

Rural transport services: operational characteristics and options for improvements

Phase 3 Report



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Cover photos. Paul Starkey: Motorcycles on the Chekimaji-Kawayo road, Hai District, Tanzania and a 35-seat bus rounding hairpin bend with stone soling on the Kavre road studied in Nepal.

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Abstract

The 'Interactions: Maintenance-Provision of Access for Rural Transport Services (IMPARTS)' project has examined how investments in low-volume rural road (LVRR) construction and maintenance affect rural transport services (RTS). Improved RTS are vital for enabling access to facilities including markets, health facilities, education and socio-economic opportunities. Previous reports have provided a literature review and scoping study and evidence collected from rural road investments in Nepal and Tanzania.

This report draws on a literature review and consultations with transport users and operators, transport associations and regulatory authorities in several countries. It examines the current operational features of rural transport services and their regulatory environment. It considers whether subsidies for RTS are realistic in low-income countries and also discusses ways in which RTS can be improved.

Most RTS are operated by small-scale entrepreneurs in the informal private sector. They work with little capital and only operate where they perceive sufficient market demand. Motorcycles are the most numerous vehicles on most LVRRs. In many countries motorcycle taxis are the main means of rural transport, and on some LVRRs they are the only RTS available.

Transport services authorities are quite small and have little contact with rural transport services. Improving RTS is problematic as there are numerous informal sector operators working independently. Formalising them is possible but difficult. There are few good lessons of how subsidies can improve RTS in low-income countries. Improvements in RTS are most likely to be achieved through district level participatory initiatives to introduce ways of consolidating passenger numbers, sharing routes and working to timetables. Connecting off-road villages by motorcycle trails and trail bridges will increase people's mobility and strengthen demand for RTS. It is recommended that transport services authorities and road authorities collaborate to develop RTS strategies, to be implemented at district level using participatory methods.

Key words

Transport services; Motorcycle taxis; Rural mobility; Buses; Minibuses; Three wheelers; Motorcycle trails.

Research for Community Access Partnership (ReCAP)

Safe and sustainable transport for rural communities

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

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Acronyms, Units and Currencies

AfCAP	Africa Community Access Partnership	NURTW	Nigerian National Union of Road Transport Workers
AFCAP1	Africa Community Access Partnership Phase 1	ReCAP	Research for Community Access Partnership
AsCAP	Asia Community Access Partnership	RTS	Rural transport services
BRT	Bus rapid transit	RTSi	Rural transport services index
DARCOBOA	Dar es Salaam Commuter Bus Owner Association	SACCO	Savings and Credit Cooperative
DART	Dar es Salaam Rapid Transit	SLRTC	Sierra Leone Road Transport Corporation
DFID	Department for International Development, UK	SUMATRA	Surface and Marine Transport Regulatory Authority
DRSP	District Roads Support Programme	SuM4All	Sustainable Mobility for All (World Bank, Washington DC)
eg	for example	TARURA	Tanzania Rural and Urban Roads Agency
FNNTA	Federation of Nepalese National Transport Entrepreneurs Association	TRANSCOOPS	Transport cooperatives
GPS	Global positioning system	TRL	Transport Research Laboratory
GRPTU	Ghana Private Road-Users Transport Union	SANTACO	South Africa National Taxi Council
IMPARTS	Interactions: Maintenance-Provision of Access for Rural Transport Services	UDA	Shirika la Usafiri Dar es Salaam (parastatal bus company)
IRAT	Improving Rural Access in Tanzania	UDA-RT	Usafiri Dar es Salaam Rapid Transit
IRI	International Roughness Index	UK	United Kingdom
JICA	Japan International Cooperation Agency	UKAid	United Kingdom Aid (Department for International Development, UK)
km	kilometre	USD	United States Dollar
LATRA	Land Transport Regulatory Authority	USDc	United States Dollar cents
LVRR	Low-volume rural road	UWADAR	Association of Transporters in Dar es Salaam
NGO	Non-governmental organisation		
NTA	National Transit Authority		

Executive Summary

The 'Interactions: Maintenance-Provision of Access for Rural Transport Services (IMPARTS)' research project has been studying how the provision and maintenance of low-volume rural roads (LVRRs) impact rural transport services (RTS) and the mobility of people and their goods. The project has been commissioned by the Research for Community Access Partnership (ReCAP), funded by the Department for International Development (DFID) of the United Kingdom (UK).

The first project phase involved literature studies and consultations with ReCAP stakeholders in Africa and Asia. This confirmed that rural road investments can have beneficial impacts, with improved access to markets, healthcare, education and economic opportunities. Although transport services provide a mechanism for achieving the impacts, little information is gathered relating to rural transport services.

In the second project phase, data relating to traffic and transport services was collected on two roads in Nepal and six roads in Tanzania that had received road investments, and for which there was data from earlier years. The findings were presented in two reports that complement this publication.

This report relates to the third phase of the project (undertaken in parallel to the second phase). This aimed to learn from international experiences about the prevailing operational features of transport services and their institutional environment, how rural transport services could be scaled up and improved, and whether subsidies were a realistic option. The methodology involved literature reviews, visits to several countries (including Nepal, Tanzania, Ghana, Liberia and Pakistan) involving discussions with transport services operators, operator associations and regulators, and electronic interactions with people from many countries with experiences relating to rural transport services.

Based on the information collected, typical transport services types and means of operation are described. Most rural transport depends on small-scale, informal sector entrepreneurs with limited capital. Market demand for their services is the key criterion for their operational decisions as they attempt to make a profit on every journey. Conventional vehicles (cars, minibuses, vans and buses) tend to be old, and are often overcrowded, with mixed loads of passengers and freight. Motorcycle numbers are growing rapidly, and in some countries motorcycle taxis are the main means of rural transport. Three-wheelers are increasingly used in rural areas (but much less than motorcycles). Rural transport services generally operate with hub-and-spoke patterns, with the larger vehicles (buses) using large towns or cities as their hubs. Villages are mainly served by smaller vehicles that terminate in nearby market towns. Operators often form associations, which are important for controlling loading and queuing at the urban terminals. Some associations become powerful cartels, controlling market entry. Transport services regulatory bodies tend to be small organisations that concentrate on regulating urban and inter-urban transport services. There is little planning of rural transport services and minimal regulatory presence at the district level. There is weak regulatory enforcement by police on rural roads. Local police tend to be sympathetic to rural transport operators, although, in some countries, they extort payments to allow non-compliant operations.

While rural transport services in high-income countries depend on subsidies, most rural transport in low-income countries is unsubsidised with authorities showing little interest in subsidising informal-sector operators. There are few examples of subsidised parastatal companies providing rural transport services. Some countries have tried to make informal operators join together in formal companies or cooperatives, mainly to improve urban or peri-urban operations. The processes have been slow and difficult.

There are few clear examples of best practices in the regulation and operation of rural transport services. A promising way forward is through participatory multidisciplinary transport planning at district level, involving operators, users and representatives of roads and transport agencies. Market demand can be stimulated through timetables, route sharing, load consolidation, construction of motorcycle trails to connect off-road villages and ensuring complementary hub-and-spoke operations.

It is recommended that transport authorities and roads authorities should collaborate at national level to produce strategies for improved rural transport services. They should work with transport services operators at district level to generate increasing transport demand and better operational practices.

1 Background

1.1 Project overview

The Research for Community Access Partnership (ReCAP), funded by UKAid, commissioned TRL to undertake this research study to gain, and to disseminate, a greater understanding of how investments in low-volume rural roads (LVRRs) impact rural transport services (RTS) and the mobility of people and their goods. This project is known as IMPARTS (Interactions: Maintenance-Provision of Access for Rural Transport Services). It has been exploring the interaction between the effective use of rural access and its dependency on the appropriate provision and preservation of LVRRs, and the resultant changes in rural transport service provision that are brought about through improved sustainable road performance.

There is understood to be a strong correlation between poverty and connectivity. Road access in rural areas can improve social welfare by increasing the proximity to, and quality of, basic services, and broadening livelihood opportunities, including agricultural production and marketing. Improved accessibility through the provision of rural road infrastructure and transport services can improve health and education outcomes by increasing attendance at clinics and schools and improving staff retention. Road infrastructure allows rural women and men to reach markets and income-generating opportunities. However, most rural people in low-income countries do not own motorised transport and therefore depend on various types of transport services for their mobility, access to services and earning potential.

The many benefits of LVRRs are largely dependent on a sustained level of infrastructure performance linked to there being appropriate and affordable transport services: rural roads must be fit for purpose in terms of facilitating the movement of people and freight. Currently, infrastructure provision and preservation are largely disassociated from service provision. Therefore, this project is examining the relationships between LVRRs and transport services, and the links between LVRR-investment planning for provision and preservation, and the actual achievements in terms of rural transport provision.

1.2 Research objective

The core research objective is to examine the conditions in which rural transport services succeed or fail, and the relevance of infrastructure condition and level of service to that outcome.

Output: definitive guidelines on how the provision-preservation-services continuum can be improved in support of better livelihood opportunities for rural communities and a positive impact on poverty reduction.

Impact: improved accessibility and mobility for rural communities, and improved overall livelihoods of those communities, in particular for vulnerable groups and individuals within those communities.

1.3 Phase 1 activities

Phase 1 of this IMPARTS project was a scoping study that involved a strategic review of existing and prevailing research into the relationships between current practice in provision and preservation of rural access and the end-product delivery of effective transport services. Phase 1 started in May 2018, and involved a detailed [literature review](#) of the relationships between LVRRs, transport services and the outcomes and impacts for rural populations (Starkey et al., 2019a). The review cited impact studies from around the world on how rural road provision had affected the local populations through improvements in mobility, agricultural production, access to medical facilities, education and poverty reduction. However, despite the large number of rural road projects in Africa, Asia, Latin America and island states, the number of clear impact lessons was surprisingly few. Most impact studies attempted to correlate various 'before' and 'after' datasets obtained through socio-economic surveys. Only a very small number of published studies have looked at transport services and the mechanisms by which these impacts had been achieved. Through liaison with road authorities in all 17 ReCAP countries, it was learned that while road investments are often justified by predicted improvements in transport services, few (if any) road authorities regularly collect 'before' and 'after' information on transport service provision. Good datasets relating to rural

transport services are rare. Even traffic counts on LVRRs that have been consistently implemented over a period of time are difficult to find.

A project inter-regional stakeholder workshop was held in Arusha, Tanzania, in November 2018 and was attended by 39 participants from 12 ReCAP countries (Starkey et al., 2019b). The participants, who were mainly engineers from roads authorities, were motivated to understand transport services issues, and endorsed the need for more integrated approaches with transport services data informing the planning of road investments (construction and maintenance). The workshop concluded that roads authorities should try to collect, and use in their planning, simple transport services outcome indicators (such as modal distribution, tariffs, frequencies and journey times). Unlike *impact* indicators that may take five years or more to respond to road investments, transport services *outcome* indicators respond rapidly to road improvements. Importantly, they also respond quite quickly to road deterioration due to inadequate maintenance. Such transport services outcome indicators could be incorporated into road planning and Maintenance Management Systems.

1.4 Phase 2 research questions and activities

The second phase of this IMPARTS project started in early 2019, with three key research questions.

- Have changes to passenger and freight transport service provision brought about benefits or disbenefits for the rural poor and low-income communities?
- Are the engineering solutions sustainable and fit-for-purpose in terms of wider transport service provision and accessibility? What are the effects of poor maintenance and road deterioration on RTS provision following road rehabilitation/upgrading?
- What other constraints to transport service expansion exist, especially where investment has been made to improve the road infrastructure?

It was agreed with ReCAP that due to time and resource limitations new data would be collected in two ReCAP countries, concentrating on outcomes (how rural transport services reacted to infrastructure changes) rather than impacts (how the lives of rural populations had changed). This was compatible with the Phase 1 work, that had reviewed impacts and had concluded (through stakeholder consultations) that it would be beneficial for rural road agencies to collect outcome indicators.

Team members visited roads authorities and rural roads in Ghana, Nepal and Tanzania to select suitable research locations. The available information and data on road planning and transport services in previous years was found to be better in Nepal and Tanzania. As a result, roads in these countries were selected for the new surveys.

In Nepal two roads were selected that had transport services data from previous years. Both had been constructed between 2002 and 2010 using labour-based methods by the District Roads Support Programme (DRSP). Their transport services had been surveyed again in 2012 using the Rural Transport Services Indicator (RTSi) methodology as part of a DRSP evaluation (Starkey, Tumbahangfe and Sharma, 2013). Under this project the roads were surveyed again in collaboration with Shuva Sharma and Sarad Gaihre of Scott Wilson Nepal. Research tools included traffic counts, user surveys, operator surveys and key informant interviews. In addition to the quantitative data collection, there were focus group discussions with key informants including vehicle operators and staff of the road authorities. Engineering surveys were carried out on each road, using visual assessment, GPS-enabled dashcam videos and smartphone recordings of the International Roughness Index (IRI). Fare data was collected as an outcome indicator and to allow the 'Rural Transport Premium' to be calculated. This is the ratio between the cost of per passenger-km of the available public transport services on low-volume, rural roads and the cost per passenger-km of standard-class, long-distance bus services. Details of the surveys carried out and the results obtained were presented in a report of the Nepal research (Starkey, Workman and Hine, 2020b).

