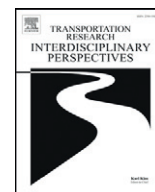




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Rural Transport Services Indicators: Using a new mixed-methods methodology to inform policy in Ghana



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ABSTRACT

Rural people need access to markets and services. In developing countries, where private vehicle ownership is limited, villagers depend on public transport services. However, research evidence available to inform policy formulation is often extremely limited. To better understand the characteristics, costs, frequencies and acceptability of rural transport services in Ghana, data was collected using a methodology developed by the International Forum for Rural Transport and Development. This methodology combines traffic count data with structured qualitative interviews with transport users, operators, regulators and local development experts. A key finding concerned motorcycle taxis which, although officially banned in 2012, remain a common sight in rural Ghana and are generally appreciated by transport users and other stakeholders. Following our presentation of findings to an audience of national stakeholders and policy-makers, a consensus emerged to continue restricting commercial motorcycle operations in cities and on highways, but allowing them on rural roads, if combined with appropriate safety training and regulations. These findings feed into an ongoing policy debate about motorcycle taxi transport in Sub-Saharan Africa.

1. Introduction

Rural women, men and children in developing countries need access to markets, health facilities and education. Rural road construction and maintenance is important for socio-economic development (Berg et al., 2016), but only half the solution. Without means of transport, road use will be limited to walking. Most households in developing countries do not own motorised transport, and depend on public transport services which are typically operated by the informal private sector. As freight and passenger volumes from villages are quite low, most operators of 'conventional' transport use small vehicles such as sedan cars (shared taxis), minibuses and pick-up trucks. Vehicle operating costs on poor roads are relatively high, and profits can be low – often too low to use new vehicles or to keep to 'one-person-per-seat' regulations (Starkey, 2016a).

In many developing countries, conventional transport services are complemented by intermediate means of transport, notably motorcycle taxis and, to a much lesser extent, motor tricycles. Motorcycle taxis represent both a solution and a problem. They offer timely transport of people and goods, with no waiting time, and people are taken straight to their required destinations. However, travel on motorcycles can be

risky, with little or no protection. The result is that where there are many motorcycle taxis in use, there are often increasing numbers of crashes, injuries and fatalities, to which the authorities have to respond. For example, Ghana, the focus of our study, prohibited the use of motorcycles and tricycles for commercial taxi purposes across the country with legislation in 2012. Enforcement of the ban was speedily started in the capital, Accra, but is yet to be successfully enforced in the more rural areas of Ghana. Clearly, rural areas have a different set of public transport challenges than their urban counterparts.

Given the relatively recent but rapid spread of motorcycle taxis in rural sub-Saharan Africa, there is an urgent need to gain an up-to-date and enhanced understanding of the prevailing rural transport situation. This will help to inform policy-making and identify key areas for policy intervention and/or further in-depth investigations, including arguments for and against the current ban on motorcycle taxis and commercial motor tricycles. To provide the 'evidence' for 'evidence-based policy formulation', the authors conducted a Rural Transport Services Indicators (RTSI) diagnostic study in three rural locations in Ghana. An RTSI diagnostic study is a quick and relatively low-cost exercise to provide an up-to-date understanding of both the access and mobility issues of rural communities and how various public transport services (conventional and intermediate) are perceived by users, operators, regulators and those concerned with rural development.

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The Ghana study also showed that the RTSI methodology – developed and tested by the International Forum for Rural Transport and Development (IFRTD) – can be used by others who were not previously familiar with it. A detailed description of the methodology can be found at the ReCAP website under ‘Rural Transport Service Indicators: Guidelines to the methodology’ (Starkey et al., 2013b). Previous RTSI studies (in Kenya, Tanzania and Cameroon) all included at least one consultant involved in the development of the indicators. This Ghana RTSI study however is the first conducted by a team of researchers (this paper’s authors minus Starkey) who were not involved in the development of the methodology, boding well for the usage and applicability of this policy-oriented research exercise at national or even local level in development countries.

2. Rural transport services in developing countries

Few rural dwellers in Ghana (and other African countries) own motorised means of transport. For most people, particularly the poor, making a journey beyond a walking distance implies using public transport. This confronts the rural dweller with a plethora of transport challenges such as non-availability, unpredictability, high transport fares and overcrowding of rural transport services (Hine, 2014). Rural people need access to markets, health centres, education services, employment and social facilities (Porter, 2014). Rural road construction or improvements – a key focus of the World Bank in the 1950s and 1960s – is only one half of the solution to increase rural mobility, stimulate economic growth and reduce poverty: having wheeled and in particular motorised transport operating on the road is the other half (Bryceson et al., 2008). For example, Atuoye et al. (2015) have highlighted the barriers and constraints pregnant women face in rural areas when attempting to access obstetric health care. Porter and Blausfuss (2002) found that transportation difficulties affected educational development, with rural students having to walk for 6–8 km, on average, for a round trip to school which affected their lives and academic progress. Poor rural transport services negatively affect school attendance – with female students particularly likely to drop-out (Danso-Wiredu, 2011) – and educational provision, through the quality of teaching staff, their attendance and retention at posts. Public transport constraints in rural areas are thus contributing to the gap between urban and rural education. While not one of the 17 United Nations (2015) Sustainable Development Goals rural transport directly or indirectly facilitates: Goal 1 (no poverty); Goal 2 (zero hunger); Goal 3 (good health and well-being); Goal 4 (quality education); Goal 8 (decent work and economic growth) and Goal 10 (reduced inequalities). Njenga and Otero (2014), in their *African Position Paper on the Role of Transport in the Sustainable Development Goals*, recognise contributions to even more SDGs.

Very few countries in the world have integrated national transport authorities that are responsible for transport infrastructure and transport services. In many countries, the authorities responsible for public transport services tend to be weak and underfunded (relative to roads authorities), and so they concentrate on high-density transport situations in urban areas and on inter-urban routes. They are seldom engaged in proactive planning relating to rural transport services (Starkey, 2016a). In Ghana, the central government is engrossed with urban and intra-urban transport provision, with proposals for timetabled urban Bus Rapid Transit lines and improved inter-city buses from the State Transport Cooperation. There is not yet any explicit transport strategy for rural transport services. Transport services in the rural areas are mainly provided by the small-scale private sector. Where larger operators can cope with timetabled services (and some low-profit runs) provided their ‘average’ profits are acceptable, a characteristic of small-scale transport is that the operators need to make a profit on each and every trip. This encourages the practice of queuing and waiting (for an uncertain and possibly long time) for

the taxi or minibus to fill before leaving the transport hub, and overloading.

In many countries in Africa (and Asia and Latin America) there has been a spontaneous and rapid growth in motorcycle taxi services in rural areas over the past twenty years (Starkey, 2016b). Porter (2014:4) noted that this more or less coincided with the expansion of mobile phone networks, leading her to observe that: ‘For the first time in African rural transport history many – even very poor – rural dwellers may have the potential to summon transport when they need it.’ In many areas motorcycle taxis are now the most common form of rural transport. While Burkina Faso, Benin and Côte d’Ivoire were among the pioneers in the widespread use of mopeds for personal mobility, the development of motorcycle taxi services in West Africa centred on Nigeria, where they are known as ‘okadas’. From there they spread rapidly to Cameroon, Benin and Ghana, as well as Sierra Leone and Liberia. Similarly, the use of motorcycle taxis arose in Uganda, Rwanda and Kenya and then spread to Tanzania, with the name ‘boda-boda’ (referring to their original use to cross the Uganda-Kenya country border) spreading along with it. Motorised three-wheelers have also spread, but at nothing like the same extent and speed. Motor tricycles are mainly used in urban areas for small-scale freight transport services and passenger transport.

