a year, during which time the community survives without a bus service. Based on the surveys, the overall annual passenger volumes were 5000, 4000

and 10,000 for the motorcycles, the two minibuses and a bus respectively (see Table 2 above). The maximum carrying capacity is 2 passengers for motorcycles, 25 passengers for minibuses and 70 passengers in the bus. Both minibuses and the bus make one return trip a day. However, the bus is more disrupted than the minibuses as it starts further up the road where the road is poor. The share of the passenger market for these modes therefore is 26%, 20% and 54% for motorcycles, minibuses and bus respectively.

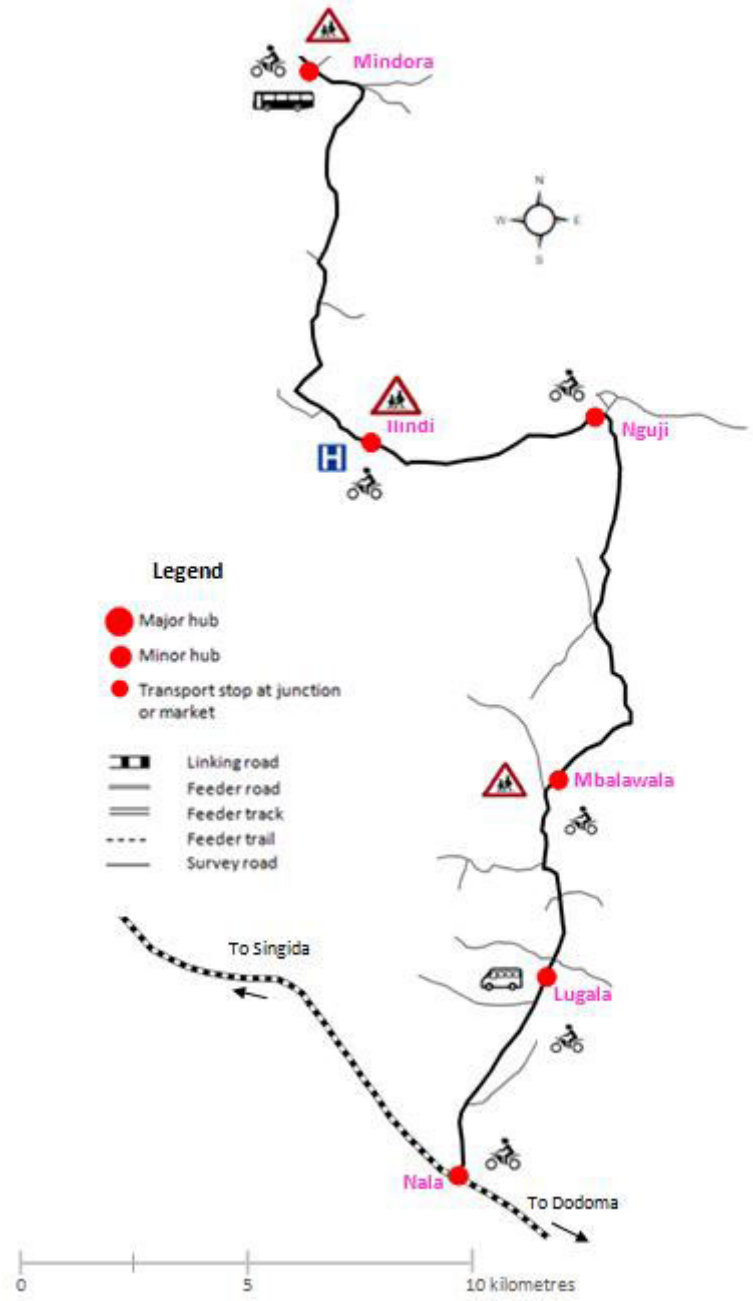



**Fig. 2: Nala–Mbalawala–Mindora road showing hubs, linking and feeding roads**

## User perspectives

A total of 76 users of motorcycles, minibuses and the bus were interviewed for the Nala–Mindora road. Out of these, 43 (57%) were male and 33 (43%) were female. The youngest respondent was a student of 16 years while the oldest was a 70-year-old farmer. The user categories interviewed included farmers, traders, disabled, elderly, students, health users, maternal health care, and those using transport for employment, financial services and/or for socio-cultural or religious reasons.