In Tanzania, six roads were visited for possible selection for surveys. All roads had different and interesting infrastructural and transport services features and it was agreed that the research benefits would be maximised by studying all six roads. One of the roads had been rehabilitated with trial sections under an AFCAP Phase 1 project and the transport services had been surveyed in 2012 as part of the AFCAP1 RTSi

project (Willilo and Starkey, 2012). The other five roads had received major investments between 2013 and 2017 to remove bottlenecks through the DFID-co-funded Improving Rural Access in Tanzania (IRAT) project support to the rural roads agency, now known as the Tanzania Rural and Urban Roads Agency (TARURA). The IRAT project had undertaken traffic counts and collected some transport services information before and after the various investments. Further data collection using similar methods to those used in Nepal was undertaken by the IMPARTS project in 2019 in collaboration with Hans Mwaipopo and Stanley Soiti. The methodology and findings were shared in a separate report of the Tanzania research (Starkey, Hine and Workman, 2020c).

1.5 Phase 3 research questions and activities

While the Phase 2 research concentrated on the interactions between transport services and infrastructure, the Phase 3 research questions concentrated on market-based solutions to rural transport services provision. The research involved investigating the motivations of the private sector to provide transport services in rural areas and considering the government structures that organise and regulate these services along with the legal and policy frameworks in which they operate. The key research questions were:

- What is preventing rural transport services being scaled up and extended to remote areas where they would have most impact?
- Are rural transport subsidies an option in low income countries?
- What can be learnt from rural transport service operations and the institutional environment in which they function in Africa and Asia?

It had been agreed that all the information required to answer these research questions, that had initially been planned for a time-sequenced third phase, would be collected in parallel with the second phase activities. Therefore, during the visits to Ghana, Nepal and Tanzania discussions were held with transport operators and key informants in transport associations and the organisations regulating transport services concerning their experiences and their ideas about how to improve transport services. The field work in Nepal and Tanzania provided many opportunities to interview and hold focus group discussions with a wide range of stakeholders including operators of different forms of transport and the people at various levels in the organisations responsible for their regulation (authorities) and self-regulation (associations). These investigations were complemented by similar discussions in Pakistan and Liberia and through electronic and face-to-face meetings with relevant informants based in other countries. Through these contacts and from further literature review, it was possible to gather additional case history information on how rural transport services have been and might be improved through investments, regulation and/or subsidies.

This report presents the key findings of the Phase 3 investigations. Section 2 provides a brief overview of transport services types and key aspects of their current operational models. Section 3 discusses factors determining rural transport services operations, which draws heavily on the lessons learned through the surveys undertaken in Nepal and Tanzania (Starkey et al., 2020b and 2020c). Sections 4-7 discuss relevant experiences and options for improving rural transport services including issues of operator associations, subsidies, the regulatory environment and consolidating demand. Sections 8-9 comprise the study's conclusions and recommendations.

2 Transport Service Types and Main Operational Models

2.1 Types of 'conventional' transport services

There is a wide range of transport services vehicles including buses, midibuses, minibuses, minivans, taxis, jeeps, pickups, passenger trucks, three-wheelers and motorcycles. All of these have different passenger capacities, levels of comfort, ground clearance, robustness and ability to pass through muddy, slippery, sandy, rocky or steep sections of a road. They also differ greatly in their purchase cost (new or second hand), their fuel consumption and their operating costs. These cost differences and the number of passengers likely to be carried will greatly influence the fares that operators need to charge to break even and to make a profit.

Large vehicles that can carry many passengers, such as buses and large passenger trucks, are generally able to offer low fares, due to their economy of scale, provided they can travel long distances with large numbers of passengers. However, these are the most expensive vehicles, and require significant capital, making it difficult for small, informal sector operators to buy them. More importantly, they are not profitable if they only carry small numbers of passengers and operate on short routes. Since many village-to-town LVRRs are quite short and have low transport demand, large buses and passenger trucks are not common on such roads, but they may operate long routes that start in villages and go onto large towns often passing along national or provincial/regional roads for much of their route. Older designs of buses generally have high clearance which makes access difficult but allows buses to travel on rough roads. Buses have problems with slippery gradients and deep sand. Where roads are very rough and where there are hairpin bends, passenger trucks and short-chassis buses have advantages over long-chassis buses.

Figure 1 A long chassis bus, a short chassis bus and a passenger truck



Countries (L-R): Tanzania, Nepal, Myanmar

For linking small villages to market towns, rural taxis may be saloon or estate cars (with official capacities of four passengers, but many more may be crammed in where there is minimal enforcement). For rough roads, jeeps and pickups may be used, although these are more expensive vehicles with higher operating costs and consequently higher fares. Enclosed pickups with sideways-facing seats sometimes carry 10-12 passengers with space for market goods between the passengers in the rear. If the roads are quite good, minivans can be used (which are relatively cheap vehicles to buy and have about 6-8 passenger seats) or more expensive minibuses (with 14-18 seats). Apart from road quality, whether minibuses are viable will depend on the market demand. If there is low market demand, it may take a long time for 16 passengers to arrive, and long-waiting times discourage people from travelling, leading to a descending spiral of transport supply and demand. Where there is a good market appropriate for minibuses, further economies of scale may be achieved using midibuses, with 25-35 seats.

Figure 2 Examples of a rural taxi, pickup/jeep, minibus and midibus used on LVRRs



Countries (L-R): Liberia, Nepal, Tanzania, Pakistan

2.2 Three-wheelers, motorcycles, motorcycle taxis and other IMTs

There are two main types of three-wheelers used on rural roads. Scooter-based autorickshaws, which the Indian Bajaj brand made popular in the 1950s as small urban taxis, are increasingly used in rural areas. Some are used as three-seat point-to-point taxis, but others operate along rural routes and generally seat six passengers. More recently, motorcycle three-wheelers have been developed, and models originally intended as small freight pickups can be fitted with sideways facing seats, designed to carry 10 passengers. These generally operate route-based services. They are much cheaper to buy and to run than four-wheel vehicles of similar passenger capacity. While they are not good on sandy or muddy roads, motorcycle three-wheelers are light weight and so can be lifted out of problems more easily than can heavier utility vehicles. In many countries, three-wheelers are increasingly being used for small-scale rural transport services.

Figure 3 An autorickshaw and motorcycle three-wheelers supplying route-based services



Countries (L-R): Tanzania, Ethiopia and Myanmar

While three-wheelers are increasing, their numbers are small compared to motorcycles that have seen exponential growth in many low- and medium-income countries in the past 20-30 thirty years. In many countries, motorcycles are now the most common vehicles on LVRRs. In the IMPARTS study in Nepal, motorcycles represented 54% of the 1500 vehicles counted (Starkey et al., 2020b). In the IMPARTs study in Tanzania, motorcycles comprised 68% of 15,000 vehicles counted including bicycles and animal carts, or 88% of the 11,500 motorised vehicles (Starkey et al., 2020c). In a recent study of transport on LVRRs in Pakistan, 62% of the 24,000 vehicles counted on eight roads were motorcycles, that carried about 48% of the 61,000 people travelling along those roads (Starkey et al., 2020a). In Pakistan, most motorcycles are owned by individuals for the mobility of themselves and their families. On LVRRs in many countries, it is not unusual to see families travelling together on one motorcycle, even though in most countries the legal limit is a driver and one passenger.

Motorcycles have numerous advantages for rural mobility: they are inexpensive to run and the cheapest robust motorised transport to buy (although beyond the reach of most rural poor people). The driver is in control, with no dependency on transport services in terms of the time of travel and the destination. On rough rural roads with potholes, they have another advantage in that they can often travel faster than 4-wheel vehicles, by meandering around problems. Where there is a fallen tree, landslide or patch of deep mud, motorcycles can often find a way round or be carried over the obstruction. They can also travel off the road along paths and trails, allowing access to off-road villages and farming areas. They can be available 24-hours a day, to assist with emergency medical journeys. Their main disadvantages are exposure to the elements, lack of comfort, low passenger and freight capacity, a higher risk of crashes than other vehicles and no protection in the event of a crash. Despite these serious concerns, the rapid expansion of motorcycle use in rural areas demonstrates that people value the convenience of the motorcycles, despite their safety record and disadvantages. Compliance with regulations requiring drivers and passengers to wear crash helmets is often low on LVRRs.

In many countries, motorcycle adoption led rapidly to motorcycle taxi services, some of which replaced bicycle taxi services. In some countries similar financing models developed spontaneously, with people such as shopkeepers or retired government officials buying motorcycles to rent out daily to young people who drove the motorcycles and gained income from passengers. Hiring out a USD 600 motorcycle for USD 2-3 dollars a day allowed it to be paid off in less than a year, and benefited the owner, the operator and the rural people who had convenient and readily available rural transport services. With such financial models, the market grew and was supplemented by small-scale loans from banks and credit organisations. The

growth of motorcycle taxis coincided with the expansion of mobile phone networks, and mobile phones allowed motorcycle taxis to be called into villages, even off-road villages, to meet specific transport needs. Motorcycles can take few passengers and need to charge high tariffs per passenger-km. While high fares can be problematic for rural people, the availability and convenience of motorcycle taxis makes them popular with rural residents. Motorcycles and motorcycle taxis are now the main means of rural transport on numerous roads in many countries, although there are often many issues in terms of regulatory compliance and safety.

Figure 4 Motorcycles and motorcycle taxis



Countries (L-R): Liberia, Myanmar, Tanzania, Timor Leste

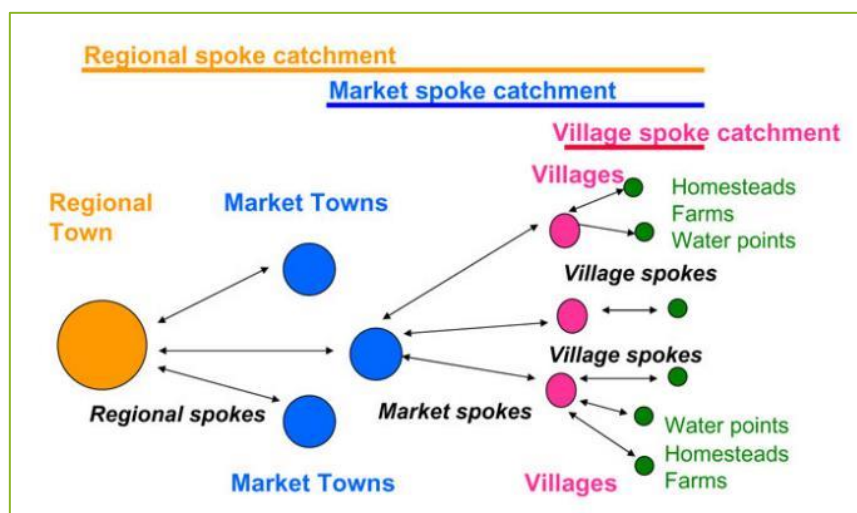
A wide range of other intermediate means of transport are used but tend to be more localised. Two-wheel tractors may pull freight trailers, and some are used for passenger transport. In some countries, animal pulled carts provide transport services, although these are increasingly being replaced by three-wheelers or motorcycles.

2.3 Operational models and hierarchies of hub and spoke systems

There are two broad categories of transport services operations: route-based services and point-to-point operations. Point-to-point services include taxis (whether two, three or four wheels) that are hired by individual customers (or small groups) for journeys between specific origins and destinations. Many dedicated freight services are also point-to-point services. Apart from taxis, most conventional transport services are route-based services, carrying a variety of passengers along predetermined routes. ‘Rural taxis’ are generally communal taxis operating along routes, picking up and dropping off different passengers by the roadside or at designated ‘bus stops’. In some countries, minibuses are referred to as ‘taxis’, but these normally have route-based operations.

Most road transport infrastructure and public transport systems have clear hub and spoke patterns, with different hierarchies at village, district and national levels (Starkey, 2007a). A simple diagram illustrating a regional hierarchy of transport hubs is shown in Figure 5. There would also be a national hub and spoke system, with the capital city connected to the regional towns. Transport on village spokes, and inter-village tracks and trails is generally dominated by intermediate means of transport, and in modern times this is mainly motorcycles and perhaps three-wheelers. This village network can be increased in scope through motorcycle trails that allow access to off-road villages.

Figure 5 Conceptual model of a segment from a regional transport hub system



Source: Starkey (2007a)

Public transport on the national and regional spokes tends to be dominated by large buses, while smaller vehicles generally operate on the market-town spokes. An exception (that proves the rule) is when buses start in large villages. These generally travel through the nearby market town, and travel on to the regional town or a large city, with much of their journeys being on regional or national roads. This means these vehicles are involved with both village-to-market transport and in regional/national transport, generally with most of their income derived from the longer market-town to city sector. The reason for highlighting the different hub and spoke operational patterns is that they generally have separate operational and/or regulatory mechanisms. This distinction between rural bus services and other rural transport modes assists in understanding the two different types of operations with their separate options for regulation, support and improvement (as is discussed in subsequent sections). There are some overlapping characteristics and some examples of rural transport services that do not fit this simple dichotomy, but the great majority of rural services do conform to this systematisation.