In Ghana, motorcycle taxis and motor tricycles too have spread recently in rural areas, in response to transport demand and inadequate conventional rural transport services. Bryceson, et al. (2003:192) observed a similar relation in Uganda in the early 2000s, stating that: ‘Boda boda flourish where more conventional motorized public transport services are uneconomic or physically impossible.’ Now, motorcycles and tricycles are increasingly important means of transport, even on roads where conventional public transport vehicles can or do operate, representing about one-tenth of the two million vehicles registered in Ghana. There are, however, significant regional differences, with motorcycles and motor tricycles representing over 90% of all registered vehicles in northern Ghana, and yet only about 15% of registered vehicles in southern Ghana (DVLA, 2014).

As noted, Ghana currently has a legislation that prohibits the operation and use of motorcycle taxis and motor tricycle taxis throughout the country. Ghana’s Road Traffic Regulations (Ghana, 2012) includes a section on ‘Prohibition of use of motorcycle or tricycle for commercial purpose’, stating, among other things, that: ‘a person shall not ride on a motorcycle or tricycle as a fare-paying passenger.’ Other countries, including Nigeria, Cameroon, Liberia and Kenya, have banned motorcycle taxis as well, but only from particular cities or streets. The discussion surrounding the enactment of the 2012 legislation had centred primarily on their use in and around Accra where they had become widespread, mainly due to their profitability, timeliness and ability to beat congestion (Oteng-Ababio and Agyemang, 2012, 2015). The increasing number of motorcycles and tricycles in Ghana has unfortunately resulted in a large increase in road traffic injuries and deaths. Motorcycle and tricycle related traffic fatalities increased from 94 in 2006 to 323 in 2015. This represents a 244 percentage increase, which is particularly disturbing because there was a 3% overall reduction in national traffic fatalities during the same period (BRRI, 2016:34). The increase is partly attributable to the large growth in motorcycle numbers, as well as to the inherent safety issues, particularly in areas that have many moving vehicles and/or fast traffic. Note that in their study on motorcycle collisions in Nigeria, Solagberu et al. (2006:266) found that the type of collision resulting in the most morbidities and mortalities were between a motorcycle and another (non-motorcycle) vehicle, which is likely to happen more in urban rather than rural areas. Nevertheless, serious concerns were raised related to the absence of driver training and required testing, the lack of insurance for commercial operations, the minimal use of safety equipment (crash helmets and high-visibility jackets) and the high numbers of crashes causing injuries and fatalities. Some of these concerns are equally applicable to more conventional means of transport. Jones et al. (2014:8) – having synthesized the literature on public

transport and health outcomes in rural sub-Saharan Africa – conclude that: ‘factors contributing to unsafe rural public transport were attributable to economic barriers to proper operations’, including vehicles’ poor mechanical conditions and lack of maintenance, and poor driving due to lack of training. All of these factors can be addressed with targeted policy interventions.

3. Data and methods

3.1. Conceptual framework

The conceptual framework underpinning this research is the ‘hub and spoke’ model, which has proven particularly useful in the appraisal of rural transport services. The idea uses a hub and spoke image (as, for example, a bicycle wheel) to illustrate the convergence or divergence of road networks from a settlement (Starkey, 2007). Each hub has a catchment area served by spokes. The transport hubs are the settlements which can range from villages (served by low volume roads, footpaths and tracks) to the national capital (served by the highways of the primary national road network) with specific transport services appropriate to the requirements of that transport catchment area. Just as the road network can be analysed in terms of international, national, provincial, district and village hub-and-spoke systems, so can the various transport services. This is important for our study because some roads have a role in more than one hub-and-spoke system: for example, national inter-urban roads may carry some short distance, village-to-town transport services for parts of their length. This may have implications for road safety, as local transport (perhaps slow and overloaded) is mixing with faster-moving longer-distance traffic. This study was focused on the transport services on the rural roads that link people in villages to their nearby small towns with markets, hospitals and secondary schools.

Rural public transport services in Ghana are provided by a range of vehicles, conventional and intermediate. The conventional vehicle types include the shared rural taxis (saloon and estate models), large buses, midi-buses and minibuses. Minibuses, known locally as ‘tro-tros’, are four-wheeled models with 12 to 16 seats. Midi-buses generally have six wheels (twin wheels on rear axle) and a capacity of 19 to 30 seats, while large buses have long-wheelbases and generally more than 40 seats (Starkey et al., 2013b). The larger vehicles (buses and midi-buses) mainly operate on national roads (as part of higher-level hub and spoke systems).

Intermediate means of transport (IMTs) are mainly two-wheel and three-wheel vehicles that provide local transport solutions, filling a gap between walking and carrying loads and conventional means of transport. While the IMTs may seem ‘unconventional’ from a modern, urban, ‘Northern’ perspective, millions of them are in daily use for private and public transport in many ‘Southern’ countries. In Ghana, the main intermediate forms of public transport in rural areas are provided by motorcycles and motor tricycles.

3.2. The Rural Transport Services Indicators methodology

The Rural Transport Services Indicators (RTSI) methodology allows researchers to gain a rapid understanding of rural transport services on particular roads (Starkey et al., 2013a, 2013b). As such it builds on a methodological legacy that started in 1980s with ‘village-level travel and transport surveys’ (VLTTs) and continued in the 1990s with the use of ‘integrated rural accessibility planning’ (IRAP) tool (Banjo et al., 2012). However, where the VLTTs and IRAP tools focus on village-based user demand, the RTSI is looking at transport supply. The RTSI methodology uses standardised check-lists and ‘Rapid Rural Appraisal’ techniques to enable a small multidisciplinary team of researchers to quickly (in four or five days) gain an understanding of the perceptions on- and experiences and challenges with rural transport services operating on a rural road and serving a catchment area. The methodology had previously been used effectively in Cameroon (Kemsop

and Starkey, 2013), Kenya (Njenga et al., 2013) and Tanzania (Willilo and Starkey, 2013).

The qualitative methodology requires in-depth discussions with about fifty people in each road catchment area in order to identify the key issues from a wide range of perspectives (Starkey et al., 2013b). This includes interviewing approximately 30 transport users of different ‘categories’ (farmers, traders, those who travel for healthcare, older persons, people with disabilities, etc.). The methodology stipulates that half of the transport user interviewees should be women. Bryceson and Howe (1993:1716) already noted the gendered dimensions of transport needs in the early 1990s: ‘Responsibilities for transport is based primarily on local consensus regarding the sexual division of labour in the household.’ Per study area/road interviews should be conducted with at least three people involved in local development initiatives (e.g. NGO worker, nurse, village chief, etc.), three regulators/enforcers and at least three operators for each form of public transport (whether conventional or intermediate) operating on the road. Some questions record quantitative information from stakeholders, such as travel frequencies, fares, operating costs, prices, distances, dates and times. However, due to the small sample sizes, and the purposive sampling procedure used, no inferential analyses were conducted to ascertain any statistical significance of differences between or within groups. Nevertheless, triangulation is embedded within the methodology to establish the veracity of quantitative information obtained from the various sources. This ensures that a reasonable and consistent consensus emerges concerning the actual fares, costs, frequencies and loading levels of the various forms of transport.