**Summary of User Satisfaction**

Women and men were asked about their satisfaction with the different means of transport. For motorcycle transport services, 21 (64%) men and 12 (36%) women were interviewed. In the case of minibuses, 13 users were interviewed of which 6 (46%) were men and 7 (54%) were women. Thirty bus users were questioned of which 16 (53%) were men and 14 (47%) were women. Fig 3 presents gender disaggregated levels of satisfaction with passenger fares, journey times, service frequency, and service predictability. Users were very dissatisfied with the passenger fares of motorcycles. They were medium satisfied with the fares for minibuses and the bus. Along the surveyed road, men were satisfied with the journey time for motorcycles while women were medium satisfied. Both men and women were dissatisfied with the journey time and service frequency for minibuses and very unsatisfied with the frequency of the bus. This is partly because the bus operates on a longer and more deteriorated road than do the minibuses. The users also complained about the unpredictability of the transport services on this road. These statistics are illustrated in Fig. 3.

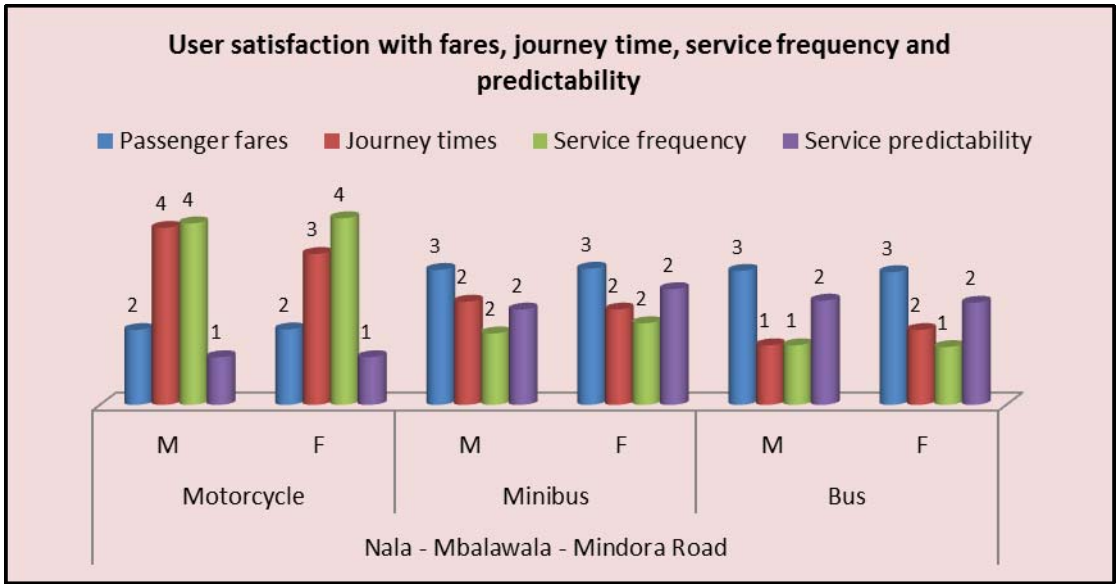



**Fig. 3: User satisfaction with fares, journey time, service frequency and predictability**

In terms of freight characteristics, men and women were medium satisfied with availability of the various modes of RTS to carry small freight (20–50 kg) but they were unsatisfied with the charges. Users were dissatisfied with the availability of motorcycles to carry medium freight and the very high charges. Users were dissatisfied with medium freight on minibuses. Users were medium satisfied with the availability of a bus to carry their medium freight but complained about the transportation cost. Freight handling was not considered a problem. These statistics are illustrated in Fig. 4.