Inter-urban bus services are generally provided by formal private sector bus companies, parastatal bus companies or by some informal sector providers. However, transport services operating on LVRRs between market hubs and villages are almost always run by operators in the informal private sector. Low market demand and high operating costs restrict formal sector transport companies from such routes unless there are government subsidies or opportunities to travel beyond the market spoke to regional cities.

The operational model used by informal sector providers is quite similar throughout low- and middle-income countries. They tend to use old vehicles (low capital costs) and endeavour to travel with full (or over-full) loads on each trip. They may keep to one route and travel just one return trip a day, starting from a village in the morning and returning in the afternoon. They may work seven days a week. If demand is higher, they may make more than one trip a day, although if a second or third trip is required it may be provided by another operator that also shares the route. Where demand does not justify one trip a day, operators may serve several roads, particularly if there are busy rural markets away from the market town. On market days, they may make several return trips a day to villages with high market-day demand, but not return to those villages until the next market day.

Some rural transport operators have a simple timetable, leaving at the same hour each morning and returning about the same time each afternoon. Other than this, most operators wait for a full load before their departure. Their cash flows require them to make a profit on each trip, and they are reluctant to leave without a profitable load. This means that waiting times can be high, reducing transport demand which may cause operators to abandon low-demand routes. On some routes with high demand and passengers along the route requiring transport, a group of operators may start to operate to informal timetables, leaving when full, or if not full, every twenty minutes (or other frequency). This predictability tends to increase transport demand.

3 Factors Determining Rural Transport Services Operations

3.1 Typical characteristics of rural transport operations

Rural transport services in low-income countries are generally run by small-scale, informal-sector entrepreneurs. This was evident from the surveys in Nepal and Tanzania, as well as from the literature review and from the work of the project team members in many other countries. This is almost universally true for the smaller rural transport services, but some rural bus services may be run by parastatal enterprises or, in a few cases, by private sector companies in the formal sector.

Informal sector operators generally have little capital. Capital or credit to purchase vehicles is problematic, for the informal sector, particularly as the assets are mobile and can disappear. With limited working capital, operators try to run their services with the aim of making a profit on every trip on every working day. This greatly influences how they operate. Formal sector enterprises (such as bus companies) need to make an average profit per trip, and can cope with some low levels of loading, provided these are compensated by enough high loading levels. Informal sector buses generally conform to the profit-every trip model.

To optimise their cash flows, informal sector transporters generally use low-cost vehicles. The larger and more expensive the vehicles, the older they tend to be on rural transport routes. Motorcycles and three-wheelers are generally only a few years old, as these are relatively cheap and short-lived. Cars, jeeps and minibuses have often had several previous owners. Rural buses can be 25 years old, or more. With vehicles with four or more wheels, there is often a stratified supply chain. The initial use might be in Japan or another industrialised country. They are exported second hand and their next use might be for urban or inter-urban transport, where profits, standards and enforcement tend to be higher. They are finally used by rural transport operators and kept going as long as they can hold together. Many vehicles are not owned by their operators but are leased from a wealthier individual on a daily, weekly or monthly basis. Their business models can be looked at positively, as a way of optimising transport provision in a difficult market, or negatively as a chasing the lowest common denominator of cost and quality.

To maximise income per trip, rural transport services frequently operate with loading levels above the legal limits for those vehicles. This was observed in Nepal and Tanzania and appears to be happening in most low-income countries. There is little enforcement on LVRRs as there are few enforcers and these tend to be sympathetic to the prevailing transport services (Starkey, 2016b). Indeed, where there is corruption, it is in the enforcers' interests that operators do not comply with regulations, in order that the enforcers can gain additional income through bribes (Starkey et al., 2020a). Enforcement tends to be stricter on national roads and in urban areas. This can influence the routing of operators and cause some services to off-load excess passengers prior to approaching checkpoint areas. In this research, compliance with crash helmet use was greater in road sections close to urban areas, with the lowest levels of compliance found on the remoter sections of roads.

One of the clear research findings from this project's Nepal and Tanzania studies is that the key determinant of transport services is market demand (Starkey et al., 2020b and 2020c). Large and small transport services were found to be operating on poor roads if there was adequate transport demand. The larger transport services did not operate daily services on roads with insufficient transport demand, even if the infrastructure was in good condition. However, on such roads they might operate on market days, when demand was much higher than normal days. A clear case was observed on the Bahi-Chipanga road in Tanzania, which had benefitted from road rehabilitation and two bridges. Only one midibus and one minibus used the first bridge each day for a return trip from a village to Dodoma. On market days, there were 24 midibus/minibus return trips a day as operators responded to the surge in demand (Starkey et al., 2020c).

3.2 Market profitability

Clearly, the main determinant of transport services is whether operators can make a profit. The informal sector operators believe they need to cover their costs on each and every trip. Formal sector operators can work on the assumption that trips on average will be profitable, with occasional loss-making services

compensated for by the higher loads on busy days. On the rural roads, most operators cannot do this, because they have few reserves and tend to live on day-to-day funding.

If the road condition is bad, vehicle operating costs will increase, so transport services favour good roads. However, this research suggests that the key limiting factor is market demand, and more importantly *density of demand*. If offered a choice between more passengers and a better road, the informal operator generally goes for the passengers and the likelihood of a higher income, despite the increased operating costs. That is provided the road is passable. The Hai road in Tanzania was in the best condition in the local road network but had little traffic and only motorcycle taxis as transport services. The connecting roads at either end of the road were rough and in poor condition, but they had regular transport services, justified by market demand (Starkey et al., 2020c).

If operators have the choice between a shortcut in poor condition or a longer route in better condition, the deciding factor is the market demand. On two roads in Tanzania (Babati and Morogoro) operators had the option of a short cut on a poor road, but with little market demand, so they continued to use the longer, smoother route by the main road (Starkey et al., 2020c). In another example in Ghana, there was also the option of a shorter route on a poor road, or a longer route on better roads. In this case the operators used the short cut that went past several villages and provided more passengers and more profit than the better main road with few villages and a low market demand (Afukaar et al., 2019; Starkey et al., 2019a).

The transport operators have to be patient waiting for passengers at transport stands, and much of their time is spent waiting. They are also flexible, so that when there is a surge in demand (notably on market days) they will do repeated trips (many more than on normal days). Most transport operators are looking for additional work, and route-based operators will accept paid assignments for particular purposes, such as family festivities.

3.3 Competition

With a limited transport market, there is inevitably some competition within transport modes and between transport modes. The route-based operators use queuing systems to ensure rotas and a relatively fair division of the market. The different transport services are generally tolerant of each other, understanding that they mainly occupy different and complementary transport niches. Nevertheless, there is often a fear that another transport service may carry passengers that might otherwise have been with them.

Route based transport services are aware that some passengers in a hurry will take a motorcycle taxi rather than wait. However, this is compensated for by the fact that motorcycle taxis travel off the road and bring people from outlying villages to the route-based transport services.

In Tanzania, motorcycle taxis do not generally have queuing systems, and operators depend on their own personality and reputation to attract customers. Many have established trust with their clients and a good reputation for customer service. The customers and the operators often have each other's mobile phone numbers and use phones to request or book services, whether from a village or back from a town (or other destination). At town or village stands, even if there is not a formal rota, operators understand their colleagues and the number of trips each operator has had that day and will often accept that in fairness it is someone else's turn.

An example of the illegal poaching passengers is cited from Fiji (see Section 5 and Box 6) where buses are regulated to follow timetables, and minivans and minibuses can undermine the market by arriving at a village bus stop just before the scheduled bus time and tempt the passengers to travel with them. While the law prohibits other transport types from picking up passengers waiting at bus stops, it is very difficult for the police or the staff of the transport regulator to enforce this (Haworth and Starkey, 2009).

There are interesting relationships between market demand, transport supply and fares. In general terms, where market demand increases, transport supply increases and fares tend to fall. This was apparent in this research, where the highest prices were on the remote sections of rural roads, and the lowest prices were on the busiest sections which had more operators and more transport modes. Operators tend to modify their tariffs in the light of competition from other transport modes. On a connecting road to the Hai road in Tanzania, autorickshaws (bajajis) operated route-based services. They charge twice the price of minibus

fares, but minibuses are not available for most of the day. On this section of the road, motorcycle taxis match the fares of bajajis. However, their fares per passenger-km were higher on routes without this competition. On several other routes in Tanzania, the motorcycle taxi fares per passenger-km were much more expensive going to one destination than to another one. The cheaper route had other transport options and the passengers would know their fares and be able to compare options (Starkey et al., 2020c).

4 Roles of Associations

There are many different forms of transport association. Transport operators may combine together informally or formally for mutual benefit and/or for self-regulatory purposes. They may work to improve standards, to help implement national transport strategies or, in the case of some cartels, maintain high prices and work against the wider interests of the population (Rizet and Hine, 1993; Starkey et al., 2002; McCormick et al., 2013; Venter, 2013; Venter et al., 2013; Transaid, 2014; Starkey, 2016b; Bishop et al., 2018a, 2018b, 2019). Because there are so many individual transport operators it is difficult for national agencies trying to improve transport services to inform, listen to or interact with all transport operators. Therefore, good associations offer a key route for increasing information exchange and for improving rural transport services.

4.1 Informal mutual societies

It is common to find that rural transport operators are members of some form of association. The simplest associations are informal clubs that operators form for mutual benefits. These are often simple savings and loans clubs or associations that help individual members in the case of crashes or sickness. Members generally pay a modest monthly fee and they designate (or vote for) the club's officials. These simple societies are common among the operators of intermediate means of transport, including bicycles, motorcycles and three-wheelers. Motorcycle operator associations are widespread in Tanzania, although in this study only a minority of motorcycle operators interviewed belonged to one. Their roles in Tanzania and many other African countries (including Cameroon, Ghana, Kenya and Uganda) have been discussed by Starkey, 2016a and 2016b; Afukaar et al., 2019; Bishop et al., 2019). Similar local organisations are found in Asia, for example among the three-wheeler operators in Pakistan (Starkey et al., 2020a).

Such associations may become formalised and registered, and they can be used to improve standards. In Tanzania they have been used to assist operator training in motorcycle safety (Transaid, 2015; Bishop and Amos, 2015; Bishop et al., 2019). In some countries including Cameroon and Rwanda, certain motorcycle taxi associations require members to wear fluorescent tabards of distinct colours with visible numbers on (Rollason, 2012; Starkey, 2016a). These make it easy for the public to identify operators with poor behaviour. Members may also be required to wear crash helmets and provide a second helmet for passengers. Motorcycle operators generally do not use queuing systems. However, three-wheelers operating route-based services do so. This was found to be the case in this research in Tanzania (Hai District) and in recent research in Pakistan (Starkey et al., 2020a, 2020c).

Governments may require motorcycle taxi operators to be members of associations. This is true in Tanzania (but this is not currently enforced) and in Kenya, where the associations must have at least 100 members (Bishop et al., 2019). In Tanzania, it was found that some motorcycle taxi association members were being exploited by their leaders, who demanded payments (Bishop et al., 2019). A survey of rural motorcycle taxi operators by Bishop et al. (2019) reported only 26% of motorcycle operators were members of associations. In this research, only 18% of motorcycle operators interviewed belonged to an association, and only on one road was there a majority of association members. This was the Bahi-Mpunguzi road, an important collector road and the only one with bus services operating. The respondents felt the benefits to them of being in an association were support in case of illness, a crash or police action. This association, as most others in Tanzania, had no control over queuing, routes or fares (Starkey et al., 2020c).

4.2 Control of terminals and queuing

Most route-based rural public transport operates from and to transport terminals in towns. These may be formal bus stands under local government control, private terminals managed by associations or informal arrangements where transport services always leave from certain roads or parking areas. Such transport terminals may be actively managed by local government officials or designated agencies. In most cases, this will be in cooperation with the relevant transport associations, who are often responsible for collecting the terminal fees. Terminal fees may include one component for local government and another for the association's funds. Where the other end of the route is in the origin/destination village, the system is generally informal, and terminal fees are not usually paid. On the routes studied in Tanzania and Nepal, the

'conventional' transport services operated out of bus stands designated by local government with loading controlled by the relevant associations. Village terminals were informal with no visible controls (Starkey et al., 2020b and 2020c). Comparable transport terminal systems are widespread in other countries.

The strength of most transport associations is the desire for cooperation around their main hubs, and this favours associations of specific transport modes (with similar operational models), based in or around the key hubs, such as district town bus stands. Each district hub may have an association for large buses, one for rural taxis and minibuses, one for three-wheelers and perhaps one for motorcycle taxis. Midi-bus operators often form associations with minibus operators but sometimes they associate with large buses, depending on their route allocation and operational practices. Members of such local associations have similar operations and concerns and the associations can represent their mutual interests. This makes local associations an important mechanism for self-regulation and for the implementation of improved standards that can be used by local governments and by local officials from national regulatory agencies.

The good local relationships that exist at district level in many countries can be used to improve transport services. However, there are two potential issues that can be observed in practice in some situations. Local officials are generally very understanding of the local transport requirements of villagers and the needs of the operators too. They may therefore 'turn a blind eye' and ignore issues like the use of dilapidated vehicles and overloading, understanding that these appear to be an accepted part of village-to-town transportation. There is also the potential for local corruption to distort decision making.