A Likert-scale was used to document road users’ (disaggregated by gender) self-rating of satisfaction for rural transport services. On the study’s Likert-scale, the following scores were possible: 1 = very dissatisfied; 2 = dissatisfied; 3 = medium (average); 4 = satisfied and 5 = very satisfied. Similar scales were used to record the opinions of operators of the various forms of transport, the regulating and enforcing authorities and relevant organisations/individuals who could comment on the rural development implications of the transport services. For each and every scoring the respondent was encouraged to explain the reasons for their scores. This is where the study entered the qualitative domain, with a 5 min scoring exercise becoming a 45 min structured but open-ended interview. Explanations were written down by the researchers.

Three researchers (two Ghanaians and an international technical advisor), experienced in transport, safety and social issues – but previously not familiar with the RTSI methodology – conducted the surveys and interviews. At each location, classified traffic counts and vehicle occupancy surveys (disaggregated by gender and age) were carried out by the team’s two research assistants, who in turn, were supported by locally recruited data collectors to ensure vehicle operators’ willingness to cooperate. These counts and surveys were conducted on two or three days; one on a non-market day and one (or two if two markets were frequented) on a market day, for 12 h from 6:00 am to 6:00 pm. The research team entered the selected communities through community leaders such as chiefs, local area assembly members and religious heads. These leaders helped to alleviate feelings of apprehension typically associated with in-depth interviews in rural settings and in identifying some of the pre-defined categories of users to interview who might have otherwise been difficult to identify (such as people with disabilities, older persons and pregnant women). Other categories, such as farmers, traders and people travelling for work, were randomly selected while walking through the village and at the roadsides at different times of the day.

3.3. Study area

Data collection took place during the dry season, in January and February 2017. A rural road was selected (between 15 and 50 km in length) in each of three distinctive ecological zones: coastal savannah, semi-deciduous forest and Guinea savannah. This allowed for a more representative picture, given that the ecology and topography often has a significant

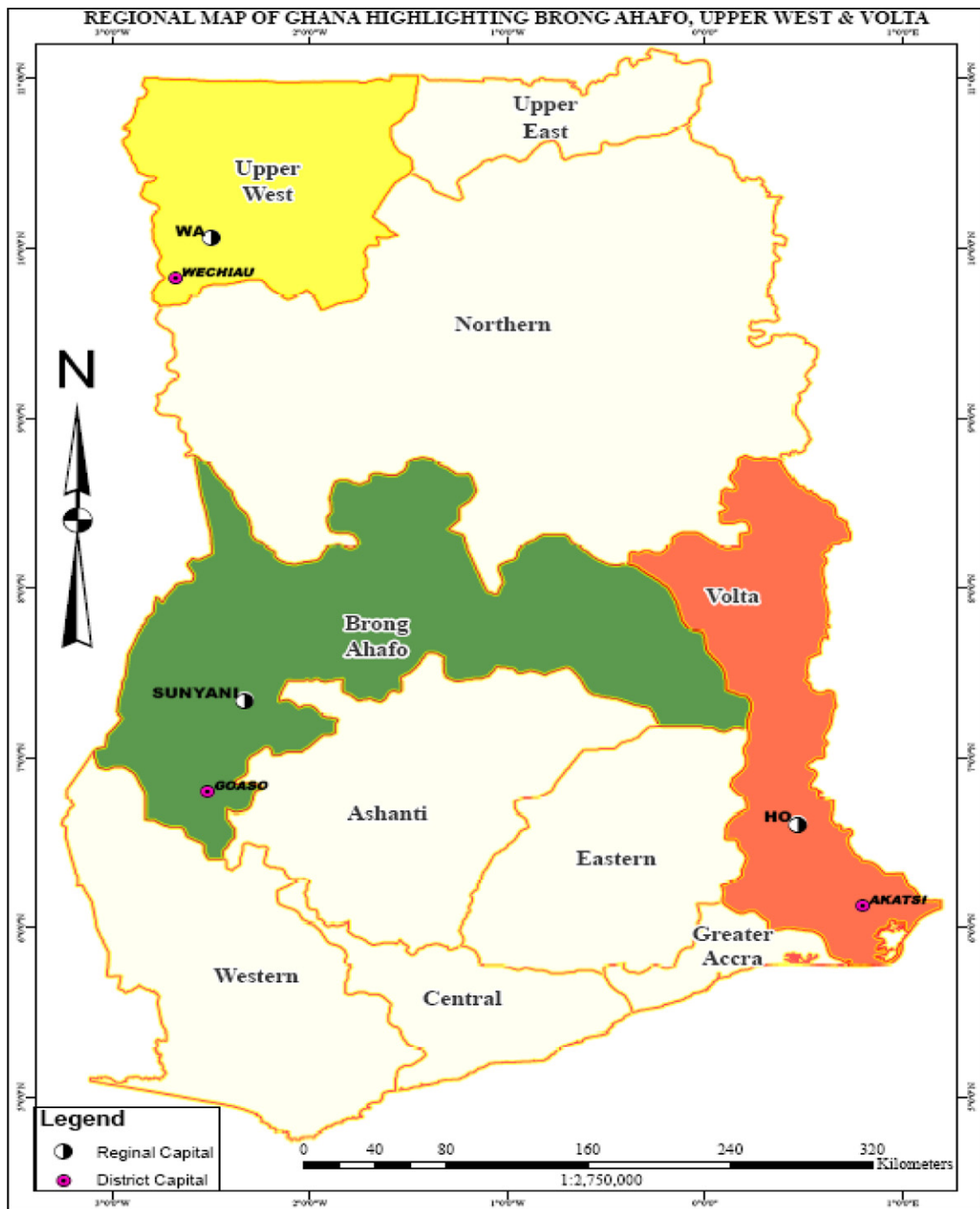


Fig. 1. Map of Ghana highlighting the three study regions.

impact on the nature of rural livelihood activities, the road characteristics/condition and means of transport. In this ecological order, the selected roads were the Abor-Avenorpeme-Hatorgodo road (henceforth Hatorgodo road) in the Volta Region; the Gyasikrom-Ayomso-Goaso road (henceforth Gyasikrom road) in the Brong Ahafo Region; and the Wa-Wechiau-Tokali road (henceforth Wechiau road) in the Upper West Region. The regions are shown in Fig. 1.

3.3.1. The Hatorgodo road

This road originates at Hatorgodo and runs through Avenorpeme to Abor, covering a distance of approximately 15 km (see Fig. 2). Although a

low-volume rural road, it was asphalted in 2015, which provided an opportunity to investigate any transport changes that had occurred since it was upgraded from a gravel surface. The surveyed road, passing through a flat landscape, was in good condition, although the first potholes had emerged. The Hatorgodo road links up with Route One (N1), a national highway. Westwards, the N1 links Abor with the district capital, Akatsi, 10 km away, which is the main market destination for the Hatorgodo catchment. Besides the large Akatsi market, there are also markets at Atiavi and Abor. All three operate on 5-day rotational cycles. Beyond Hatorgodo there are a few communities, including Ledzorbui and Agorvinu, which can be accessed by crossing the Hator creek by a dugout canoe.