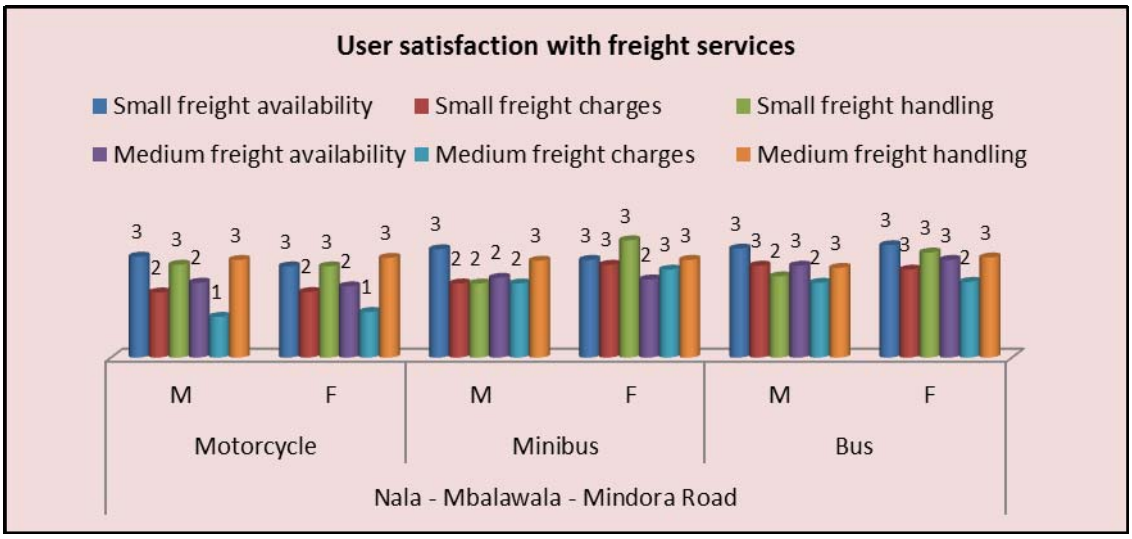



**Fig. 4: User satisfaction to freight characteristics**

The survey results indicate that both men and women were dissatisfied with the safety of all transport modes. Women were more satisfied than men with the security risks (theft, assault, harassment) of the minibuses and bus. Users were dissatisfied with the comfort in terms of seat condition of minibuses and bus but were satisfied with those of motorcycles. Both men and women considered there was poor access for vulnerable people (elderly or physically challenged people) on all modes, and women considered motorcycles particularly difficult for vulnerable people (Figure 5).