Where local terminal fees and/or regulatory standards are high, some operators are likely to load and unload outside the terminal. This was observed in some locations in Tanzania and Nepal and has also been observed in other countries including China (Starkey, 2013a). The unofficial 'terminals' outside the official stands are not secret, and so must be tolerated by the local authorities. They generally involve specific vehicle types (motorcycles, three-wheelers and/or minivans) and/or specific routes. On the Sindhuli road in Nepal, the local buses terminated at the junction at the start/end of the road and did not travel the extra 3 km to the district bus stand (Starkey et al., 2020b).

With the increasing use of mobile phones, particularly to call rural motorcycle taxis, there may be less need for such transport services to operate from specific stands. This may well reduce the strength of local associations and their possible self-regulatory functions.

4.3 Nationally recognised associations

Local associations often link with other similar associations to form national associations that can lobby for regulatory or fiscal reforms appropriate to their businesses. These may become nationally recognised bodies, and can grow into highly influential organisations with hierarchical, centralised power structures.

Nepal has powerful bus and freight associations, that have operated strong cartels or syndicates for many years. The Federation of Nepalese National Transport Entrepreneurs Association (FNNTA) says it has about 400,000 public transport vehicles across Nepal linked to it (although official figures suggest it is more like 200,000). Over the years it has organised national strikes and has been blamed for some bombs in local offices of the official regulating body, the Department of Transport Management. In May 2018, FNNTA organised a national transport strike and its leaders were arrested. As part of the government's terms to release the FNNTA officials, the association agreed to end its syndicate system and allow all operators to run buses. A year later, the FNNTA was asking its members to register as formal companies within the tax system, but only 6,000 vehicles out of 200,000 had been registered in this way. The government had threatened to remove all passenger transport vehicles that were still operating in the informal sector, but with so little compliance, this threat has yet to be implemented (Setopati, 2018; Xinhua, 2018; Himalayan, 2019).

Powerful national transport associations in Africa include the Ghana Private Road-Users Transport Union (GRPTU) and the Nigerian National Union of Road Transport Workers (NURTW). The GRPTU has been controlling taxi ranks, bus stands and lorry parks for more than thirty years and has tens of thousands of members (Lyon, 2006). In both the GRPTU and the NURTW, their officers at different levels are powerful, and they maintain strict cartels. They are able to fine members and expel them (effectively removing their livelihoods as transport operators). They allocate routes and can impose regulations about where different

types of vehicle can operate. Being powerful and important at national, state/regional and district levels, they are highly influential, and different levels of government have had to acknowledge this. Their influence can be used to maintain the status quo or to alter it, and this requires considerable diplomacy on all sides. As with any such organisations, there are opportunities for corruption and rent-seeking and for altruistic collaboration.

In Zambia, there used to be two major registered operator associations, the United Transport and Taxis Association and the Bus Driver and Motor Taxis Association. However, in 2003, when fuel prices were raised, both associations encouraged strike action, including taking public transport off the roads. Therefore, the government considered these to be destabilising influences on the country, and 'deregistered' them. In a similar downfall in Kenya, the Matutu Vehicle Owners Association that had been representing the interests of minibuses and midibuses was banned in 1988 and was later replaced by the Matutu Owners Association in 2003 (Orero and McCormick, 2011).

In Liberia, the Ministry of Transport attempted to improve safety standards by working with motorcycle taxi associations. They recognised an association based in the capital city and authorised it to issue stickers to motorcycle taxi operators, showing they had paid certain fees. The 'association' agreed to provide safety training and to enforce self-regulated compliance with safe practices. The hierarchical, top-down 'association' established local subsidiaries at the devolved county level and tried to persuade motorcycle taxi operators to join and buy the stickers. This was assisted by the police in some localities, who confiscated motorcycles without stickers. The local operators complained their association leaders were not representative and they were becoming rich on this 'protection racket'. They said that there were no benefits to members and that safety standards (such as helmet use) had not changed (Starkey et al., 2017). So, while working with associations may be a valuable way of improving rural transport services, it is not a panacea because association leaders and government officials may use their positions for rent-seeking opportunities.

4.4 Cartels

The boundary between an association and a cartel is not always clear, particularly when all operators feel obliged to join the same association in order to be able to operate from a terminal or along a route. If the association is a 'closed shop', this can be anti-competitive, but it may not be aggressively so.

It is generally recognised that queuing systems organised by associations reduce the potential chaos in and around terminals. Without some form of recognised queue or rota, many operators and their agents could be actively soliciting custom at the same time. The disadvantage of queuing systems is that customer choice is limited: if you want to travel soon, you have to take the next vehicle, whatever its condition. Associations generally agree standardised tariffs, sometimes in collaboration with national or local transport regulating bodies. This aids the stability of the industry, but it does restrict market competition on prices. In general, both national regulating agencies and self-regulating associations/cartels see there can be benefits to operators and to the public if fares are controlled and market entry is restricted to an appropriate number of operators. Queuing and terminal controls can prevent the 'tragedy of the commons' scenario caused by excess supply and competition causing all operators to suffer (Starkey, 2016b). However, transport cartels can perpetuate sub-optimal transport services, with an excess of old vehicles reducing incentives for inefficient operators to withdraw from the market and for efficient operators to replace their vehicles.

In Nepal, the associations tend to operate quite aggressively as cartels. Examples are cited where jeeps that had attempted to operate on bus routes have been burned (Starkey et al., 2013b). Another example of anticompetitive cartel behaviour in Nepal was cited by MEH Consultants and Starkey (2009). An association that operated very old jeeps accepted a member with a newer jeep. This caused much dissatisfaction with passengers, who preferred the better vehicle and started complaining about the other old vehicles. The cartel therefore expelled the member with the newer jeep and prevented him from operating in the area. Instead of allowing market forces to encourage others to adopt more modern vehicles, the cartel preferred a descent to the lowest common denominator.

This study identified some other issues in association membership in Nepal. On the Kavre road, all the operators of buses and minivans were members of an association, as were 89% of the autorickshaw drivers. However, on the Sindhuli road, only 38% of the bus operators interviewed and only 21% of jeep/pickup operators were members of an association. No autorickshaw operators interviewed were members. Given the reputation of the bus and freight cartels in Nepal, it was surprising to learn that on the Sindhuli road the number of jeeps/pickups was increasing and taking some market share from the existing buses. The chair of the local bus operators' association complained that the jeeps, many of which were not registered as transport services vehicles, were being protected by district-level political interests (Starkey et al., 2020b).

In the freight industry in Nepal, there is a large over-supply of very old trucks, which in a free market would compete on price, leading to reduced tariffs and some operators exiting the market due to low profitability. The freight cartel avoids a 'tragedy of the commons' scenario by dividing the market among its members on a rota basis (queuing system). A freight consignor is obliged to go to the first operator in the 'lorry park' and take the price offered. Although this leads to very few days of work a month (which is sub optimal for all concerned), with high tariffs, large numbers of operators are able to survive, with minimal fleet renewal. Similar freight cartels have been operating in Africa, as detailed in some old but still relevant studies in Ghana and elsewhere (Rizet and Hine, 1993; Ellis and Hine, 1998; Lyon, 2006; Teravaninthorn and Raballand, 2009). In comparison in Pakistan, a competitive market was maintained through multiple freight agents competing with one-another, from multiple lorry parks in each town (Rizet and Hine, 1993).

4.5 Cooperative organisations

One possible model for officially-recognised but devolved transport associations used in Kenya are Savings and Credit Cooperatives (SACCOs). A wide range of SACCOs exist, including agricultural crop and marketing cooperatives. They are regulated by the Sacco Societies Regulatory Authority, established by an Act of Parliament. In order to control the sector and reduce accidents, ensure accountability, eliminate illegal drivers and encourage a move towards larger vehicles and larger modern 'responsible' companies, the Government made it a requirement that by 2011, all Public Service Vehicles (PSVs) should operate as SACCOs or companies. The companies or SACCOs arrange service rotas, supervise queuing at terminals and engage with the authorities on issues such as fares and changes to regulations. They may also provide support to members in the case of accidents, sickness or financial issues (Starkey, et al. 2013a). The minibuses and midibuses (both known in Kenya as matatus) have to display clearly to which SACCO they belong. This assists regulation and self-regulation, as improper conduct could lead to collective punishment against the SACCO, suspending the operating licence and preventing all members from legal operations. An important regulatory breakthrough came with the introduction of safety belts in all passenger seats and of a 'one-person, one-seat' policy. Despite a long lead in period, many matatu owners did not bother to fit seat belts, assuming the regulation would be widely ignored and that the policy would be dropped. However, from the outset there was rigorous enforcement. After some weeks of transport chaos around Nairobi, the SACCOs and matatu owners complied. The Kenyan authorities have been trying to reduce congestion in towns and cities by phasing out minibuses in favour of the larger capacity midibuses. This is now being achieved in cooperation with the SACCOs.

However, like all forms of association, there are good and bad examples. It was reported that there were some fake SACCOs, with fake licences and inspection stickers, which extorted money from individual operators needing licences. Some routes serving Nairobi had too many licensed SACCOs (Orero and McCormick, 2011). The fake registration issue is now being overcome through the computerisation of registration records that can be accessed by police at check points. New draft model by-laws for transport cooperatives (TRANSCOOPS) were drawn up in 2018 (Ministry of Industry, Trade and Cooperatives, 2018).

4.6 Improving transport services through transport associations

Through appropriate self-regulation, transport associations can lead to improved transport services, including the implementation of timetabled, predictable services, route-sharing and emergency transport.

In Ethiopia, transport associations have worked with regulators to assign route rotas, so operators have to alternate profitable, high-demand routes with lower demand routes. Operators are willing to undertake several trips on low-demand routes, knowing that they will then be allowed trips on high-demand routes. This increases the predictability of transport services on all routes, to the benefit of the users and the operators (Starkey, 2007b).

In Nigeria, the Partnership for Reviving Routine Immunisation in Northern Nigeria, Maternal, Newborn and Child Health Initiative and Transaid worked with the National Union of Road Transport Workers to train drivers to cope with the emergency transportation of women in labour to the closest hospital. The drivers only received compensation for the cost of fuel, but having completed a maternal trip, they were moved up to the top of the taxi queue. Between January 2010 and May 2012, 5,515 emergency transfers were recorded (Adamu et al., 2012).

Another potential benefit of self-regulated associations is trying to maintain standards of honesty and behaviour, helping to return items lost on public transport and tracking down drivers (association members or outsiders) suspected of a crime (Lyon, 2006; Bishop et al., 2019b).

Because it is so difficult for governments, regulatory agencies and enforcement officials to deal with large numbers of independent, informal sector operators, it is now a widespread aspiration of governments that transport services be formalised through associations such as SACCOs or companies. This is the current policy of the Land Transport Regulatory Authority (LATRA) in Tanzania, although it is yet to be implemented.

As with many issues, the priority for regulating agencies is for formalising urban and inter-urban public transport. This is where there are high numbers of informal operators and greater problems when transport becomes chaotic. Few, if any, transport regulatory authorities are actively trying to reform rural transport. Any such reforms are likely to be spin-offs from experiences with urban and inter-urban operators. The regulatory work with SACCOs in Kenya was initiated to improve transport services in and around Nairobi and other large towns. Many rural transport services in the Kenya highlands travel into Nairobi and were affected. However, the regulatory environment in rural areas for vehicles not travelling to Nairobi, is much more relaxed.

Some lessons can be learned by attempts to get many informal operators in urban areas to work together. This is increasingly required as large cities develop Bus Rapid Transit (BRT) systems that affect routes previously operated by informal operators. Two simplified case histories relating to minibus and midibus operators in cities in Tanzania and South Africa are provided in Box 1 and Box 2. In both cases, efforts continued for many years. Neither case represents a best practice example to follow. It can take years to achieve results, and even these are vulnerable to new, informal sector entrants, particularly if these have some political support. As was made clear in the South African case studies, the informal operator model of easy entry to the market, low capital costs (old vehicles) and high market demand will always be attractive (Venter, 2013).

The Tanzanian and South African examples show how difficult it is to regulate and formalise informal sector operators, even in urban settings where all the stakeholders are available to attend meetings and where enforcement is relatively easy because transport services are concentrated into small geographical areas, and the enforcement agencies are well represented. Formalising rural transport services is likely to be much more difficult, particularly if top-down approaches are used. Rural transport operations are much more dispersed, there are fewer enforcers and regulators in rural areas and the local population and local officials tend to be sympathetic to the needs of the rural transport operators. With these considerations, it would seem that progress is likely to be greatest if the formalisation approach is based on participatory methods, can be negotiated at a devolved level and enforced mainly through local self-regulation.

To ensure sustainability, proposals for formalisation should be based on business models that are not only attractive to existing operators but also to possible new entrants who might otherwise be tempted to enter the market using the operational models currently prevailing.

Box 1 The organisation of minibus and midibus operators in Dar es Salaam, Tanzania

Minibuses and midibuses are known in Tanzania as dala dalas. They are represented by Dar es Salaam Commuter Bus Owner Association (DARCOBOA), and the Association of Transporters in Dar es Salaam (UWADAR). In 2008, there were estimated to be 6000-7000 informal operators and in the city's transport masterplan, they were described as a 'struggling industry operating and surviving on the lowest common denominator of cost and quality' (JICA, 2008). Prior to 1983, only the parastatal company Shirika la Usafiri Dar es Salaam (UDA) was allowed to operate transport services. However, as illegal dala dalas increased in the period 1975-1982, from 1983 UDA contracted private dala dalas to operate services for them. In 1991, dala dalas were placed under the Central Transport Licensing Authority and fares were fully deregulated (JICA, 2008). By 2003 dala dalas had captured 90% of the market, with the remaining 10% provided by UDA (Jan et al., 2019).