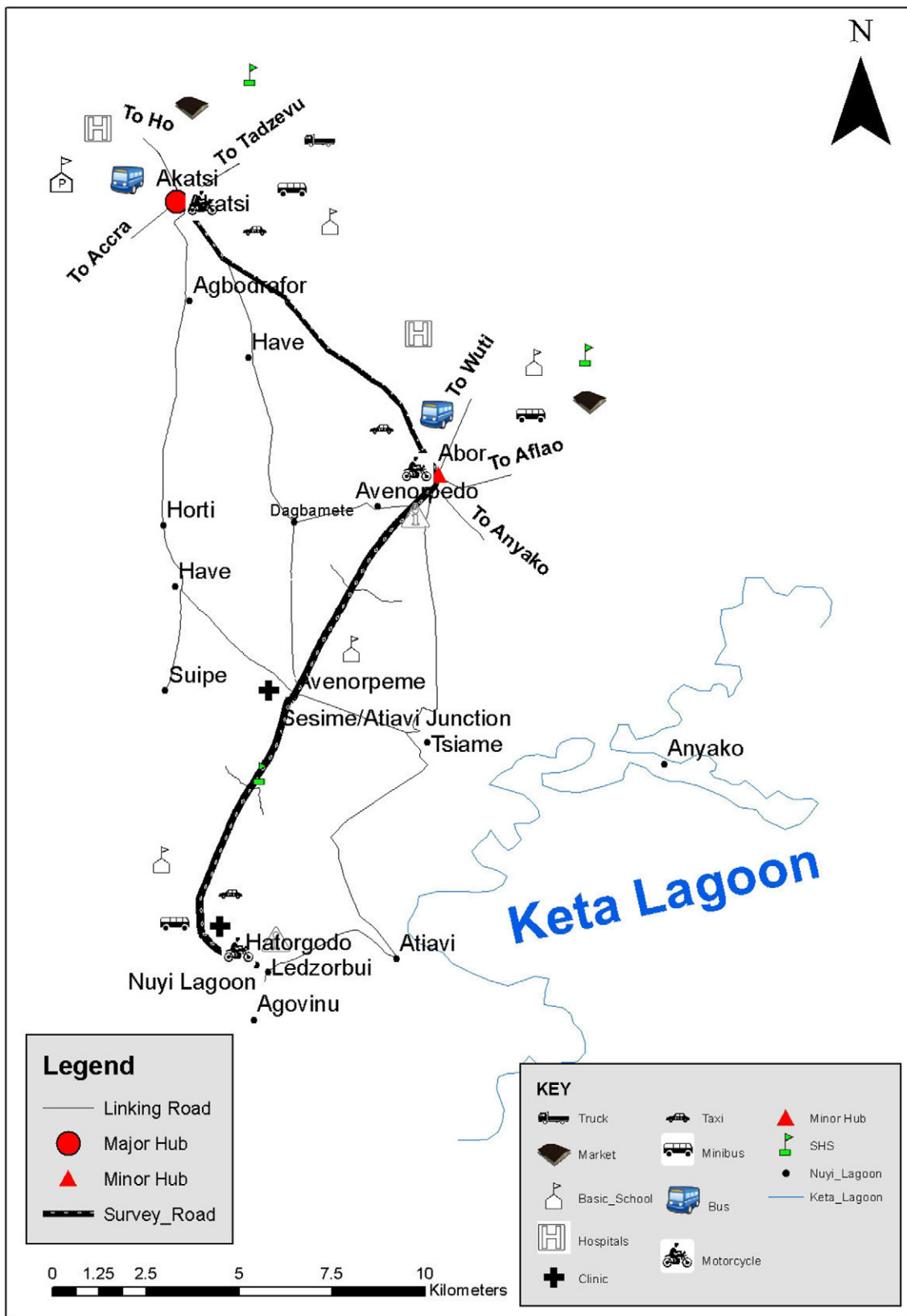


Fig. 2. Map showing the Hatorgodo survey road.

3.3.2. The Gyasikrom road

The Gyasikrom to Goaso road starts as a 19 km unpaved feeder road, going to Ayomso, a small transport hub with a weekly market. It then continues for 9 km to Goaso, the district capital which is located along paved

Route 12 of the national highway network (see Fig. 3). The rural road passes through an undulating landscape and semi-deciduous forest. About 5 km from Gyasikrom, the road transverses the Ayum forest reserve. The gravel road is said to become uncomfortably dusty during the dry season

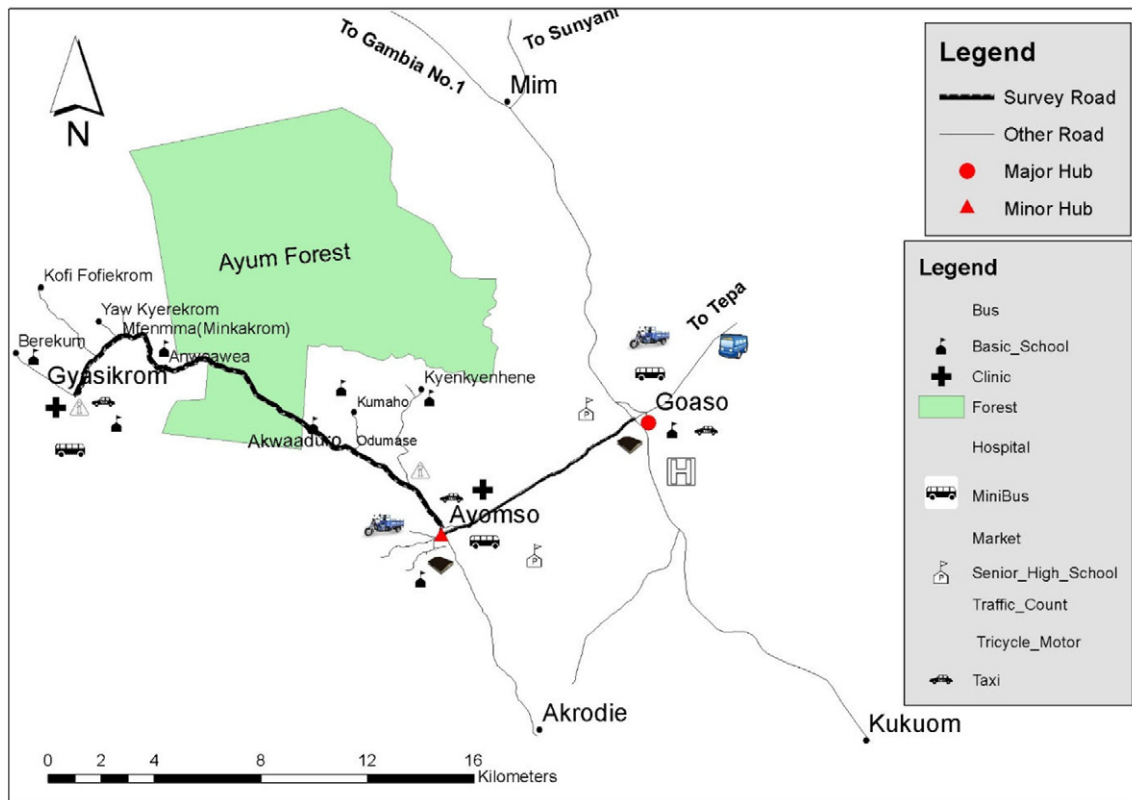


Fig. 3. Map showing the Gyasikrom survey road.

and muddy and slippery during the rainy season, both of which affect transport operations. The road also serves small off-road communities including some beyond Gyasikrom.

3.3.3. The Wechiau road

The 49 km Tokali-Wechiau-Wa gravel road, as shown in Fig. 4, is the longest of the three surveyed roads. Wechiau is the district capital town (and a small market and transport hub), while Wa is the regional capital and a major market and transport hub, located on the national highway network. Most markets in the area have six-day cycles. Lassia-Tuolu on the road has a Senior High School, which serves Wa West District. The Guinea savannah ecology supports mixed farming on the generally flat topography. The road suffers from dust for much of the year and flash floods during the short but intense rainy season. Interestingly, there is an alternative road between Wechiau and Wa that is in better condition and passes via Dorimon. However, transport service providers prefer the more populated route via Lassia, which was the road surveyed.