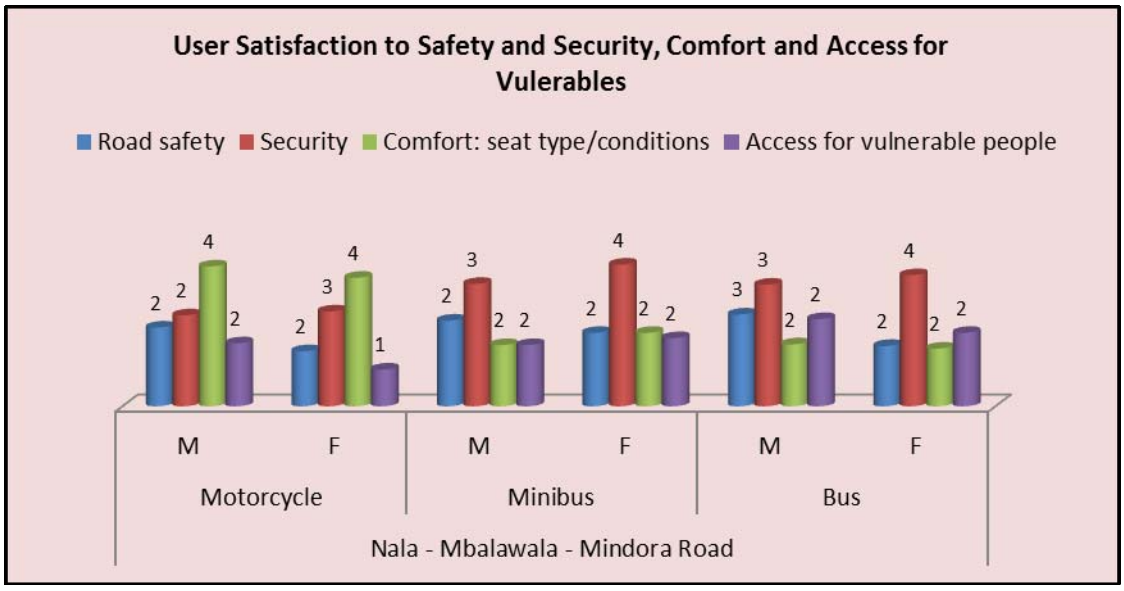



**Fig. 5: User satisfaction to safety and security, comfort and access for vulnerable**

Men and women regard motorcycles as providing very poor comfort in terms of the environment (noise levels/dust/heat) as shown in Table 5. All transport users interviewed indicated that they were dissatisfied with roadside waiting facilities. This is due to the fact that these facilities do not exist. Users were satisfied with the linking intermodal connectivity but dissatisfied with the feeding intermodal connectivity. This can be explained by the fact that the available motorcycles provide feeder transport services that are operated by owners who also use them on other private activities. At the time of the survey, there were no dedicated motorcycle taxi operators available at hubs. However, they could be called from their home bases by mobile phones.

| Table 5. Summary of user satisfaction responses disaggregated for gender | | | | | | |
|---|---|---|---|---|---|---|
| **Means of transport** | **Motorcycle** | | **Minibus** | | **Bus** | |
| **Gender of respondent** | **M** | **F** | **M** | **F** | **M** | **F** |
| *Sample size (N)* | *21* | *12* | *6* | *7* | *16* | *14* |
| Passenger fares | 2 | 2 | 3 | 3 | 3 | 3 |
| Journey times | 4 | 3 | 2 | 2 | 1 | 2 |
| Service frequency | 4 | 4 | 2 | 2 | 1 | 1 |
| Service predictability | 1 | 1 | 2 | 2 | 2 | 2 |
| Passenger capacity | 4 | 4 | 3 | 3 | 2 | 2 |
| Small freight availability | 3 | 3 | 3 | 3 | 3 | 3 |
| Small freight charges | 2 | 2 | 2 | 3 | 3 | 3 |
| Small freight handling | 3 | 3 | 2 | 3 | 2 | 3 |
| Medium freight availability | 2 | 2 | 2 | 2 | 3 | 3 |
| Medium freight charges | 1 | 1 | 2 | 3 | 2 | 2 |
| Medium freight handling | 3 | 3 | 3 | 3 | 3 | 3 |
| Courier services | 2 | 2 | 2 | 2 | 2 | 1 |
| Road safety | 2 | 2 | 2 | 2 | 3 | 2 |
| Security | 2 | 3 | 3 | 4 | 3 | 4 |
| Comfort: space | n/a | n/a | 2 | 3 | 2 | 2 |
| Comfort: seat type/conditions | 4 | 4 | 2 | 2 | 2 | 2 |
| Comfort: surrounding baggage | n/a | n/a | 1 | 2 | 1 | 2 |
| Comfort: environment | 1 | 1 | 2 | 2 | 2 | 2 |
| Access for vulnerable people | 2 | 1 | 2 | 2 | 2 | 2 |
| **Overall un-weighted** | **2** | **2** | **2** | **2** | **2** | **2** |
| **Overall weighted** | | | | | | |

| **Satisfaction for all transport types** | | |
|---|---|---|
| **Gender of respondent** | **M** | **F** |
| Facilities at roadside stops | 1 | 1 |
| Feeding intermodal connectivity | 2 | 2 |
| Linking intermodal connectivity | 4 | 4 |
| **Overall un-weighted** | **2** | **2** |
| **Overall weighted** | | |

The higher the score the better.
1 = Very dissatisfied. 2 = Dissatisfied. 3 = Medium. 4 = Satisfied. 5 = Very satisfied

## Operator perspectives

Five operators were interviewed to provide opinions on the operator's perspective. Three were owner-operators of motorcycles. The minibus operator and the bus operator were both drivers who were retained by the owners. The drivers did not pay a daily leasing fee but paid over the daily income, less the cost of the daily fuel. The minibus driver paid TZS 15,000 (USD 9.38) a day to the owner and the bus driver paid TZS 105,000 (USD 66) to the owner on operating days. Their salaries were not constant, but varied with the level of the operating income. The minibuses and bus each made one return trip a day to Dodoma, leaving in the morning and returning in the afternoon. The road has major seasonal disruption that seriously affects the RTS operations. The road is disrupted for about five months a year. The bus is more disrupted than minibuses and motorcycles. Fares per kilometre were much higher for motorcycles as compared to the bus and minibuses. The average

motorcycles fare was USDc 24 per kilometre, while those for minibuses and the bus were USDc 3. There are no operator associations on this road. Some of the statistics are summarised in Fig. 6.