Most of the operators do not own their dala dalas but rent them on a daily basis from the owners. The drivers invariably have an assistant (the conductor) to encourage passengers, take fares and control loading. The operators have a poor reputation among regulators and are reported to often speed, double park to load while blocking the carriageway, cram in passengers to maximise revenues and cause 93% of fatal crashes in Dar es Salaam (JICA, 2008). Routes are assigned to operators by the Land Transport Regulatory Authority (LATRA), formerly part of the Surface and Marine Transport Regulatory Authority (SUMATRA).

The Japanese funded 'Dar es Salaam Transport Policy and System Development Masterplan' recommended that there should be an 'effective consolidation framework' to improve the industry (JICA, 2008). The measures to be taken, using a participatory and collaborative approach would include:

- Creating an area-based cooperative alliance to consolidate operators into community groups or companies to improve representation and develop structures with managerial authority and accountability, to be achieved in collaboration with the operator associations (DARCOBOA, UWADAR).
- Developing codes of conduct and operational standards (voluntarily or a condition of the right to operate) supported by resources.
- Creating access to credit to upgrade equipment to manage shocks such as crashes (mutual member benefit).
- Improving the security of employment for drivers and conductors through enforcing labour rules as part of the 'right to operate' permit condition.
- Once organised and accountable, the industry could receive limited subsidies to allow ticket concessions, for example for students, people with disabilities and/or older persons.

With the planning and construction of the new purpose-built arterial lines for Dar es Salaam's Rapid Transit (DART), it became crucial to ensure that the dala dalas would provide complementary feeder transport to and from the BRT stations, but not operate on the arterial routes. Therefore in 2016, both DARCOBOA and UWADAR formed a consortium with Usafiri Dar es Salaam Rapid Transit (UDA-RT), the designated service provider for the DART buses. The consortium was set up so that 30% of the shares were held by dala dala owners. Training in bus driving was given to dala dala drivers and currently about half of the UDA-RT's bus drivers are former dala dala drivers. Dala dalas continue to operate on the many other routes in Dar es Salaam, with most operating as before, with owner's leasing out vehicles on a daily basis to drivers and conductors. DART itself has suffered from many issues, including insufficient buses and failure to contract a new service provider to replace the start-up agency (Jan et al., 2019).

Figure 6 Dala dala midibuses at a bus stop in Dar es Salam, showing double parking



Box 2 The organisation of minibus and midibus operators in South Africa

In the 1960s, the urban townships of South Africa were inadequately served by state-subsidised bus and commuter rail services. The informal urban public transport industry emerged in the 1970s as an entrepreneurial response to the lack of transport, first as a communal taxi service using cars, and then as minibus services (known as 'taxis' in South Africa). In 1982, 16-seater minibuses were allowed to operate legally. Private sector bus services became concerned because of the competition, but the Transport Deregulation Act of 1988 removed entry barriers to minibus services (Venter, 2013). This led to an explosive growth of minibus operations. The permits issued nationwide rose in 1986-87 from 7,093 to 34,378 (Khosa, 1991). Vicious competition developed. In the absence of other ways of allocating routes, area-based associations claimed ownership of routes and rank space. Large fees were levied for the protection of 'property rights' rather than to promote the general interests of members. Because these arrangements were not enforced by the authorities they were enforced privately, and threats and violence were used to settle disputes (Venter, 2013). Deaths and injuries from taxi violence grew through the 1980s reaching a high of 330 deaths in 1993. Dugard (2001) concluded that 'the continuation of violence into the democratic era was mainly a result of the success of violence as a means of extracting profits'. There was also a reported drop in road safety.

To deal with the chaotic situation a task team was set up by the government to end the deregulated operating environment by 1995 and to 'formalise' the industry. Key measures that were introduced included:

- *Administrative formalisation*: The registration of existing operators including those without permits.
- *Financial recapitalisation*: This was designed to reduce the oversupply of vehicles and improve safety. The existing fleet of 16 seat minibuses were largely replaced by larger newer 35-seat midibuses.
- *The formalisation of industrial relations*: The government pressed for a single representative body with whom it could negotiate and the South Africa National Taxi Council (SANTACO) was established.

Although the recapitalisation programme was perceived by many to be a success, Venter (2013) argues that the minibus sector never bought into the government's vision for a more efficient transport system. New operators continued to enter the industry without permits, and it is argued that the recapitalisation programme may be criticised for costing jobs, raising fares and creating an opportunity for further illegal services with lower fares (Boudreaux, 2006). Furthermore, factionalism and competition prevented the development of a unified voice for the industry.

Venter (2013) further argued that 'transformation of an informal public transport industry into a formal industry, operating within the quality frameworks required by government, is not likely to be achievable via a heavy-handed, top-down regulatory approach. There is a distinct internal logic to operating informally, including relatively low entry barriers, low labour and operating costs, and the ready availability of a captive market. Informal operators historically saw no benefit in formalisation, as it promised access neither to new markets, nor to cost saving technologies. They therefore successfully resisted government's attempts at formalisation'.

The industry went through a further substantial change with the introduction of the Bus Rapid Transit (BRT) systems in Johannesburg and in Cape Town. In Johannesburg, negotiations started with 18 taxi associations in 2007. After several years of turmoil, demonstrations and some limited violence, eventually by 2019, 313 taxi operators gave up their businesses and became co-owners of, and in some cases employees of, the new BRT operating company. Additional compensation was paid to operators to guarantee the previous incomes of running taxis (Venter, 2013).

In Cape Town, BRT implementation started in 2007 but it was only in 2013-14 that the first trunk and feeder routes were fully opened. One reason for the delay was the long process of bringing minibus/midibus operators into the business plan, negotiating 12-year contracts with them, and educating them to become scheduled bus operators. A major training programme was introduced for the operators covering law and corporate governance, management and leadership, public transport planning and management and the regulations and operations of scheduled bus services (Schalekamp, 2017).

5 Subsidies for Rural Transport Services

5.1 The need for subsidies

Rural people need access to markets, health services, education, livelihood opportunities and social services. This requires the provision of roads and trails (and navigable waterways in some areas) and the availability of means of transport. In low income countries, most people do not own their own motorised transport (although ownership of motorcycles is increasing rapidly). They therefore depend on transport services. In the literature review in the IMPARTS scoping report (Starkey et al., 2019a), the importance of roads and transport services was stressed, with adequate mobility leading to positive impacts in health, education, agricultural production and economic development. However, many roads in low income countries do not have adequate transport services, leading to negative impacts on health, education and rural economic development. Examples of inadequate transport services have been cited in the IMPARTS scoping report (Starkey et al., 2019a) and by many authors including Starkey et al., (2002); Hine et al., (2016); and Starkey et al., (2017). The current research project focused on roads that had benefited from recent investments in road infrastructure and so were not representative of all the rural roads in Nepal and Tanzania, many of which will have fewer or poorer transport services. Even on the 'privileged' roads surveyed in Tanzania, on only one of the six roads did 'conventional' transport services operate all along the road and serve all villages. On most sections of most roads, the only form of transport services were motorcycle taxis which are much more expensive per passenger-km than 'conventional' services (Starkey et al., 2020c). Elsewhere in Tanzania, in Kilolo, it was reported that villagers walked for several hours through the night to catch the early morning bus to Iringa, because they could not afford the motorcycle taxi tariffs (Hine et al., 2016).

Helping to improve transport services through subsidies or other arrangements can be justified in several ways. In France, the 'right to transportation' of appropriate quality, price and access was enshrined in law in 1982 (Saroli, 2015; Hine et al., 2016). Rights-based arguments, including gender-based considerations can be used to justify appropriate transport services, where sections of society are inadequately served (Starkey et al., 2020a). Rights-based arguments can be used in high-income countries, where affluent rural people generally have access to good quality motor transport, but children, people with disabilities, older persons and poor inhabitants may not have access to mobility and depend on transport services. With a strap line for the sustainable development goals being 'leave no one behind', there are international incentives to enable vulnerable communities to have access to transport services, whether in low-, middle- or high-income countries. If the private sector is not providing these, how can governments assist through appropriate legislation or funding?

In some countries, public transport receives a range of subsidies. These are mainly aimed at urban transport systems and parastatal transport service providers. In high-income countries, rural bus routes provided by bus companies and smaller rural paratransit vehicles are frequently subsidised. In high-, medium- and low-income countries, there are few examples of informal sector rural transport services benefitting from subsidies. Options for funding and subsidies have been reviewed by Hine et al. (2016). In the following sections, some options for subsidies and international experiences are discussed.

5.2 Parastatal bus enterprises

Sixty years ago, many low-income countries had parastatal bus companies that provided urban transport and operated on some inter-urban and rural routes. These were considered a national service and they received various subsidies. Rural services were limited and comprised medium-distance bus services (or in some cases passenger truck services) that started in large villages and travelled to the bus stand at the relevant town or city hub. The authors are unaware of any small-scale, short distance services from villages to district market towns provided by parastatal bus companies.

Around the world, parastatal companies are notorious for becoming inefficient and over-staffed. Those offering services to the communities whether transport, health service provision, water or electricity are under pressure to keep service levels high, but prices low. If price increases have to be approved at a political level (which is generally the case), there is a reluctance to increase charges to cover all the costs.

Prices paid by the users may only cover marginal running costs, so staffing inefficiencies are not factored in, and renewal of equipment is problematic, or delayed. The common scenario is a gradual run-down of equipment and a deterioration of services, until there is a new injection of funding. While this scenario is not an inevitable consequence of parastatal enterprises (and Swiss Railways is a world-famous example of an efficient parastatal transport system), most countries have had examples over the years of the downward spiral of parastatal transport systems. This would include most low- and middle-income countries, including Ghana, Indonesia, Liberia, Malawi, Sierra Leone, South Africa, Sri Lanka, and Zambia.

In many low-income countries in the period 1960-1980, struggling parastatal bus companies ceased to operate on rural routes. Some concentrated on the urban services and/or inter-urban services, some were privatised and others closed down following deregulation and the growth of more efficient, private sector operators. However, some parastatal companies remain. An example from the National Transit Authority (NTA) in Liberia is provided in Box 3. The only villages served by NTA are a few peri-urban villages in Greater Monrovia, and some villages along the national highways of the inter-urban routes.

Box 3 The National Transit Authority, Liberia

The National Transit Authority (NTA) was established in 2008. It took over from the Monrovia Transit Authority, created in 1977 as a department of the Monrovia City Corporation to provide affordable mass transit service to the residents of Liberia's capital city of Monrovia. It was originally envisaged that the NTA would establish subsidiaries in other parts of the country and, when appropriate, encourage private participation of small, medium and large transport companies. In 2017, NTA operated on 17 routes across Monrovia and the surrounding 'Greater Monrovia'. It also attempted to operate 14 inter-urban routes passing through eight counties across the country, but some of these routes were only passable by buses in the dry season. Government policy was to keep NTA fares low, both to cater for the poorer sections of the population and to help moderate the fares of commercial operators. Fares were about USDc 1.3 per passenger-km on urban routes and USDc 1.4 per passenger-km on bituminous inter-urban roads. The NTA fares were lower than the commercial competition, with minibus fares on bituminous roads at USDc 2.4 per passenger-km. NTA fares on gravel national roads were USDc 2.8 per passenger-km (if they were operating), while the robust rural pickups would charge USDc 11-12 per passenger-km on these routes. In 2017, NTA employed 363 staff and had a nominal fleet of 90 buses, of which 33 were in operational condition (with about two drivers and two conductors per working bus). There had been various capital injections of new and second-hand buses over the years, including donations from India and Turkey, but there has been no budget to regularly replace the old vehicles.

The operational budget required a 60% direct subsidy plus a 100% subsidy for fleet renewal. For the fiscal year ending in June 2016, operational revenues (USD 1.9 million) were just 40% of total funding (USD 4.6 million) and the remainder (USD 2.7 million) were authorised government subsidies. USD 1.8 million was spent on salaries, USD 2.3 million on supplies and consumables and USD 0.5 million on capital items (Starkey et al., 2017).

Figure 7 Intercity buses of the National Transit Authority in Liberia



Sierra Leone, a neighbouring state to Liberia, also has a parastatal bus company, the Sierra Leone Road Transport Corporation. This is currently on an upward curve of investment and fleet expansion, as reported in Box 4. However, like other parastatal bus companies, this primarily operates urban and inter-urban bus services. Rural transport services from villages to local towns in Sierra Leone are provided by motorcycle taxis and 'poda-poda' communal taxis that may be pickups or minibuses. These different types of transport services are shown in Figure 8.