4. Results of the study

4.1. Service frequency and predictability

The opportunities to travel by public transport are generally limited and erratic in rural communities. An indicator of service frequency can be ‘travel opportunities’, defined as ‘the number of opportunities users have each day to travel to the main transport hub destination’. For example, if transport services vehicles passed hourly, there would be 12 opportunities a day. For the purpose of this research, the authors distinguished between normal days, market days (generally with higher traffic volumes) and disrupted days (when road condition or weather prevent normal travel patterns). Given that data usually tends to be collected during the more convenient dry season (as was also the case for this study) the ‘disrupted’ days

question is particular important, as [Blanford et al. \(2012:1\)](#) state: ‘... population served by health [and other] facilities will be severely overestimated if assessments are solely conducted during the dry season.’ The number of ‘travel opportunities’ per normal (non-market) day by different types of vehicles is illustrated in [Table 1](#).

Clearly, each road has its own unique mix of vehicles operating on it, underscoring the need to look at different and geographically disperse locations, to appreciate the nature and complexity of rural transport services in a country. On the Gyasikrom road, an average of 13 travelling opportunities were available to residents on a normal day. Among these limited travelling opportunities, seven out of the 13 were provided by motorcycles and tricycles. Of the three surveyed roads, only the Hatorgodo road has more than 20 travelling opportunities per day on a non-market day. However, most of the travelling opportunities on this road are provided by motorcycle taxis, which do have limited passenger and freight carrying capacity. Freight carrying capacity is particularly important for rural dwellers, for instance when travelling to a market to sell one’s agricultural produce. Farmers typically sell at markets once every week or fortnight, with the freight’s weight (but not necessary the volume) quite limited. The RTSI methodology distinguishes between ‘accompanied freight’ (20–50 kg) and ‘unaccompanied freight’ (c. 200 kg). The availability of public transport services is mainly limited to daytime hours and tends to be more frequent in the morning and late afternoon. The limited availability of public transport services can have severe implications, as the following comment of a young woman illustrates:

My father had been taken sick overnight and was taken to Gyasikrom clinic. He was referred to a hospital but there were no means of transport available until daybreak, and, sadly, he died on arrival at the hospital the following day.

None of the studied roads had scheduled transport services operating on them, although the first services of the day tend to leave around

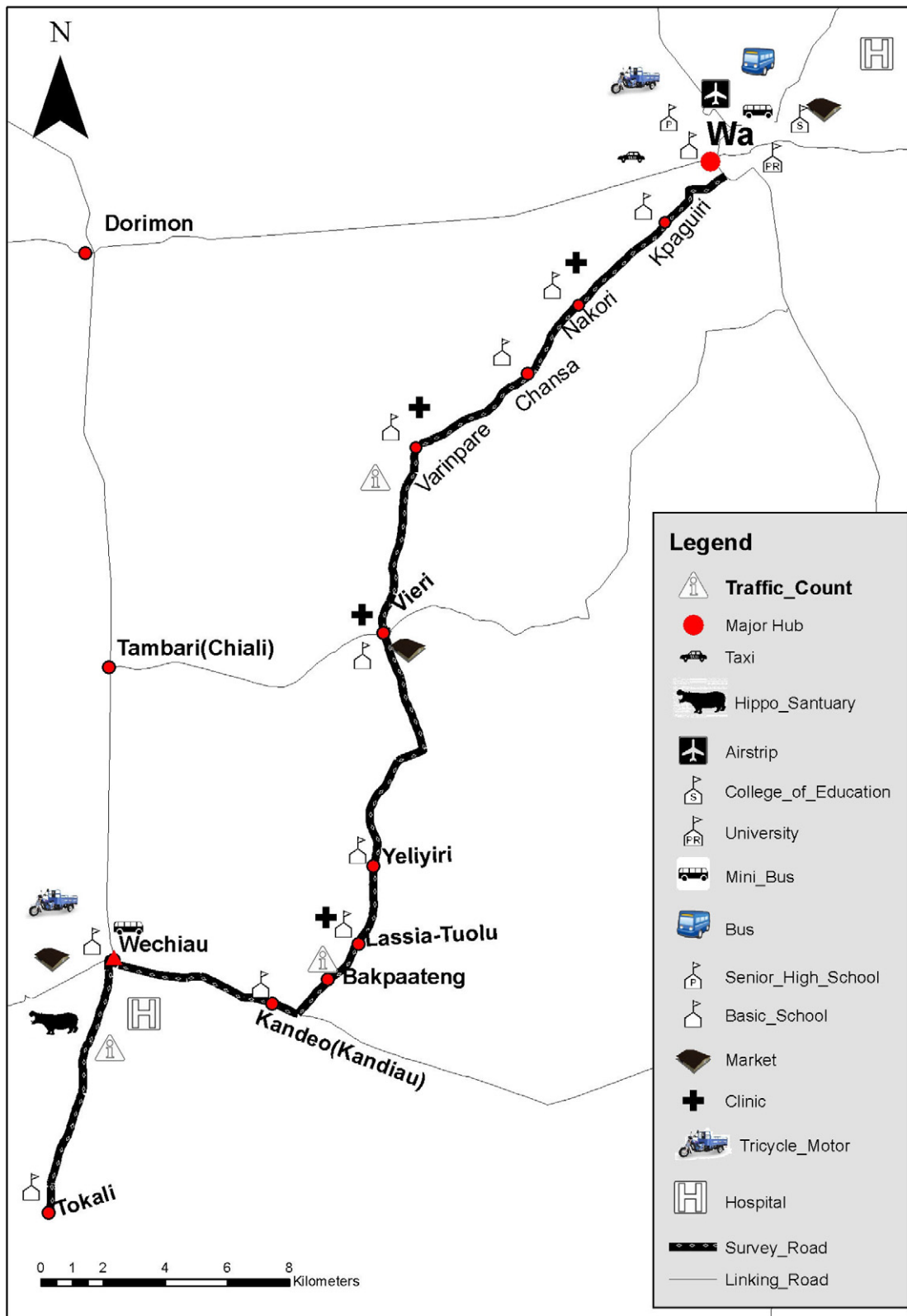


Fig. 4. Map showing the Wechiau survey road.

the same time each morning. Conventional means of transport only leave when full, which makes transport unpredictable and often results in long waiting times (some respondents indicated that they often have to wait 3 h for a vehicle). It was also observed that where there is more

than one means of transport operating on the same road, the larger vehicle can be disadvantaged, despite charging lower fares. For instance, it takes at least 12 persons to fill a minibus, but a motorcycle taxi will depart with just one or two persons. Therefore, when five or six persons

Table 1
Number of transport opportunities available on a normal day by means.

Transport means	Number of transport opportunities on normal days		
	Gyasikrom road	Hatorgodo road	Wechiau road
Minibus(tro-tro)	n/a ^a	n/a ^b	5
Car taxi (saloon/estate)	6	5	n/a ^a
Motor tricycle	3	n/a ^a	4
Motorcycle taxi	4	18	3

^a Not applicable as this vehicle type does not operate on the road.

^b Minibuses only operate along the road on market days.

are waiting for the minibus to fill up, some of these passengers may be lured away by an arriving motorcycle taxi, thus further increasing the ‘fill-up’ time for the minibus. Despite this, taxi and minibus operators generally regard motorcycle taxis as complementary, as they also bring people from isolated communities to the larger vehicles, thereby increasing their loading levels.