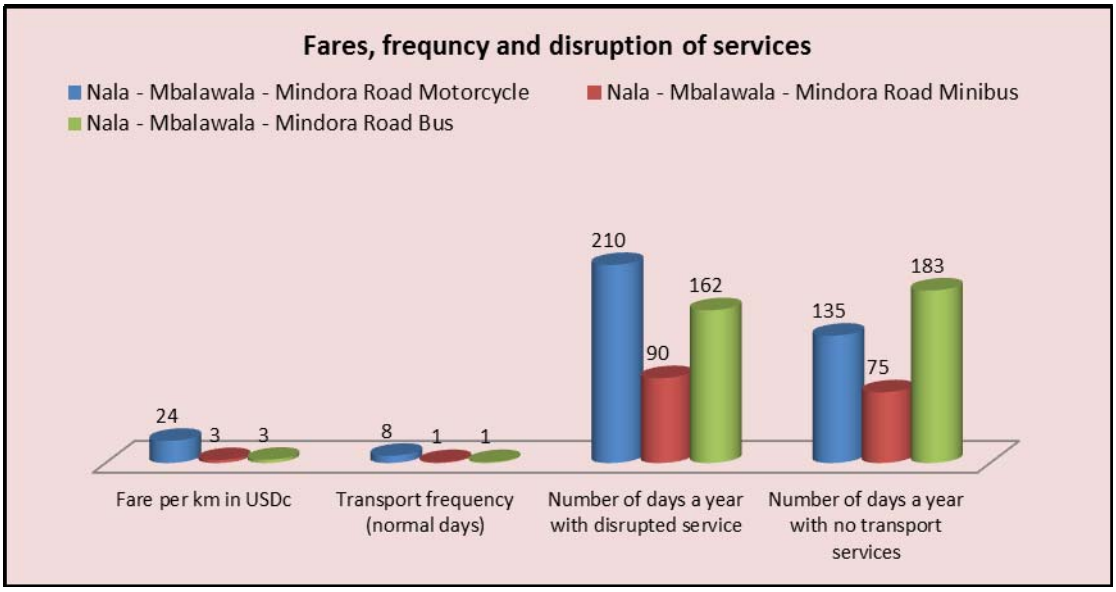



**Fig. 6: Fares, service frequency and disruption along the Nala–Mbalawala–Mindora road**

The survey results for operators indicate that poor road condition and access to capital/credit facilities were amongst the key challenges facing the operators. On the other hand, regulatory issues such as check points, barriers, enforced safety regulations relating to loading levels, crash helmets, seat belts and restrictions on operating hours and routes of operation were regarded as very strong disincentive to operate on the road especially for minibuses and bus. A bus operator confessed that, if they know that they were overloaded they normally bypass Nala junction so as to avoid the weighbridge along the Singida road. Conversely subsidies, tax relief, flat rate tax, and route allocation were perceived as weak incentive to RTS operations along the subject road.

**Table 6. Summary of operator perspectives**

| Means of transport | Motorcycle | Minibus | Bus |
|---|---|---|---|
| *Sample size (N)* | *3* | *1* | *1* |
| Road condition for operations | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Adequacy of working capital | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| Facilities for formal credit | ★★☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Facilities for informal credit | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| Adequacy of technical facilities | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| Regulatory disincentives | ★★★☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| Regulatory incentives | ★★☆☆☆ | ★★☆☆☆ | ★★★☆☆ |
| Active associations | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| Security risks | ★☆☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| **Un-weighted average 2** | ★★☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ |
| **Weighted average 3** | | | |