Figure 8 Sierra Leone parastatal inter-urban buses (left two) and informal poda-poda minibuses and motorcycles



Box 4 The Sierra Leone Road Transport Corporation

The Sierra Leone Road Transport Corporation (SLRTC) was set up by an Act of Parliament of 1964. It initially provided some urban and inter-urban bus services as well as bus services for colleges and ministries. Without ongoing capital investments, its fleet deteriorated. After the civil war, SLRTC was built up again with new capital. A small fleet of Chinese buses was imported in 2008. In 2015, SLRTC acquired 100 small buses (20-, 39-, and 46-seats) to operate on Freetown bus routes, airport shuttles and for school-bus runs (Sewa News, 2015). In 2017, SLRTC was reported to be providing good inter-urban services within Sierra Leone, but its buses did not travel off the country's arterial road network (Mustapha et al., 2017). SLRTC expanded its fleet by another 200 buses suitable for inter-urban routes in 2018 (Journal du Cameroun, 2018). In 2018, a consultancy study was commissioned to examine ways of improving the business efficiency of SLRTC and consider options for greater private sector involvement in SLRTC and in the provision of transport services. It is not yet clear whether the SLRTC will be able to continue to thrive, to retain (or expand) its current routes and standards and to maintain its fleet. There have been some press reports of internal problems and corruption (Sierra Express, 2018).

In one study on rural transport services undertaken in Yunnan in China, it was found that a parastatal bus company had a monopoly of rural transport services provision and was able to charge high fares and to receive annual rural route subsidies. Some details of this system are provided in Box 5. However, rural transport minivans and midibuses of the bus company predominantly operated medium distance services along main roads. Of 33 rural roads studied, only four had any legal transport services. These were the start of medium-distance routes to county towns, and not the short routes to the nearest market town more typical of rural transport services. Small-scale, informal sector operators were illegal (apparently to maintain rural transport safety standards). This meant most rural residents wishing to travel between their villages and local market towns (where clinics, schools and markets were located) had little choice but to travel on family motorcycles (Starkey, 2013a and 2013b). Interestingly, the rural bus route operational model favoured by the Chinese company (starting in a village but then travelling on main roads for most of their route) is similar to the operational patterns observed with private sector rural buses in Nepal and Tanzania. Such bus services provide good access to cities, but they do not provide frequent transport services between villages and the local towns, which is generally wanted by rural people, particularly women.

Sri Lanka has a transport board supporting 13 parastatal bus companies and other 'cluster' companies. These received USD 27 million in subsidies in 2004 (Gwilliam, 2005) and higher subsidies have been reported in subsequent years (Hine et al., 2016). While some of the routes operated by the bus companies start in rural areas, most are services on the main road network. The parastatal bus companies are losing market share and private bus services carry 76% of passenger trips (Gwilliam, 2005).

National parastatal bus companies are one way to subsidise transport, but they mainly operate on urban and inter-urban routes. Such routes are always likely to be seen as the most economically attractive for the companies, and the ones with greatest public (and so political) support. National bus companies do not seem to be a suitable model for providing rural transport services. Devolved, provincial or district level companies might be more appropriate, but there appear to be no good examples of these. Short distance rural routes seem to be the speciality of small-scale, local entrepreneurs with an understanding of the local transport demand (even in China, despite their illegal status).

Box 5 Bus transport services in Pu'er, Yunnan, China

Pu'er prefecture of Yunnan Province has a population of about 2.5 million people and comprises ten counties. There are two main bus companies providing transport services within Pu'er. Hong Feng provides urban transport for Pu'er city and some rural routes terminating in the city. The Jin Kongque company is responsible for the inter-urban routes between the county towns and Pu'er city, and for rural routes between villages and county towns. The bus companies have monopolies of public transport services as informal private transport services using minibuses, minivans, pickups, three-wheelers or motorcycles are banned. Some illegal services do exist and may be tolerated by local officials and enforcers who 'turn a blind eye' to them. Both bus companies may be considered parastatals as they report to the prefecture transport bureau, a devolved administration of the Ministry of Transport. In China they are considered 'private', as they are expected to cover all their costs (other than the rural route subsidies). The bus companies must submit tenders to operate on a route and provide details of their vehicles, prices and timetables for approval. As they have monopolies, only one company bids for a route licence. For 'rural routes', the company gets a subsidy of about USD 1000 a year for each minivan and USD 3000 a year for each 19-seater bus assigned to the route. The companies gain income from bus fares and from the services offered at bus terminals (for which construction grants are available). Each bus ticket issued has a levy of 6-10% for terminal fees, which depend on the level of terminal services provided. Jin Kongque operates a range of 'buses', including 7/8-seat minivans, 19-seat midibuses and larger buses for the inter-urban routes. Most of its fleet are midibuses and larger buses. In 2013, the official fares for 19-seat buses was equivalent to USDc 10.7 per passenger-km. This allowed the company to cover its vehicle operating costs if the vehicles were half full. Passengers reported paying twice the official fares on some routes, and that buses were often over-crowded. Despite the subsidies and the high fares allowable, the Jin Kongque only serves a minority of villages in the prefecture. Of the 33 roads considered for rehabilitation under an Asia Development Bank project, only four had rural transport services provided by the bus companies. These rural transport services were medium distance routes (over 100 km) operated by 19-seater buses that started in villages early in the morning and for most of their journeys travelled on good county-level roads to distant county towns. Despite its monopoly status, subsidies and high fares, the Jin Kongque bus company was mainly operating medium distance bus services along main roads. It had little interest in organising shorter distance, village to local market town services on poor rural roads with limited market demand. The informal private sector entrepreneurs that were willing to serve such routes without subsidies were not legally allowed to do so (Starkey, 2013a and 2013b).

Figure 9 Formal sector 19-seater bus (left and centre interior) and minivans (right) in Pu'er, China



5.3 Fuel and import tariff subsidies

Fuel subsidies are sometimes offered by governments to stop fares rising at times of increasing oil prices. Once in place, they are difficult to withdraw without leading to fare rises. The rural transport subsidies referred to in China (Box 5) were sometimes referred to as fuel subsidies.

Fiji has highly regulated bus services, with 57 private companies operating on 1088 urban, inter-urban and rural routes (Haworth and Starkey, 2009 and 2017). Most operations are unsubsidised, but there are fuel duty rebates to compensate for tariff concessions for school children and negotiated subsidies to keep fares constant at times of rising fuel prices. There are also import duty concessions to assist fleet renewal and the purchase of replacement tyres. This is summarised in Box 6.

In an attempt to cushion the impact of rising fuel prices the Philippines introduced a targeted programme of fuel subsidies using smart cards for jeepneys (route-based communal taxis) and motorised three-wheelers, that are important, informal means of transport in peri-urban and rural areas. It is estimated that there are over one million three-wheelers providing transport services. The subsidy was expected to benefit both drivers and users (Layug, 2014).

The fuel and import tariff subsidies available for transport services are not normally targeted at rural transport operators. The main beneficiaries are the operators and users of the more widely used urban and inter-urban transport services.

5.4 Route subsidies and cross-subsidies

All, or most, high-income countries subsidise public transport, with most subsidies going to urban transport services (Hine et al., 2016). In most high-income countries, rural transport services are not profitable, with low demand and infrequent services causing a downward spiral. To ensure there are some rural bus services, countries such as the UK invite tenders from bus companies prepared to offer transport services. These tender for the subsidy they require to operate specific routes to agreed timetables. However, route-based services may not be ideal for the small number of passengers carried, and wealthy countries are increasingly subsidising smaller services that operate like communal taxis, and can be called on-demand by entitled users, such as the elderly and disabled persons (Hine et al., 2016).

As indicated in Box 6, Fiji, a middle-income country, is considering some specific rural route subsidies to keep bus services operating on rough rural roads with low transport demand (Starkey and Haworth, 2009 and 2017).

While there is little, if any, use of rural route subsidies in low-income countries, there are some interesting examples of route cross-subsidies. As has been mentioned, in Ethiopia, rural taxi associations working with transport regulators operate route rotas. This means operators have to alternate profitable, high-demand routes with lower demand routes. This is effectively an informal private-sector implemented cross-subsidy. The operators are only willing to undertake trips on low-demand routes because they can make compensating profits on high-demand routes (Starkey, 2007b).

In Fiji, there is a strong regulatory body and efficient private bus companies (see Box 6). This allows route licences to include various forms of cross subsidy. The main cross subsidy relates to school bus services which are often loss-making, as buses only operate with one-way loads in mornings and afternoons. The licences for some of the attractive urban routes include several unattractive school bus runs. Companies bid for these licences to gain the profitable bus route element and accept that this is attached to the supply of unprofitable school bus schedules. In doing so, the operator is effectively cross subsidising the school services (Haworth and Starkey, 2009). Such route cross-subsidies could be used to improve rural bus services, with profitable inter-urban route licences conditional on some services on rural routes.

Cross subsidies appear a viable means of improving rural transport services provided there is effective regulation and good relations between the regulator and transport operators. The possibility of providing conditions on route licences that required operators on high-demand routes to make a proportion of their operations on low-demand routes was put to officials from LATRA, the transport regulator in Tanzania. The concept was welcomed, but there were grave reservations about its practicality, in the prevailing circumstances in Tanzania. Working relations, trust and enforcement would need to be improved to allow such innovations to be accepted by all parties.

Box 6 Comprehensive bus rural and urban bus services in Fiji

Fiji's bus system is exceptional in providing most communities affordable access to employment, markets, health and education. Buses provide timetabled services in peak and off-peak periods in urban and rural areas. Bus routes reach 95% of the country's population. Regulated bus services, are provided by 1673 buses, owned by 57 private companies operating on 1088 routes with a total of 500,000 passenger trips per day (Fiji's population is 900,000). Passengers consider bus services to be beneficial, safe and affordable but they would prefer more modern, comfortable buses. Buses on rural routes are frequently over 25 years old, with robust, high-clearance chassis requiring steep stairs to access them. Poor road quality affects some rural routes. Richer countries have better bus fleets, but Fiji is unique as the bus industry provides a comprehensive, well-regulated and safe service, with affordable fares (with concessions), at minimal cost to the government. It works because the industry regulator, the Land Transport Authority (LTA), maintains high standards and minimises illegal competition (Haworth and Starkey, 2009).

One of the biggest problems for the timetabled bus services is the poaching of bus passengers by minivans, minibuses and, in rural areas, passenger trucks. By arriving at a bus stop a few minutes before a bus is due, the unauthorised vehicles can tempt passengers to travel with them. Bus companies are quite vulnerable to the poaching of passengers, as it is always the fares from the last few passengers that effectively become the 'operating profit' of any bus operation (Haworth and Starkey, 2009).

The bus industry has received annual subsidies of about USD 4 million, similar to the government's revenue from the VAT paid on bus tickets. Bus companies receive USDc 10 per litre rebate on fuel in return for concessionary fares for school children. At times of rising fuel prices, the bus companies negotiate time-limited subsidies to prevent fare rises. In 2008, the fuel subsidy was 21% of company turnover, contingent upon the companies submitting audited accounts. There have been duty concessions on the importing of new bus chassis and tyres. Due to the problem of low rural transport demand and rough rural roads, the companies that operate rural routes are negotiating rural route subsidies (Haworth and Starkey, 2009).

Nationwide electronic ticketing was introduced in 2017, with 1,613 buses operating with installed GPS-sensitive e-ticket machines. Within a matter of weeks of its introduction, most of the country's population had bought registered, pre-payment cards. A mobile phone provider operates the system. A card tap-in on boarding the bus initiates a printed ticket with relevant details. With the ending of cash payments, the bus drivers went on strike, but agreed to return following a wage increase to compensate them for the new lack of fraudulent opportunities (they used to pocket a proportion of the day's takings). The e-ticket system and GPS tracking are providing much useful data for the companies and the regulator on timetable compliance, route compliance, passenger loads and the number of passengers with ticket concessions. An initial problem was card-sharing, with revenue data suggesting large numbers of normal passengers were using the e-tickets of those who are allowed concessions, including the elderly, children, people with disabilities` (Haworth and Starkey, 2017).

With plans to electrify the entire fleet by 2040, there are proposals for a private bus-leasing company to be responsible for importing hybrid and electric buses. This would reduce the risk to small bus companies of purchasing technologies not yet proven in Fiji. The company would receive capital from development banks, and the government would provide appropriate support including import duty concessions on electric buses (Haworth and Starkey, 2017).

Only the larger villages are served by rural bus routes. It has been suggested that the bus companies work with the operators of smaller vehicles, such as passenger pickups, to provide scheduled feeder services between the smaller villages and the main rural bus stops (Haworth and Starkey, 2009).

Figure 10 Buses of formal sector bus companies in Fiji, and a provincial bus station (right)



6 Institutional Environment and Roles of Regulators

In Nepal and Tanzania, it was found that the transport regulating authorities paid little attention to rural transport services, with little or no representation in district towns or other rural transport hubs. While their mandates were countrywide, they had few staff and small budgets. For example, LATRA in Tanzania had about 40 professional staff in 2019, in a country with 31 regions and 169 districts. Quite naturally, in the circumstances, LATRA concentrated on regulating urban and inter-urban transport services, where the demand was high, political support was greatest and where poor transport services could cause environmental, safety, social, economic and political problems. Much of their resources also went on implementing fiscal and administrative measures to do with licensing. This was important for government revenues, and in some circumstances allowed staff opportunities for rent seeking. The regulatory environments observed in Nepal and Tanzania are not unusual and similar situations are likely to occur in most low-income and many middle-income countries (Starkey, 2016b). There are few examples of national transport services regulators that are proactively engaged with the rural transport services and have a good understanding of the transport needs of rural people. The regulatory agencies are more likely to try to tighten regulations and encourage enforcement, in response to political requirements for modern and safe public transport. Such regulations, if implemented, would likely worsen the plight of rural transport operators and their passengers. The example of China was cited (see Box 5) where legislation intended to improve road safety prevented informal operators from providing rural transport services (including school minivan runs). The result was that in rural areas most people, including school children, had no option but to travel on family motorcycles, widely regarded as the most dangerous form of road transport.