Limited transport opportunities are particularly problematic for people living off the main road. In an interview with the chief and elders at Kyenkenhenekrom, a village 4.5 km off the Gyasikrom road, one of the elders stated that:

Steep hills render accessibility to this village difficult. The road gets worse during the rainy season and transport is disrupted. Sometimes, it takes more than a month for us to see a car in this village.

The Kyenkenhenekrom chief illustrated what the implications of no or very limited transport services can be for rural communities:

When school children complete Primary 6, they have to join the Junior High School at Ayomso, 7 km away. Students who stay with their parents here have to walk 14 km a day. Otherwise, their parents have to rent lodgings or find a friend or relative for the child to live with.

On the Gyasikrom and Hatorgodo roads, minibus and midi-bus services operate only on market days. A male farmer at Kofi Fofiekrom (off the Gyasikrom road) reported:

Travelling along the road is problematic as no minibus comes here except on market days and no public transport vehicle is available after 6 pm.

A student corroborated this by saying: *If you arrive late in the day, you are unlikely to get transport.* The limited availability of transport services makes passengers take any passing vehicle, even if they have to sit on the roof of a bus or in the boot of a car. People reported that the fares are the same whether one travels on top of the bus, or inside it. Generally, road users were neutrally satisfied with the service frequency of motorcycles, with both men and women rating them with an average of 3 (medium/average) out of 5. This was only slightly higher than the satisfaction scores for service frequency for the more conventional means of transport. Although motorcycle taxis were common in the Hatorgodo area, they were not (yet?) widespread in the Wechiau and Gyasikrom areas. Here, many of the motorcycles and motor tricycles were used privately (although the owners sometimes helped out friends and family with their transport, in exchange for fuel money). The penetration of motorcycle taxis and tricycles is an ongoing process in rural areas, despite their abundance in many urban areas.

4.2. Travel comfort

Passengers and freight overloading of vehicles was commonplace on the rural roads surveyed. During open-ended interviewing, most users interviewed complained about overloading as a major transportation inconvenience. For the Gyasikrom road, car taxis with seating for a driver and four passengers will often carry six (two on the front seat, four in the back) with sometimes additional people in the boot. Similarly, minibuses and midi-buses increase the number of passengers per row (and even the

number of rows), and sometimes carry extra passengers on their roofs, to the detriment of passenger comfort and safety. Passenger discomfort is also caused by luggage (all vehicles were found to mix passengers and freight): people want to travel with their own things, but not be inconvenienced by the goods of others. Respondents complained of the pain and exhaustion caused by overcrowding and unnatural sitting positions. Motorcycle taxis can also be uncomfortable due to multiple passengers and freight. While they also expose passengers to the environment (dust, rain, sun), they do leave speedily and their journey times are relatively short. In the northern part of Ghana, minibuses are referred to as ‘ovens’ as temperatures in a waiting minibus can reach 40 °C.

Though transport services in rural areas are generally limited and inconvenient for all, vulnerable people suffer even more in their day-to-day mobility. Generally, minibuses and midi-buses were considered the most convenient means of transport for vulnerable people. Over-crowding was an issue, particularly when a vulnerable person had to travel with a helper. On the Gyasikrom road, a person with disabilities travelling with a wheelchair commented:

I paid the fare for two people to be allowed to be alone in the front seat, but then the driver wanted me to pay for my wheelchair, which was on top of the vehicle, because he said it could be used for an extra passenger or freight.

There are advantages and disadvantages of using motorcycle taxis for transporting vulnerable people. Motorcycle taxis can be called by mobile phone – many rural areas have mobile phone coverage and most motorcycle taxi riders have mobiles – to collect the vulnerable person at their house and deliver them to their final destination, thereby providing a convenient door-to-door service. This can be particularly important for medical emergencies. However, ‘boarding’ and holding onto a motorcycle can be challenging. People with disabilities often require an extra passenger to travel with them on a motorcycle, so that the vulnerable person can be transported more safely, wedged between the driver and a second pillion passenger.

4.3. Transport fares and charges

Information on transportation fares charged were collected from users, and triangulated with those stated by transport operators. The statistics were standardised as fare rates per passenger-kilometre in US Dollar cents (USDc). The different fares charged are shown in Table 2.

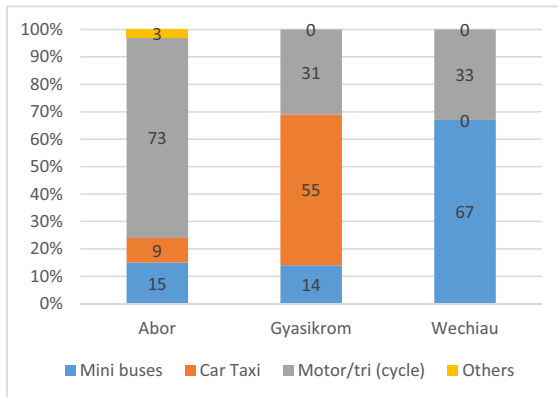
The fares per passenger-km charged on the Gyasikrom road were the highest for all vehicle types. There may be several reasons for this, including the fact that this is a relatively affluent rural area, particularly when the world market price for cocoa is high. Another possible reason for the high cost is that it is a gravel road of medium length. The Wechiau road is also gravelled, but significantly longer, and longer routes tend to result in lower fares per kilometre. By contrast, the Hatorgodo road is paved, limiting vehicle maintenance costs, which in turn could lead to lower fares. In practice, passenger fares do not seem to have fallen since the road was paved. Hettige (2006), in her study for the Asian Development Bank, observed something similar and pointed towards the lack of competition among transport providers in rural locations, due to their low number. The ‘gain’ of paving the Hatorgodo road for transport users seems to be

Table 2
Fares per passenger-kilometre (USDc) on surveyed road by mode.

Major transport mode	Fares per passenger-km in USDc for surveyed road		
	Gyasikrom road	Hatorgodo road	Wechiau road
Minibus (tro-tro)	7	5	4
Car taxi (saloon/estate)	7	6	n/a ^a
Motor tricycle	12	n/a ^a	5
Motorcycle taxi	14	9	9

^a Not applicable as this mode does not operate on that road.

Table 3
Annual share of passenger transport in transport on the roads studied.



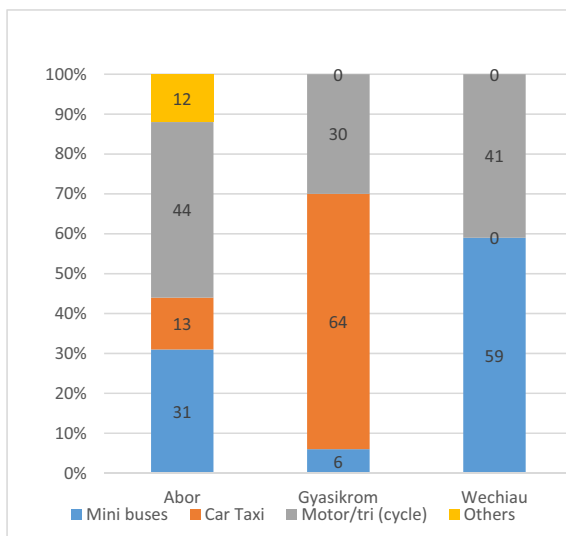
that newer vehicles appear to be operating on this road, offering more passenger comfort for the same price.

The passenger fares for mini-buses are similar to those of car-taxis, which seems surprising given their economies of scale. However, mini-buses are generally considered the preferred transport service, as more freight can be taken by the users, perhaps allowing the mini-bus operators to charge the same as the car-taxis. As in other countries, the fares per passenger kilometre were highest for motorcycles. These ranged from 9 USDC on the Hatorgodo and Wechiau roads to 14 USDC on the Gyasikrom road. This is the premium that many users are prepared to pay for a timely transport service that will leave immediately and then transport passengers to their specified destinations.