*The more stars the better.* ★☆☆☆☆ *= Very dissatisfied.* ★★☆☆☆ *= Dissatisfied.* ★★★☆☆ *= Medium.* ★★★★☆ *= Satisfied.* ★★★★★ *= Very satisfied*

## Regulator perspectives

A Ward Executive Officer (WEO), a village secretary and a traffic police officer were interviewed to provide their opinions on the regulator's perspective. The traffic police are responsible for enforcing traffic regulations and have a good understanding about the operators' compliance with traffic

regulations. Ward Executive Officers and village secretaries are also suitable people to interview as they have to travel regularly by public transport and are generally aware of various regulatory issues. Therefore the interviewed people were considered to be authoritative and relevant from the regulator's perspective.

The operators of motorcycles tend to ignore regulatory issues on this road. This may be due to low enforcement capacity and the remoteness of the hubs where these motorcycles operate. Minibuses, the bus and trucks do comply with insurance, tax and financial regulations. They do not generally comply with safety regulations, operational regulations and environmental legislation. There is minimal enforcement of these regulations. Figure 7 and Table 7 summarises regulatory compliance issues.

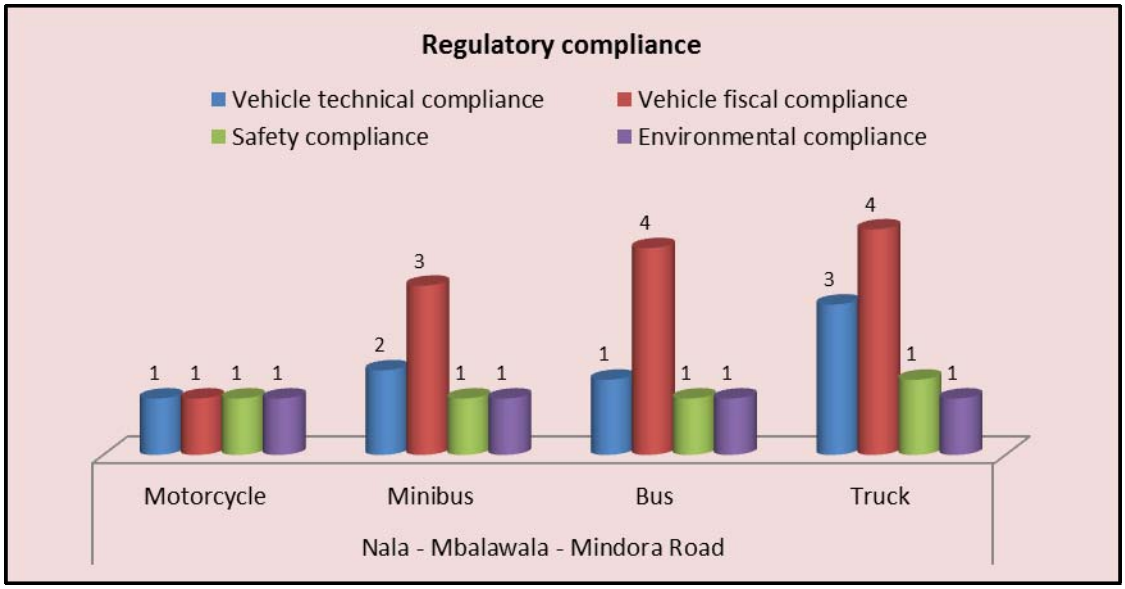



**Fig. 7: Compliance levels with technical, fiscal, safety, and environment along Nala- Mindora Road**

| Table 7. Summary of regulator perspectives | | | | |
|---|---|---|---|---|
| **Means of transport** | **Motorcycle** | **Minibus** | **Bus** | **Truck** |
| Vehicle technical compliance | ★ | ★★ | ★ | ★★★ |
| Vehicle fiscal compliance | ★ | ★★★ | ★★★★ | ★★★★ |
| Insurance compliance | ★ | ★★★★ | ★★★★ | ★★★★ |
| Operational compliance | ★ | ★ | ★ | ★ |
| Safety compliance | ★ | ★ | ★ | ★ |
| Environmental compliance | ★ | ★ | ★ | ★ |
| Regulatory planning framework | ★ | ★★★ | ★★★ | ★★★ |
| Safety of the road | ★ | ★ | ★ | ★ |
| **Un-weighted average** | ★ | ★★ | ★★ | ★★ |