A recent ReCAP research project in Pakistan (Starkey et al., 2020a) found the regulatory environment for rural transport was potentially difficult for local transport operators due to high-standard national regulations. The agenda set by the politicians was to enable safe and modern forms of transport in rural areas, without considering the economic realities of providing such services. As in many other countries, the saving grace for the rural transport operators and their passengers was that enforcement on rural roads was minimal, although some enforcers (mainly police) extorted modest *bhatta* payments (bribes). This allowed three-wheelers and pickups (the only transport services available) to provide essential transport services for women, children and less affluent men (the more affluent men rode motorcycles or used cars).

One example of a highly effective transport regulatory agency in Fiji was provided (see Box 6). Fiji is a middle-income country with a small land area (covering several islands) and a low population (900,000). It has also benefitted from a long heritage of popular and efficient private, formal-sector bus services that have had to competitively tender for routes regularly. Until recently, there were no alternative rural transport services. For these reasons, it would be difficult for other countries to adopt the Fijian model, but they can emulate the stakeholder engagement, the concern for rural areas and the proactive and understanding way it has implemented reforms in close collaboration with the service providers.

The way forward for most transport service regulatory agencies would be difficult, given their urban, top-down perspectives, their lack of understanding of, and interaction with, rural transport services and users, their small numbers of staff, their lack of visibility at devolved levels and their small budgets. They generally have limited political support and may be considered the 'poor relation' of the road agencies that have many more staff, larger budgets and greater political influence.

One of the more obvious solutions would be join together the agencies responsible for roads and transport. This would result in more staff being available at the devolved level to engage with transport services operators and other local stakeholders. The fiscal and administrative functions that currently take up much of the staff time could be delegated to a separate agency (although this would not be popular in countries where rent-seeking opportunities are available in this area). Those responsible for transport services could form a policy and planning unit with urban, inter-urban and rural sections. Those in the rural transport policy and planning unit could work with district administrations (including roads agency staff), local transport associations and transport user representatives to plan and implement rural transport services.

Whether or not such a scenario is realistic depends on many factors, including whether there is sufficient political good will for this in the government and in the roads' authorities. There would be need for significant and relevant capacity building at all levels, if this approach were to be implemented.

7 Promoting Market Demand

This research has found that market demand appears to be the key factor limiting the provision of transport services on passable rural roads. This implies, one of the best ways to improve transport services would be to increase market demand. The following sections of this report will explore some options to try to stimulate market demand. In all cases, there would be need for stakeholder consultations and participative processes for implementation. This research has highlighted the importance of learning from local inhabitants and rural stakeholders to inform decision making and ensure the solutions proposed would work in the local circumstances.

7.1 Service frequency and predictability

Increasing predictability and frequency increases market demand. People do not like waiting for long periods, uncertain when and whether transport will arrive. When transport is regular and predictable, people can plan to travel, whether daily or occasionally (Starkey, 2007b; 2016b). Many rural bus services (and passenger truck services in some countries) assure a daily market, by leaving predictably (often early morning) and returning later in the day. Everyone in the terminal village and along the road knows the departure time(s) and the predictability. *Simple timetables can increase market demand.*

In areas where there are surges of demand on market days, the predictability that transport services will arrive on market days ensures many people will plan to travel on those days. They do not bother to travel on other days except in an emergency, knowing that they cannot depend on transport services. *Predictability can increase market demand.*

The morning departures and afternoon returns are convenient for those travelling to a distant city, but are less suitable for people (often women and children) that need to travel to nearer rural clinics or small shopping centres. Similarly, market day only transport is not suitable for many other needs, particularly as clinics and other service providers are always stretched by demand on market days. People (particularly rural women with multitasking responsibilities) need more frequent transport, allowing them to return in an hour or two.

In Tanzania, on a connecting route to the Hai road, three-wheeler (bajaji) operators run frequent route-based services between Boma Ng'ombe and Rundugai. If possible, they wait until four passengers are ready to travel, but will generally leave anyway every 10-15 minutes, hoping to pick up passengers on the way, and ensuring people at the other terminus do not have to wait long before departures (Starkey et al., 2020c). A similar pattern of operations was developed by operators of three-wheelers and pickups on a road in Pakistan, they shared the route with a queuing system, and left as soon as they had a load, or after 15-20 minutes even if they did not have a full load (Starkey et al., 2020a). Pickups and three-wheelers at their joint village departure stand are shown in Figure 11. Both these examples were on quite busy sections of the road and did not extend to the more remote parts of the road. However, this frequency stimulated demand, and people from further villages would walk to the 'shuttle' terminal because they knew they would leave quickly and have a frequent service for their return journeys. On another road in Pakistan, there was a downward spiral of low daytime transport demand and longer and longer waits. A village association of three-wheeler operators agreed to start a trial of working to a timetable throughout the day. Unfortunately, the three-wheeler association in the destination market town thought this was a way of poaching their clients and did not agree to the trial (Starkey et al., 2020a). However, there is evidence from around the world that suggests market demand can grow by increasing transport frequency. This introduces an element of risk for operators, as they cannot be guaranteed a full load on each trip. Through the mutual support available within associations, it should be possible to protect the more vulnerable operators.

Figure 11 Village transport hub in Pakistan where pickups and three-wheelers operate a joint timetabled service



7.2 Consolidating demand

Where transport demand is low, there will still be people in villages wanting to travel or to send freight. There needs to be some mechanisms for consolidating this demand, and persuading transport operators to respond. Once a regular service has been established, more people will want to travel (see Section 7.1). Ride-sharing apps are likely to achieve this in the future (see Section 7.6). However, similar results can be achieved more slowly through discussions and negotiations (Starkey, 2007b). For example, operators need to agree the minimum load that is viable for them without losing money. An initial timetable for the trial should be agreed and a village committee, group of transport users, NGO or other rural entity should then guarantee the operator will earn at least the tariff associated with this minimal load. The village organisation could 'sell' this number of tickets. However, this may not be necessary, as payments will only need to be made for the 'missing' passengers where there is insufficient transport demand to cover the minimum load required. Such payments will be minimal (if any), provided the villagers or association members continue to travel and/or encourage other people to do so. The operators will make a profit on all the extra passengers above the minimum load, and the start of the service should encourage more people to travel. The mechanism is only necessary to 'prime the pump' and initiate regular transport services. Any early costs are likely to be less, overall, than if the users had to pay for the more expensive motorcycle taxis and/or chartered vehicles. The arrangements and mechanisms required will depend on local circumstances but should be achievable with trust and cooperation within and between the villages concerned and the operator(s). Facilitating such arrangements and spreading the mechanism to other communities could be the work of a local NGO or of a devolved local government official (e.g. district-level staff from a roads and transport agency). Where there are community-based organisations implementing maintenance contracts on rural roads, the responsible persons could be introduced to this system, so that the roads and transport services work become integrated even at this devolved level. *Consolidating existing transport demand leads to greater transport demand.*

7.3 Route planning and sharing

Informal transport services providers are good at optimising the transport services they run but may lack the skills and collaborative mechanisms to develop services that are more inclusive. For example, they may serve remote villages on market days, but not on other days due to poor transport demand. Through planning and sharing routes, it may be possible to increase transport services in an area. On two of the roads in Tanzania, the improved road had no conventional transport services, but geographically they were shortcuts between two other destinations that were served by minibuses and midibuses. The individual operators did not want to operate on the short cut routes, due to a lower density of demand (Starkey et al., 2020c). However, although transport demand was low on the shortcuts, there was some daily demand on those roads. Therefore, the overall demand of the shortcut road plus the alternative (preferred) route was inevitably greater than that of just the alternative route. While it would not be in any operator's own interest to switch to the shortcut, it would be in the association's interest to gain income from that untapped demand. One answer would be to share that road on a rota basis by increasing the overall number of daily trips. Depending on the relative demand, one in three trips could pass along that road, while advancing the timing of the next trip on the alternative road so the gap between services is not

excessive. This should increase the overall income of the operators, with each operator gaining a few extra trips per week.

From the IMPARTS research in Tanzania (Starkey et al., 2020c), this mechanism should work on the Babati road but not on the Morogoro road which still has infrastructure issues and very low demand on part of the road. This system could also work on the Bagamoyo road (with through services to Chilizze). Individual operators say market demand on that road is too low for them, but by sharing this additional route this extra demand can be captured by all the operators. Such route sharing requires planning, trust and collaboration. It can be facilitated/imposed by operator associations (see section 4.6) or by route licences (see section 5.4). If implemented successfully, a positive feedback loop should be created, as the additional services should generate increased transport demand, benefiting both transport operators and rural residents.

7.4 Hub and spoke complementarity

Various transport services have different advantages and disadvantages. Buses can provide cheap transport over distances of tens of kilometres, or more. They are unsuitable for short-distance journeys with few passengers. Smaller means of transport such as motorcycles, three-wheelers, pickups and minivans are well-suited to shorter journeys with few passengers. The two types of transport are complementary and smaller vehicles can provide feeder-transport to carry passengers to and from longer-distance bus routes. Such feeder transport is often planned for urban BRT routes, and to link town centres to out-of-town bus terminals. With careful planning, the feeder transport can be coordinated with the bus timetables. If the medium-distance buses pass through large villages/small towns with clinics, schools and shops, these small centres can act as short-distance hubs for the surrounding villages. Low-capacity feeder transport can provide shuttle services between outlying villages and these small town hubs, with onward connectivity by bus to the more distant town or city.

In some countries, such as Ghana, Sierra Leone and Tanzania, motorcycle taxis are already providing such feeder transport to and from bus routes. In Fiji, where motorcycle taxis are not used, additional hub and spoke systems were proposed to improve rural bus services and also increase villagers' access to and from clinics and local facilities which was particularly important for women and children (Haworth and Starkey, 2019). The proposals would have shortened some bus routes (making journeys quicker, allowing for more trips per day), with feeder services bringing passengers to the new rural bus terminals from several villages. Unfortunately, a social issue made implementation of this problematic, as there was great distrust between the people operating the buses and those operating pickups and other small means of transport.

In China, a proposal was prepared to improve bus services by inaugurating township-based transport services. This would bring passengers from and to those villages without bus services, allowing passengers access to the shops, schools and clinics in the township and to connect to the bus services to the county towns (Starkey, 2013a; 2013b). Unfortunately, this was not implemented as only bus companies could operate transport services, and they were not interested in operating small-scale, feeder services. So, villagers wishing to travel could only use family motorcycles.

Hub and spoke systems are widely used ways of consolidating transport demand, using complementary large and small means of transport. Indeed, most land transport systems are based on such models (see Section 2.3). There is scope to improve rural transport by developing additional small-scale hubs, but this requires careful planning and good collaboration between the various stakeholders.

7.5 Motorcycle trails

As mentioned in Section 2.3, motorcycle trails can allow people living in off-road villages to reach the road network using motorised transport (Sum4All, 2019). This is already happening for some villages in Tanzania, as motorcycle taxi drivers interviewed on all roads studied in this research said they regularly collected people from off-road villages. Evidence collected following trail construction in Liberia showed that people in off-road villages travelled more to markets, clinics and other destinations. Some people would travel all the way by motorcycle taxi, but many took the motorcycle along the trail to the nearest road, and then took other public transport (Starkey et al., 2017; Jenkins et al., 2020). Similarly, urban-based family

members would travel on public transport to the start of the trail, and then take a motorcycle taxi from the junction to their relatives' village. In other words, the motorcycle trails boosted overall transport demand for all forms of rural transport services. The junctions of the road network and the end of the trails become complementary small transport hubs, and start to diversify economically and develop, stimulated by the greater number of people passing through and those waiting for connections. Therefore, constructing motorcycle trails to off-road villages can be a way to stimulate additional market demand for rural transport services, increasing the probability of greater transport frequency and predictability.

7.6 Telecommunications, ride-sharing apps and electronic ticketing

With increasing use of mobile phones and tablet computers throughout the world, and greater rural coverage from telecommunication satellites and masts, there are many implications for rural transport services. Sometimes external sources can reduce the need to travel, for example if information on health, education, agriculture or market prices can be obtained by phone or the internet, there is no need to travel to seek it.