4.4. Role of various transport means in providing rural transport services

Minibuses, midi buses, car taxis, motorcycle taxis and motor tricycles were the most commonly available vehicle modes providing rural transport services on the surveyed roads. The traffic counts also picked up for private use bicycles and a few light trucks, which were mainly used by private companies, e.g. loggers along the Gyasikrom road (the ‘other’ category in Tables 3 and 4 for the Abor road refers to pick-up trucks). The numbers and relative importance of the key public transport means varied considerably from one rural road to the other. Again, this emphasises the importance

Table 4
Annual share of rural freight transport on the studied roads.



of understanding local situations and having a regulatory framework appropriate for diverse situations.

As shown in Tables 3 and 4, while car taxis transport the majority (55%) of annual passengers and annual small freight (64%) on the Gyasikrom road, the minibuses and midi-buses have this dominant role for the Wechiau area, conveying 67% and 59% of the annual share of passengers and small freight respectively (extrapolated from data obtained through traffic counts and surveys).

On the Hatorgodo road, motorcycle taxis carry most passengers (73%) and freight (44%), despite having excellent road conditions for conventional vehicles. Even on the Gyasikrom and Wechiau roads which are dominated by conventional vehicles, intermediate means of transport still play a crucial role in providing mobility in the rural areas, and are responsible for about one third of annual passenger and freight movements. The importance of motorcycles and tricycles is remarkable, especially given that commercial services are, given the 2012 legislation, operating illegally.

4.5. Safety of rural transport services

With regard to road safety for minibus users, respondents on the Gyasikrom road were generally satisfied to very satisfied. In contrast, residents on the Hatorgodo road were generally dissatisfied with their safety when using minibuses. This appears surprising as the Hatorgodo road is paved and in good condition. However, the smooth road leads to higher speeds, while the rough, unpaved gravel road significantly reduces travel speeds. Road users were generally dissatisfied with the road safety situation concerning motorcycles. Clearly, research on the safety aspects of motorcycles and three-wheelers needs to be undertaken, with data disaggregated for mode of transport, circumstances, severity of crashes, and the particular location of the crashes (differentiating low-volume rural roads, inter-urban roads, peri-urban and urban locations). This will inform specific and targeted safety interventions that can be undertaken. Without this, it is quite possible that the valuable services offered by motorcycle taxis in rural areas, as suggested by the interviewees, could be lost under the guise of what is perhaps an urban-biased perception that motorcycle taxis are too unsafe to be permitted.

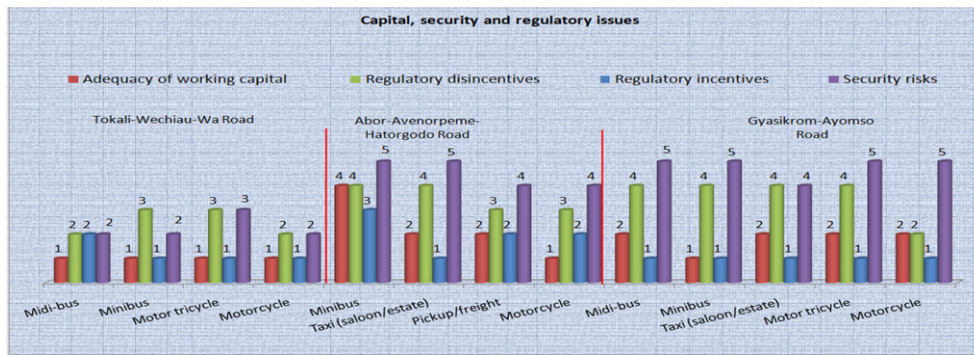
4.6. Operator perspectives

The researchers interviewed a total of 30 operators across the three locations, covering both conventional and intermediate means of transport. Generally, the operator does not tend to be the owner of the vehicle, and this is particularly true for the mini- and midi bus, where none of the (interviewed) operators were the owners. Normally, there is an arrangement in place with an operator being required to pay a fixed daily or weekly amount to the owner of the vehicle. This puts financial pressure on the operators, resulting in, among other things, a tendency at the loading terminals to get full passenger loads before starting their journeys; driving (too) fast to make more runs; and overloading the vehicles to make more money (as maintenance/repair costs are often for the vehicle owner). Nearly all operators indicated that accessing work capital is ‘difficult’ to ‘very difficult’, making it hard to purchase a vehicle themselves and become owner-operators, as is clear from Table 5. Regulatory disincentives, such as having to pay a bribe at a checkpoint, were also frequently reported.

4.7. Regulator perspectives

For each location, at least three regulators were interviewed. These were often police officers but the team also interviewed a few officers from the Ghana Private Road Transport Union (GPRTU). The GPRTU is an umbrella group that brings together private commercial vehicle owners and their drivers in Ghana, working closely with the local authority to co-regulate the public transport sector. It ensures, for example, that transport operators/owners fulfil their tax obligations to the local assemblies and have insured their vehicles in line with regulations. Despite being accused by users, (aspirant) operators and other regulators to depict ‘cartel’

Table 5
Operators' ranking scores on our 1 (very dissatisfied) to 5 (very satisfied) Likert scale.



behaviour and working solely in the best interest of their members rather than the public, they are important stakeholders for any policy or regulatory intervention.

The police regularly conduct checks on the road to ascertain whether vehicle operators have valid certificates covering roadworthiness, taxes and insurance. For all three roads, motorcycles (and motor-tricycles, if operating) had the lowest average score for regulatory compliance, but the open-ended questions showed that this was partly explained by the fact that there is no regulation for commercial motorcycles/tricycles since it is illegal to operate one (see Table 6). Safety compliance is an important but complex issue. Old and frequently overloaded vehicles coupled with bad roads result in low safety compliance scores given by regulators. However, there seems to be a consensus among the police officers interviewed that enforcing regulations too strictly, particularly for overloading and the use of old vehicles, may also result in operators not being able to cover their overhead costs and run an economically viable service, thus leading to the withdrawal of the service. Remarkably, the transport regulators do not object to the current uses of motorcycles and motor-tricycles for passenger service transport, indicating that strict enforcement of the traffic regulations would deprive rural dwellers of essential transport services. A policeman based at the Ayomso police station stated:

We do what is reasonable to enforce but not what is unrealistic. If a motorcycle rider does not wear a helmet, we stop him because this is for his safety and he can still ride with a helmet on of course. But to stop car taxis from overloading would be highly unreasonable because people along the rural road have to travel and they do not have an alternative. We know that vehicles generally fully load at the start of the trip but pick up passengers along the way, which makes the vehicles overloaded. If we would begin to stop and fine

drivers for this, the community would turn against us and make our work and lives very difficult.

4.8. Development perspectives

In each location the team interviewed three or four development ‘experts’, such as primary and secondary school headmasters and senior health personnel at local clinics and hospitals, to better understand the contributions of the various means of transport to local development. The term ‘development’ in the surveys covers a range of issues, such as contributions to agriculture, trade, education, health, youth and women’s empowerment, etc. Whatever means of transport the interviewee was commenting on, each one scored at least a 3 and often a 4 or 5 when asked about its contribution in facilitation agriculture and enterprise/trade. This underscores the importance of rural transport services for rural livelihoods. Qualitative data suggested that a mix of transport means is also important, and that its integration with mobile phones is making life much easier: arranging a mini-bus (to attend a funeral or wedding), a pick-up truck or motor tricycle (to collect one’s harvest) or a car-taxi or motorcycle taxi for a medical emergency, is now a push of button away, confirming Porter’s (2014) observation.