*The more stars the better. ★ = Very dissatisfied. ★★ = Dissatisfied. ★★★ = Medium. ★★★★ = Satisfied. ★★★★★ = Very satisfied*

## Development perspectives

Four people were interviewed to provide opinions for the development perspective. These were a Village Executive Officer (VEO), a Ward Executive Officer (WEO), a nurse and a teacher. The nurse was able to give opinions on how the various type of transport meet the needs of patients and the activities of the various health services. The VEO and WEO were regularly involved in discussions within communities that address development issues such as constraints to rural enterprises,

agriculture and the medical sector. Teachers tend to have had good understanding of various rural challenges, including education and the empowerment of young people. Therefore, the people consulted together are thought to have provided relevant and authoritative assessments of development perspectives.

Opinions from the development perspective showed that the contribution of the existing rural transport services to facilitate agriculture and rural enterprise along the subject road was weak. Despite motorcycles being uncomfortable and difficult for many people, their availability meant that their contribution to development-related transport was large. This was even true for their contribution to maternal health. In fact the overall development impact of motorcycles was greater than that of the minibuses or bus (based on a non-weighted average of all issues).

**Table 8. Summary of development perspectives[1]**

| Means of transport | Motorcycle | Minibus | Bus | Truck |
|---|---|---|---|---|
| Agricultural facilitation | ★★☆☆☆ | ★☆☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ |
| Enterprise/trade facilitation | ★★★☆☆ | ★★☆☆☆ | ★★★☆☆ | ★★☆☆☆ |
| Women's empowerment | ★★☆☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ |
| Minority group empowerment | n/a | n/a | n/a | n/a |
| Disabled people's empowerment | ★☆☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Young people's empowerment | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Maternal health needs | ★★★★☆ | ★★☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Medical service transport | ★★☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Education-related transport | ★★☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ | ★☆☆☆☆ |
| Mobile phone and ICT integration | ★★★☆☆ | ★☆☆☆☆ | ★☆☆☆☆ | ★★☆☆☆ |
| **Un-weighted average[2]** | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ | ★★☆☆☆ |
| Cultural impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| Environment impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★☆☆☆ |
| HIV/Aids impact | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| **Un-weighted average[3]** | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ | ★★★☆☆ |
| **Weighted average[4]** | | | | |
| **Overall weighted average[5]** | | | | |
| Integration with feeder transport | | ★★☆☆☆ | | |
| Integration with external transport | | ★★★☆☆ | | |
| Road maintenance adequacy | | ★☆☆☆☆ | | |
| **Final weighted average[6]** | | | | |

*The more stars the better, from the development perspective. For example, the contribution of each mode of transport to the achievement of development goals in that area of concern has been rated by the people interviewed as:* ★☆☆☆☆ *= Very poor.* ★★☆☆☆ *= Poor.* ★★★☆☆ *= Medium.* ★★★★☆ *= Good.* ★★★★★ *= Very good.*

## Conclusions

The survey of the Nala–Mbalawala–Mindora road (35 km) gives a fascinating picture on how transport demand in rural areas can attract various types of rural transport services. It is very unusual for a 65-seater bus to operate on a narrow, sandy and un-engineered road. However due to the poor road and the weather, this crucial service cannot operator for about five months of the year. In the rainy season, many people have to walk or cycle as the number of motorcycle taxis is still small. However, the relevant authorities appear to be responding to the issue and are rehabilitating the road with drainage culverts.

The overall satisfaction for all forms of transport was low. The key concerns for the users included the poor service frequency for buses, poor predictability for motorcycles and high cost of medium freight (100–200 kg) on motorcycles. Operators complained about the poor road condition, lack of access to capital/credit facilities and poor technical support facilities. Regulators noted very low compliance levels for motorcycles, but buses and minibuses complied quite well with insurance and fiscal regulations. The people providing a development perspective considered that overall transport contribution to development was poor. Although all means of transport were less than satisfactory, motorcycles were rated as the means of transport contributing most to development (based on the un-weighted mean).