In countries such as the USA, transport firms offering low-cost travel to and from airports started by using call-centres to consolidate demand and optimise routings. Their shuttle passenger vans (referred to as paratransit) had no predetermined timetables or specific route, but as requests came in the operators would assign vans to pick up passengers from two or three hotels to take their clients to the airport. At the airport, a liaison official would assign arriving passengers to a certain van, who would then take their clients to their different, but nearby, destinations. A similar, simple paratransit model is used to consolidate loads for subsidised transport services for vulnerable people (such as the elderly and people with disabilities) in some high-income countries. With rural transport demand insufficient to justify fixed routes and timetables, the paratransit model allows clients to phone in transport requests, and the operator to consolidate the dispersed demand into viable journeys serving several villages. This paratransit model is very simple to operate, requiring only a central phone hub and several transport operators ready to respond flexibly. Fares would probably need to be above those of a route-based vehicle travelling with a full load, but below those that would be charged by a chartered point-to-point taxi. In many countries, operators of minivans and minibuses wait for hours in a queue for their turn on the main route, and so such a system (run by the local transport association) would allow them to serve additional roads that did not justify daily trips. However, the authors are not aware of such practices, which, if well-run would benefit both the operators and the users.

Increasingly in USA and in many countries, the paratransit market is now using communal ride-sharing apps that can perform similar functions to the older phone-based systems. Ride-sharing apps are widely used in some cities as are ride-hailing apps (similar to Uber) that can be used for single clients wanting motorcycle taxis (as in Pakistan, Kenya and Rwanda), three-wheelers, 4-wheel taxis or larger vehicles. Such apps have much potential to be used for rural transport services. The increasing use of mobile phone payment services (such as M-Pesa across Africa, and Tigo Pesa in Tanzania) can not only make payments easier, but can be used to make small deposits with bookings to give the operator confidence to travel to a remote area.

Mobile apps offer a highly effective method of improving rural transport supply and demand. These should be encouraged for use by small-scale transport services (motorcycle taxis and three-wheelers) and also for larger services such as minivans and minibuses. For the larger vehicles, the management of the system might be easier if they were embedded within hub-based associations. However, formal sector organisations (using Uber-type systems) could help link supply and demand over larger areas. Consolidating dispersed rural transport demand would have many benefits and offers great scope for entrepreneurs, devolved administrations and/or NGOs.

To date, electronic ticketing has been used effectively in integrated transport systems in cities (such as Hang Zhou and London). In Fiji, all buses, including rural buses, have adopted it (see Box 6). With the widespread use of mobile phones and mobile-phone-based money transfer systems, there will be scope for electronic ticketing for rural transport services, ideally across all public transport types (as in Hang Zhou). This is not on the immediate horizon in most low-income countries but is likely to be one way forward. One

of the advantages of this (as has been found in Fiji) is the great value of the anonymised statistics that can be accessed, showing ridership patterns, travel times and the types of people travelling (age, gender, disabilities, etc). Such information should prove invaluable in planning and developing improved rural transport services in the coming years. Figure 12 shows the use of the card-based system on urban and rural buses in Fiji. The customer taps their card (with money deposited on it). They state their destination and the driver types in the fare. The ticket is automatically printed for the passenger (the driver does not touch the card or the ticket), and provides not only a verifiable receipt, but also the remaining balance on the passenger's card.

Figure 12 Montage showing bus e-ticketing in Fiji, with tap in, ticket collection, driver's panel and sample ticket



8 Conclusions

8.1 Research questions

The research questions for this part of the study were:

- What can be learnt from rural transport service operations and the institutional environment in which they function in Africa and Asia?
- Are rural transport subsidies an option in low income countries?
- What is preventing rural transport services being scaled up and extended to remote areas where they would have most impact?

8.2 Rural transport services operations and institutional environment

In most low and middle-income countries, there has been a large expansion in motorcycle numbers which is having a large impact on rural transport. In many countries, motorcycles are the most common vehicles on rural roads. On some LVRRs studied in Tanzania they represented over 90% of the traffic and the passenger movements. In Tanzania, and many other countries, motorcycle taxis are often the only public transport services available on rural roads. Three-wheelers are mainly used as small urban taxis, but they are increasingly used in Africa and Asia for providing both point-to-point and route-based services suitable for roads with low transport supply and demand. Three-wheelers have started to have an impact on the rural roads studied in Nepal and Tanzania, notably on the busier sections near to the urban areas which have higher transport demand than is provided by the longer distance services.

The IMPARTS observations and literature review suggest rural transport services are predominantly provided by individual operators working in the informal private sector. Smaller vehicles may be owner-operated or may be leased on a daily basis. Bus owners may hire drivers to operate their vehicles, but smaller-scale transport services are generally operated by the person owning or leasing the vehicle. Few informal sector operators own more than one vehicle, but some people with greater wealth own several vehicles that they rent out to different operators.

In certain countries, there are examples of parastatal bus services and private sector formal services. These mainly operate on urban and inter-urban routes. Where buses do provide rural transport services, they generally start in villages and travel over 100 km to a major town or city, with much of their route on main roads. Medium distance transport between villages and local market towns is almost invariably by smaller vehicles such as minibuses, minivans, pickups, three-wheelers and, in some countries, motorcycle taxis.

Operators of rural transport services may join with others to form associations for mutual support. This is most common for the services that operate from urban stands. This research found that many operators based in rural areas are not members of associations. Associations frequently control queuing and loading at urban stands. Such associations can become strongly anti-competitive cartels. In some countries strong national associations are cartels with great influence and power.

The informal sector rural transport services are market driven and expect to make a profit on each trip. They therefore only operate when and where they perceive market demand. No journeys or profits are possible when roads are impassable. When roads are in poor condition, journey times and operating costs are high. This research demonstrated that while rural transport services prefer good quality, all-season roads, passenger numbers are a greater priority. They will operate on poor but reliably passable roads if there is a market. They will not use better quality roads and bridges if they see little market potential. It is evident that transport services operators and other stakeholders should be consulted prior to rural transport investments, to ensure the planned infrastructure is appropriate and fit for purpose.

Transport services regulatory bodies have few staff and low budgets and concentrate on urban and inter-urban transport services. They seldom engage with rural transport services operators or plan rural transport systems. Regulations are normally imposed at national level, without recognising the various issues associated with rural transport services. They are not generally updated rapidly to take account of changes in rural transport services, such as the increasing use of motorcycles and (in some countries) motorcycle taxis. In several countries, changes to the regulatory environment have been brought in

following high-profile, fatal crashes, which have led to the banning of certain vehicle types or operational practices for public transport services.

While the regulatory environment is seldom very conducive to current rural transport services (many of which would be deemed to be operating illegally), enforcement of regulations concerning rural transport services is often minimal. There are few, if any, staff from the regulatory authority at district level and few police regularly patrol rural roads. The police, and any other local enforcers, tend to be sympathetic to the transport needs of rural people, and accept certain levels of non-compliance in terms of vehicle condition, loading levels and fiscal regulations. In some countries, the opportunities for rent-seeking (bribery) means that non-compliance is advantageous for the enforcers. Enforcement can be stricter in some locations, for example on the outskirts of market towns, but seldom penetrates into the remoter LVRR network.

In general, the regulatory environment, enforcement agencies and any transport associations tend to allow the status quo to carry on. Changes to national regulations tend to have little immediate effect on rural transport services. Improvements in services are most likely to be implemented in rural areas through local initiatives, perhaps at district level, where there may be a mutual interest in raising standards through appropriate schemes designed to improve transport demand, service frequency and reliability and fleet quality.

8.3 Subsidy options

Subsidies are essential for rural transport services in high-income countries. In some low- and middle-income countries there are subsidised formal sector bus operations, but these mainly serve urban and inter-urban routes, and only benefit a small number of rural villages directly. There is little enthusiasm in low-income countries for direct subsidies for informal sector operators. Indeed, some national authorities appear more concerned to increase their tax revenues from transport services. While there have been some schemes to provide subsidies to prevent fares rising, these have mainly been introduced to avert discontent in the peri-urban areas around important cities.

While a case for subsidies for rural transport services can be made in the contexts of rights and 'leaving no one behind', it is concluded that this is not a realistic option in the short-to-medium term in low-income countries. However, some expenditure can be encouraged from aid agencies, local authorities and/or NGOs to support schemes to improve rural transport services. Short-term subsidies to cover certain operating costs and/or fleet renewal, could be included as part of the inducements to participate in district-level schemes to improve transport services through load consolidation and route improvement. The targeted subsidies could be used to help 'prime the pump' and create a virtuous spiral of increasing ridership and improving transport services.

8.4 Potential to scale up and extend rural transport services

Rural residents require transport services that are readily available, affordable, predictable, accessible, comfortable and safe. They also need them to carry their produce and goods to and from markets. Rural transport operators need to be assured of a market and be able to make a profit. Most rural transport operators struggle to make a good livelihood and may use substandard vehicles and risky practices to make a living. With passengers glad of any transport, sympathetic local enforcers and a lack of scrutiny from transport regulatory authorities, there are few incentives for operators to improve their rural transport services.

It is difficult for the current, under-resourced transport services authorities to improve rural transport services. With pressures from politicians and urban middle-classes and media encouraging modernisation, there is a tendency to try to raise standards through national legislation. Raising standards is likely to lead to higher transport costs. However, in the absence of rural enforcement things change little on rural roads. Where there is strict enforcement, as in China, rural transport services may disappear completely as the informal sector cannot operate profitably, and the formal sector prefers to operate on inter-urban routes. In such circumstances, private motorcycles become the main means of medium distance transport for rural families who cannot afford to own cars.

Regulators would like transport services to be run by formal sector operators, either companies or cooperatives. This would make negotiations and enforcement more straightforward. There have been attempts to formalise transport services (mainly in urban or peri-urban areas), but these have taken many years of patient negotiations. Without strict enforcement, compliant formalised operators are vulnerable to competition from non-compliant individuals reverting to the informal sector model of minimal capital investment, high loading factors and attractive journey times and/or prices.

At the devolved district level, it may be possible for local planners to work with transport associations and local user groups to improve transport services. This would not be practicable for most existing regulating bodies due to their small staffing levels and limited presence at district level. However, it could be feasible if rural roads agencies and transport services agencies collaborated and formed 'Roads and Transport' units (with various administrative options to allow effective collaboration or even institutional integration). One aim should be to start upward spirals of transport services and market demand. With greater market demand, there is more scope for improvements in vehicle type and transport frequency as well as price reductions per passenger-km. On some routes, operators can quite easily stimulate greater demand by agreeing to work to timetables as greater predictability increases transport services use.

Transport demand (the main criterion for the operation of transport services) can be stimulated by increasing and/or by consolidating the number of people wishing to travel. This can be achieved through community collaboration and dialogue with transport operators to initiate (or increase) services. Local NGOs or 'Roads and Transport' officials could help initiate the processes. Ride-sharing apps (or simple call centres) offer good and increasingly viable options to consolidate loads. Route sharing allows operator associations (or regulatory authorities) to apportion routes with different transport demand, using rotas or imposing a cross-subsidy mechanism. Taking on and sharing a new route by a local association can create a larger transport market, and lead to improved overall incomes for the operators sharing it. This process also requires participatory collaboration and could be facilitated by 'Roads and Transport' officials, or a local NGO. Connecting off-road villages using motorcycle trails and trail bridges can increase transport demand on the road network and so stimulate greater transport frequencies and/or use of larger vehicles. Planning for more effective integration of large and complementary small transport service types can be achieved by ensuring smaller vehicles provide effective feeder services for the large capacity vehicles (such as buses). This tends to happen spontaneously but can be improved through planning and simple modelling.

9 Recommendations

9.1 Develop integrated approaches to rural roads, motorcycle trails and transport services

The following recommendations are intended for national transport services regulatory authorities (or agencies), road authorities (or agencies) and devolved government authorities (such as district administrations).

- Transport services authorities/agencies and roads authorities/agencies should actively collaborate, to share knowledge and understanding to help improve rural transport. In the long term, institutional integration could assist in this process but in the short term collaborative operational units can be developed.
- Transport services agencies should use participative processes to develop and implement realistic strategies for improving rural transport services. This should involve collaboration with the devolved staff of roads agencies and delegation for overseeing implementation to devolved, multi-disciplinary coordination groups including representatives of local authorities, transport services operators and transport users.
- Road authorities should develop a national strategy to ensure that all off-road villages in suitable locations can be connected to the road network by low-cost motorcycle trails and trail bridges that could be constructed by community-based groups, with appropriate advice and support.
- Roads authorities should establish units to provide guidance on the construction and maintenance of motorcycle trails and trail bridges. These units should provide technical advice and capacity building to local authorities and/or interested NGOs and community-based groups that can support the local construction of motorcycle trails and trail bridges to connect off-road villages.
- Local authorities, working in coordination with roads agencies and other actors, should endeavour to ensure off-road villages in their areas are connected to the road network through appropriate trails, trail bridges, waterways or other appropriate infrastructure.

9.2 Work with stakeholders to improve rural transport services

The following recommendations are intended for those people or groups working at a devolved level to improve rural transport services. Depending on the institutional arrangements and agreements, these might be district level committees, staff of devolved 'Roads and Transport' authorities/coordination groups and/or local development-oriented NGOs working in collaboration with others. Further information on the various participatory options are provided in the IMPARTS Guidelines (Starkey et al., 2020d).

- At devolved levels, initiate participatory processes and initiatives to stimulate discussion with transport operators and users on ways of improving rural transport services, including frequencies, routings, vehicle types, tariffs and safety.
- Working with local partners, NGOs, local transport associations and user representatives, consider ways of introducing load-consolidation schemes, timetabled services, route sharing on alternative routes and the introduction electronic methods such as apps to consolidate transport demand.

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