5. Discussion and conclusions

Rural populations in Ghana – and rural dwellers in developing countries more generally – face many obstacles and challenges with regard to their transport needs. Current services tend to be unpredictable, of low frequency, expensive, slow and uncomfortable with dangerous overloading

Table 6
Regulators' ranking scores on our 1 (very dissatisfied) to 5 (very satisfied) Likert scale.

Means of transport	Tokali-Wechiau-Wa Road					Abor-Avenorpeme-Hatorgodo					Gyasiakrom-Ayomso Road				
	Midi-bus	Minibus	Light truck	Motor tricycle	Motor cycle	Midi-bus	Minibus	Taxi (saloon)	Pickup/ freight	Light truck	Motor cycle	Midi-bus	Minibus	Taxi (saloon)	Motor cycle
Vehicle technical compliance	5	5	5	4	3	3	3	3	4	3		5	5	5	4
Vehicle fiscal compliance	5	4	5	2	2	4	4	4	4	4		5	5	5	
Insurance compliance	4	4	4	1	2	3	3	4	4	3		5	5	5	
Operational compliance	4	4	3	2	3	2	2	3	4	2	3	2	2	2	
Safety compliance	3	3	2	2	3	2	1	2	2	2	2	2	2	2	3
Environmental compliance	4	4	4	4	4	4	4	3	3	4	3	4	4	4	4
Regulatory planning framework	3	3	2	2	2	3	3	3	2		1	2	2	2	3
Safety of the road	1	1	1	1	1	4	4	4	4		3	4	4	4	
Un-weighted Average	4	4	3	2	3	3	3	3	3	3	2	4	4	4	4

taking place, confirming Starkey's (2016a, 2016b) observations. Users are generally dissatisfied with rural transport services, although satisfaction levels vary from region to region, from one mode of transport to another, and between genders. The conclusions of more detailed research studies (e.g. Atuoye et al., 2015; Danso-Wiredu, 2011) have been corroborated by the qualitative responses to these surveys, suggesting that access to medical facilities, attendance at schools, and livelihood opportunities are being limited in rural Ghana due to poor rural transport services.

Villagers have adopted a number of coping strategies to minimise the negative impact of poor public transport services. The most prominent one is perhaps limiting the times of embarking on a journey, for instance by postponing or combining possible journeys. As a result, the weekly visit to the market is also a time when other services in the town are utilised. The high demand on market days may therefore mask the suppressed overall demand. Another reported coping mechanism is the advance booking of tickets: people who live on the rural road pay their fares to the driver on the outward run, so that he will reserve a space on the way back. The most common strategy, however, is to accept overloading. Overcrowding is deemed preferable to waiting for another hour or two for the next available vehicle.

Both passengers and transport operators stressed that good transport services depend on the provision of good road infrastructure, although this does not have to equal paving all roads. The key issue is removing/addressing specific problems that prevent the operation of transport services, such as slippery sections and broken culverts, through 'spot improvements' that can be undertaken in a decentralised way, in association with the communities. An example of this was seen on the Gyasikrom road, where a local assembly man was working with young men to fix a broken concrete culvert. It was particularly interesting to discuss the impact of paving the Hatorgodo road with transport services users and operators. This intervention was extremely popular with all respondents, but there was little evidence of any impact on services. Fares had not come down and most passengers and freight were still carried by motorcycle taxis. Note that in areas where transport users clearly prefer conventional transport means, paving a road will provide all-season access (so few if any 'disrupted' days) thus perhaps having a larger impact. The minibuses in use on the Hatorgodo road appeared to be newer models, but they only operated on market days and also on just one section of the paved road. Passengers rated them poorly for safety, which appeared to be because the drivers could travel quickly on the paved road. This RTSI study clearly showed that in relation to the Hatorgodo road – and to some extent for the Wechiau road, which despite being in a bad condition, was preferred over the slightly longer (but quicker and in better condition) Dorimon road – the 'holy grail' for improving rural mobility is not necessarily upgrading gravel to asphalt roads. Arguably, there are other interventions to improve mobility and access that could have been implemented for a small percentage of the cost of paving the road, such as a subsidised (and timetabled) mini or midi-bus service.

6. Implications for policy

Since the cost of road paving is paid for by the government, it is relevant to mention that at a meeting to brief government about the findings of this research, the stakeholders (including the Ministry of Transport, Department of Feeder Roads and the Ghana Traffic Police) felt that the provision of transport services in rural Ghana should no longer be left solely to the private sector. Rather, the Ghanaian government should become involved and facilitate the provision of more predictable and comfortable services. One suggestion was that all rural routes should have at least one timetabled bus a day in each direction, starting in the morning at the furthest village and returning to that village in the evening (the local name for such a service is a 'sleeper bus', as it stays overnight at the end-of-the-line village). This minibus or midi-bus could be provided through the regulation of private sector operators, with associated route subsidies. Furthermore, arrangements could be put in place for ensuring that mini/midi buses operate on roads according to timetables with transport unions-. These

arrangements may require some subsidies, but should increase passenger volumes (due to the suppressed demand mentioned) and would be particularly beneficial to those people living midway along the routes.

The RTSI methodology used for this study is well-suited to assess the impact of the recent spread of motorcycles and motor tricycles on all three rural roads' (and more generally in SSA) transport services, which is something that is more difficult with other transport and mobility methodologies. Clearly, the present situation with regard to motorcycle taxis and motor tricycles is unsatisfactory. Sections of public opinion (mainly people with urban perspectives) see the solution as strong enforcement to uphold existing prohibitions (Oteng-Ababio and Agyemang, 2012, 2015). However, rural-based regulators were reluctant to enforce the ban in rural areas and on low volume roads. Some stakeholders consulted from the Ministry of Transport, the Department of Feeder Roads and the Ghana Traffic Police, favoured removing the universal ban and replacing it with more nuanced regulations. This would allow continued prohibition of motorcycle taxis and/or three-wheelers in specified urban areas and on certain busy highways. However, it would allow them to operate on rural roads where the safety risks are reduced due to significantly lower traffic volumes and speeds, although, as Porter (2014:10) observes, when accidents do happen in rural areas, the consequences can be particularly significant due to poorer access to trauma care.

By legalising motorcycle taxis and three wheelers in designated situations, it will become possible to start to regulate them for improved safety and good practices. Once they are legal, it will be possible to introduce new operator-training schemes and regulated testing. Kudebong et al. (2011:135), who looked at the economic burden of motorcycle accidents in Bolgatanga Municipality in northern Ghana, came to the same conclusion: 'Motorcycle accidents could be reduced through law enforcement, continuous mass education and helmet use.' Motorcycle taxi operator unions could assist with self-regulation among operators, building on the experiences of other countries, including Rwanda, Tanzania, Thailand, Sierra Leone and Uganda (Mustapha et al., 2018; Oshima et al., 2007; Starkey, 2016b; Transaid, 2015a, 2015b;).

The above mentioned findings and conclusions would have been impossible to arrive at with a quantitative methodology. The RTSI methodology allows one not only to identify regional differences and preferences in public transport use, but also to better understand these differences and preferences. This in turn allows policy-makers to formulate evidence-based policy that is more likely to be effective, as it is based on the lived-experiences of different key-stakeholders, foremost rural transport users. Furthermore, this study has showed that the RTSI methodology can be used by familiarising oneself with the 'Rural Transport Service Indicators: Guidelines to the methodology' (2013), freely accessible from the ReCAP website.

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